The Thai social capital as a social determinant of oral health

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Appendices

- Appendix I Protocol for Oral Epidemiological Examinations
- Appendix II Information sheet and consent forms
- Appendix III Research questionnaire

Research Abstract

Background: A Strategy to promote social capital has been included in the Thai government's economic and social development plan since 2007. According to the plan, social capital covered the traditional definition of institutional and social networks, the structure of relationships and norms of reciprocity. In addition, it also included all non-financial capital such as individual characteristics, local wisdom and physical environment. Several studies, conducted in the industrialized countries, found social capital to be a determinant of health/oral health. However, no studies systematically explored the nature of social capital in Thai rural communities and its relationship to oral health.

Objectives: This research aimed to explore social capital of Thai rural communities, focusing on its role in oral health. Researchers also wanted to test if the well-established determinants (such as socioeconomic status, smoking, oral health care utilization) could determine oral health of the Thai rural people.

Methods: An integrated qualitative-quantitative approach was implemented. An ethnographic study in several north-eastern communities was undertaken to identify the locally specific social capital variables. Those variables were transformed into a questionnaire, then asked in the quantitative phase of the study. The questionnaire also explored oral health related quality of life (OHIP-14), oral health behaviours, mental health, socioeconomic status and demographics. Clinical oral health examinations, collecting caries experience (DMFT) and clinical attachment loss (CAL), were carried out. 650 participants, 35-80 years old, living in six sub-districts or Tambon (Thai: ອຳນລ) of Sakonnakhon, north eastern Thailand participated in this study.

Results: The ethnographic study found that Thai rural social capital comprises tangible and intangible assets that contribute to people's *Survival* from financial constrains, their lifestyle of "living in moderation" (*Sufficiency*) and the presence of a *Sustainable* community environment. The quantitative study found 1) non-linear relationship between Thai social capital and oral disease as well as oral health related the quality of life; 2) age was the strongest predictor of oral diseases; and 3) conventional risk factors were associated with oral diseases, oral health-related quality of life e.g.

socioeconomic status associated with caries experience, smoking associated periodontitis, and oral health care utilization associated with oral health-related quality of life.

The research contributions: 1) Social capital is a determinant of health/oral health in contemporary Thai rural communities. 2) By incorporating the concept of locally and culturally-appropriate research study, it is the very first community dentistry research, done in Thailand that used the qualitative-quantitative integration approach. 3) It confirmed the influence of major risk factors of oral diseases in Thai rural population. 4) It was the first study to use a Thai version of OHIP-14 to explore oral health related quality of life in Thai population.

Declaration

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution to Sutee Suksudaj and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

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Sutee Suksudaj

Date 30 September 2010

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Chapter 1 : Introduction

1.1. The characteristics of northeast Thai rural communities

Thai society has unique characteristics that need to be considered before initiating public health research studies and programs. Historically, Thailand is the world's only Theravada Buddhist country that has never been colonised by European countries. It can be claimed that Theravada Buddhism, accompanied with the monarchy system, has continuously influenced the Thais' world view and their socio-cultural structure for several centuries without any direct Western manipulation¹. Geographically, Thailand is very fertile. Although its size is ranked 50th among the world's countries, Thailand is the world's 8th biggest food exporter². The quantity and variety of foods produced in Thailand should be noted. Because of its tropical location, Thailand is also known as one of the areas with the highest biodiversity in the world. Forty percent of Thai's labor force work in the agriculture sector. The majority of people in the agricultural sector are small-scale farmers and the land under plantation crops is mostly owned by those farmers. On average, a Thai small-scale farmer household holds 22,000 square meters of land for their plantation³. However, the small-scale farmers are always regarded by the government as the most deprived (or grass root) group in the country. Unlike industrialised countries, deprived groups of Thai people hold some amounts of land and are able to produce food and herbal medicine for themselves.

The North-east Thai rural area is one of the most interesting in Thailand. Compared to other areas in Thailand, this area has less rain, fewer irrigation systems and less fertile soil. The farm product from this area is comparatively lower than the northern, middle and southern areas. Therefore, economically, small-scale farmers from this area are always considered as the poorest of the poor people in Thailand. The majority of people are in the primary agriculture societies. Culturally, people in this area share the strong Thai-Laos culture and tradition, huge amounts of ancient and local wisdom concerning social interaction, religious beliefs and even healing methods which are well preserved and transferred to later generations⁴. Extended families, strong community bonds, routine religious ceremony participation and any other characteristics of the primary communities could still be investigated. Moreover, this area is regarded as the cradle of

Buddhist saints. North-east forests were the origin of the Buddhism forest tradition and it was believed by Buddhists around the world that the lineages of the enlightened monks still exist. Politically, the party who won the election in the north-eastern area was more likely to be the government. One third of the country's voters are located in this area. The north-eastern people have been also regarded as notorious vote-sellers⁵.

Since the first national economic development plan in 1961, several constructions initiated by the government have improved the infra-structure for the people. People in most of the north-eastern communities can access basic public services such as schools, primary health centres, roads, electricity and clean water. Following the first plan, nine five-year plans were implemented. The paradigm of Thai development was based heavily on the concepts of capitalism and industrialisation. Several cash crops were introduced to small-scale farmers. The concept of agriculture was changed from cultivation of various kinds of crops to meet the needs of the farmers' family, to planting single species for cash. Young people left the village to work as unskilled labourers in industrial factories in the big cities. Single cash crops plantations led to the heavy usage of chemical fertiliser, pesticides and herbicides. The independent primary agricultural lifestyle has changed to the plantations that depend on seeds and chemicals from multi-national corporations ⁶.

Effects of industrialisation development are evidence in Thai north-eastern communities. Deforestation, soil depletion and chemical exposure accompanied social problems such as emigration of younger generations, family breakdowns, drugs and violence have been listed as routine social problems that were scarce in previous generations⁷.

Concerned about these negative effects, the ninth economic and social development plan shifted the focus of development from the economic money-driven to the human-centre scheme. Finally, the latest 10th plan (covering 2007–2011) recognized the social capital as one of the elements for Thai community development.

1.2 Social capital as a concept for community development

Social capital is a social concept mentioned by several classic theorists. This concept traces back to the 19th century of Marx's analysis of social class and Durkheim's study of anomie ⁸. Pierre Bourdieu, James Coleman and Robert Putnam, could be considered the

most influential contemporary scholars in the field of social capital. Robert Putnam's acclaimed book "Bowling alone: the collapse and revival of American community", provoked the general public and politicians awareness of this issue⁹. The notion of social capital was mentioned several times in UK Prime Minister Tony Blair's speeches from the years 2000 to 2002¹⁰. It has also been introduced as a significant social development strategy by the World Bank¹¹.

Social capital sometimes has been depicted as a magic remedy to cure several social problems. It was studied beyond the sociology field into the fields of education, political science, business and public health. The studies found the association between social capital and school attrition, academic performance, crime rate, juvenile delinquency, political participation, organisation business benefit and health status¹².

In the Thai context, the notion of social capital was re-introduced as one of the strategies to cope with the aftermath of the 1997 financial crisis. Shivakumar et al. proposed that Thai social capital has been depleted as a result of modern development and the financial crisis¹³. In 1998, King Bhumibol Adulyadej officially addressed the concept of "new theory on the sufficiency economy" as a model of self-reliance that could lead to economic-reliance and a sustainable future¹⁴. From then on, social capital along with other concepts in the same category such as self-reliance, sufficiency and moderation were heavily promoted as the national values by Thai governments. Recently, the Thai National Economic and Social Development in Thailand's 10th national economic and social development plan (this plan covered the country's development strategies from 2007–2011).

1.2.1 Definition of social capital

There are several definitions of social capital. In the broadest sense, social capital is a type of asset. It was differentiated from two other well-known capitals: financial capital and human capital. While people's financial capital was the amount in their bank account, and their human capital was what was in their head or their ability to perform the task, their social capital could be found in the structure of their relationships⁸. Leading scholars accepted that social capital could be both an individual asset and a community attribute. Bourdieu defined this notion as "the aggregate of the actual of potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition"¹⁵. Coleman defined social capital through its function. Coleman's social capital included the entities in the social structures that facilitate certain actions of person or the communities who belonged to those structures. More recently, Putnam's definition of social capital as "the connections among individuals–social networks and the norms of reciprocity and trustworthiness that arise from them⁹", was the most widely accepted.

Used in a practical perspective, a simplified categorisation of social capital was proposed. Two perspectives of social capital: cognitive and structural (Bain et al. 1998, cited in De Silva 2005) were widely accepted¹⁶. The cognitive social capital, what people "feel", referred to the individual's characteristics such as trust and reciprocity, while the structural social capital could be found in what people "do" which referred to group participation and networking.

1.2.1 The mechanism of social capital

One could integrate the characteristics of social capital mentioned above and conceptualise that an individual with high social capital tends to have a rich social connection, living a highly socialised lifestyle, having the ability to do and to return favours, being trustful and knowledgeable. Whereas communities with high social capital tend to hold people in complex networks and have strong social institutions. Optionally, those communities could be rich in culture and tradition, and may be located in natural-resource-rich areas.

The Thai social capital conceptual framework was suggested by the World Bank in 2006¹⁷. The World Bank considered cognitive social capital (such as trust) and the structural social capital (such as organisation and networks) as the stocks. Villagers utilised those stocks in order to address common community problems. The process of utilisation could be observed in the community voluntary actions and communication. This concept of capital utilisation will be discussed later in this chapter.

1.2.3 The modification of the social capital definition in Thai's context

The Thai National Economic and Social Development Board (NESDB) adjusted the definition of social definitions to fit Thai's social context in their 10th economic and social development plan (2007–2011)¹⁸. In Thai social context, social capital was the structure of the relationships of four elements: people, institution, culture and knowledge. The people element included their morality, their ability and wisdom, while the institution were family, religion, politics and administration, education, business and the media. The element of culture included the belief, faith, social norm; moreover, the historical buildings, sites and objects were also included in this group. Unlike the definitions given by Seeman¹⁹ and Schwarzer²⁰, who considered social support to be the consequences of social networks, the Thai NESDB integrated social network and social support into their definition of social capital. The knowledge element consisted of the local wisdom and the new knowledge²¹. The NESDB considered those four elements as Thai society's assets and as the critical aspects for promoting desirable Thai lifestyle and economic growth.

The NESDB's definition integrates human capital and social capital in their definitions. Moreover, the level of reference clearly mentioned that Thai's social capital could be considered at both an individual and community level.

In order to clarify the terms, in this thesis, "social capital" refers to the traditional meaning given by social theorists, and "Thai social capital" will indicate the meaning given by NESDB.

1.2.4 The relevant social concepts of Thai development and the Inpaeng network

The NESDB broad definition of Thai social capital went along very well with views of several Thai scholars on the discourse of Thai development. Pongpisit Wisetkul and Apichai Panthasen suggested the notion of Buddhist Meritlism and Buddhist economics²²⁻²³. Both of them applied the Thai Theravada Buddhist teachings and several concepts that were familiar by Thai lay people such as *Punna*, *Dana* and *Sila* (Thai: ug, mu, An, to challenge the mainstream consumerist economic system. Seri Phongphit's view of social capital was widely accepted. He differentiated money as distinct financial capital and he urged the people to focus more on natural resources capital, wisdom capital and social capital. Like NESDB, in some contexts, Seri included all non-monetary capital and

categorised them as social capital. In his acclaimed "back to the roots" notion he proposed the promotion of social capital as a strategy to address Thai poverty. In this sense, social capital incorporated the inherited local wisdoms that were expressed in the culture, traditions, life style, value system and the fertility of the communities' environmental system²⁴⁻²⁶.

As mentioned earlier, the most well-known development philosophy in contemporary Thai society is the King Bhumibol Adulyadej's "Sufficiency Economy" (Thai: เศรษฐกิจพอเพียง). The core concept of this philosophy was translated from the economic and social development plan as: ²⁷

"Sufficiency Economy is a philosophy that guides the livelihood and behavior of people at all levels, from the family to the community to the country, on matters concerning national development and administration. It calls for a "middle way" to be observed, especially in pursuing economic development in keeping with the world of globalization. Sufficiency means moderation and reasonableness, including the need to build a reasonable immune system against shocks from the outside or from the inside. Intelligence, attentiveness, and extreme care should be used to ensure that all plans and every step of their implementation are based on knowledge. At the same time we must build up the spiritual foundation of all people in the nation, especially state officials, scholars, and business people at all levels, so they are conscious of moral integrity and honesty and they strive for the appropriate wisdom to live life with forbearance, diligence, self-awareness, intelligence, and attentiveness. In this way we can hope to maintain balance and be ready to cope with rapid physical, social, environmental, and cultural changes from the outside world."

Nithi Eawsriwong, one of the most influential Thai social scientists, concluded the ultimate goal of Sufficiency Economy was to establish the security of the four life essences and sustainability (the four life essences included food, clothing, accommodation, and medicine). This ideology is also the social goal of other economic philosophies. However, while communism suggested that the security of four life essences could be established by the state, and capitalism assigned this task to the mechanism of the free market, the sufficiency economy required the cooperation among people, community and the state. Unlike the other perspectives that considered the

sufficiency economy as mere agricultural technique or even a set of financial ethics, Nithi proposed sufficiency economy as a culture. He argued that the sufficiency economy is the opposite of individualism; it required the interconnectedness between people and their ecosystem. He asserted that strong social/community bonds, the social capital, was the key element for achieving the sufficiency economy²⁸.

Since the Asian financial crisis in 1997, a set of social values including living in moderation, being mindful, looking inward, being self-prepared for uncertainty, and sustainable development, were promoted as the contemporary Thai national values via several social campaigns led by the philosophy of the sufficiency economy. Groups of Thai people, particularly small-scale farmers, were encouraged to integrate those contemporary values, mixed with their own traditional culture and local wisdom and came up with their unique style of a self-reliant way of life. Parnwell studied some rural Isaan (Thai: อิสาน, meaning: of the north-east) communities and found three phases social phenomena along 30 years timeline (Before 1975: Localism and harmony, Post-1975: Delocalization and disharmonization, Post-1983: Neo-localism and reharmonization). He claimed that the social harmony and local environment were severely depleted during the early decades of launching the Thai national economic and social development plans. However, the "self-reliance and the strengthening of community social and economic institutions" observed in those communities were the critical social entities that rehabilitate the social harmony and local environment. He used the terms "ecolocalism" and "neolocalism" to describe the social movement that collected the Isaan communities' strength, including social capital, in order to survive in contemporary social constrains^{7, 29}.

The Inpaeng network is another outstanding example of how Isaan people adjusted themselves in order to cope with the modern constraint. In short, Inpaeng is the name of a non-profit network that aims to promote a self-reliant lifestyle for people living around the Phuphan mountain range at the middle of the Isaan area. One of the Inpaeng's main strategies was to utilise the unique Thai social capital acquired from the communities. This research study will explore Thai social capital according to Inpaeng context. The context of Inpaeng network will be discussed extensively in the following chapter.

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1.3 Health/Oral health system in Thailand

1.3.1 Health service

Thai public health services are categorised by level of care including primary care, secondary care and tertiary care. The majority of primary care is given by public health centres. For secondary health care, the main providers are community hospitals. Lastly, the tertiary care is provided by general hospitals, regional hospitals and University hospitals. Geographically, health centre's service covers the sub-district (Thai: Tambon ກຳນລ) level, the community hospitals provided health services in the district (Thai: Amphur ອຳເກລ) level, the general hospitals for province (Thai: Changwat ຈັງຫວັດ) level, and the tertiary care hospitals provide health services in the regional and national level. The health services from health centres are provided mainly by public health workers, registered nurses and dental nurses. The services given at community hospital level and beyond are done by medical doctors and dentists. Private health services are also found in the form of clinics and private hospitals.

1.3.2 Health policy

The Thai Ministry of Public Health (MoPH) reported the health strategic plan of Thailand in their book "Thailand Health Profile 2005–2007".³⁰ The ministry incorporated the "Millennium Development Goals", proposed by the United Nations Millennium Declaration, to achieve "Health for all" and "all for health" conditions. They planned to draw the contributions of every element in Thai society to create a healthy country. The MoPH vision of the Thai health system was "Aiming for sufficiency health system in creation good health, good services, food society, happy/sufficient livelihood in a sustainable manner". Six strategies were proposed by the MoPH for development of the Thai health system. Those strategies fully incorporated the notion of the sufficiency economy. The phrase "the sufficiency economy" reflected the core values of good governance, happy lifestyle in a society of well-being, immunity or protection system, integrated Thai and international wisdom and knowledge-based, appeared in almost every strategy.

In conclusion, contemporary Thai health policies emphasises not only the health providers" perspectives but also valued Thai social characteristics. Both attributes were equally valued as strategies to develop the Thai health system.

1.3.3 Oral health status in the Thai population

The MoPH has conducted several national oral health surveys starting from 1984 and repeated every five years. Six surveys were implemented; five national reports were published in 1984, 1989, 1994, 2001 and 2007 respectively. They aimed to monitor the severity of oral diseases across various age groups in the Thai population. The surveys collected data from seven age groups: 3 year olds, 5 year olds, 12 year olds, 15 year olds, 35–44 year olds, 60–74 year olds and 80 years or older.

According to the national oral health survey data from 1984 to 2007³¹, dental caries and tooth loss in every age group are problems that have never been improved. The prevalence of caries was almost 60% in the 3 year old group and 80% of the 5 year old group in 1984; the caries prevalence and severity in those age groups were increasing along the timeline. The prevalence of dental caries in permanent dentition was also extremely high. Sixty percent of the 12 year old group and 90% of the older groups had caries experience. The mean DMFT was 2.24 affected teeth per person for the adolescents, 6.74 for the adults, and 15.85 for the older adult group.

In adults and the elderly, more than 40% had at least one site in their mouth with 4 mms or deeper periodontal pocket depth. Since 1984, the trend of the periodontal problems in adults has not improved. More than 70% of the adults and older groups were non-smokers.

The severity of oral diseases among rural people was considerably worse compared to the city people. Moreover, people in the city areas have improved their oral health slightly along the timeline but the rural people have not.

The latest national oral health survey data (2007) also explored some oral health behaviours. Almost 80% of the adult group (78.5%) and more than 60% of older group (63.8%) always brushed their teeth with fluoride toothpaste. Less than 40% of the adult (38.8%) and older groups (32.3%) had a dental visit since last year. Three main reasons for

last dental visit of the adults were cavities (12.9%), pain (15.8%), and calculus (12.5%). The majority of the adult and older participants (more than 60 percent) received oral health instruction via television programs.

According to the latest national oral health survey report, sugar consumption in children and adolescents was the major risk factor for dental caries in those groups. However, no clear risk factors contributing to the oral health problems in adult and older groups were identified. In fact, since 1984, Thai Ministry of Public Health's data, have never been analysed to identify oral health determinants in the Thai population. No inferential analysis, exploring oral health risk factors, was reported in any national oral health survey reports. At the end of their executive report, the authors expected more severity of tooth loss and periodontitis for the adult and older population unless some "clear" preventive strategies were implemented.

As stated in the annual report of Thai Health Promotion Foundation in 2006, oral health was set as the first Thai health indicator followed by other main issues such as teenage pregnancy, nutrition, alcohol consumption and mental health trauma³². It can be confirmed that the oral diseases dental caries and periodontitis, are contemporary Thai public health problems. However, no clear social strategies, particularly for the rural communities, were proposed to deal with these growing problems.

The following paragraphs review the studies of traditional social determinants of oral health. The findings from the studies should be used in the Thai national-level for designing oral health promotion strategies. Moreover, apart from the traditional determinants, the locally specific Thai social determinants of oral health should be studied systematically as well. Thai social capital was explored in this study, in order to serve that proposes.

1.3.4 The determinants of oral health: studies in Thai population

Some cross sectional studies have investigated the determinants of oral health in Thai communities.

Since the 1980s, the studies explored the clinical and behavioral variables as determinants of oral health. Then, after the year 2000, more studies focusing on social

determinants of oral health could be observed. Yupin Songpaisan et al. ³³ explored the influence of dental service typology and fluoride well drinking water on dental caries severity in northern provinces. In southern provinces, Baelum et al.³⁴⁻³⁵ explored the relationship between several local context variables and oral diseases of adult participants. The results showed that, people of Muslim faith were less likely to have tooth loss and periodontitis compared to Buddhist participants. Also in a southern province, Petersen et al. found in a study of school children that annual dental visiting, consumption of sweets, Muslim ethnic groups and being female were positively associated with caries experience³⁶. For the central region, a relationship between mother's education, family income and Early Childhood Caries was found in Thongchai Vachirarojpisan et al.'s study³⁷. Supaporn Chatrchaiwiwatana's study found that Betel quid chewing and low education were risk factors for tooth loss in the north-east Thai people³⁸.

In summary, some well-known social determinants of oral health such as education and income were widely researched in Thai communities. Some Thai culturally specific variables such as religion and Betel quid chewing were considered. However, systematic studies on the social determinants of oral health in north-east rural Thai communities could not be found.

1.3.5 Oral health-related quality of life and studies in Thai communities

Researchers have proposed using perspectives to illustrate oral health apart from measuring the prevalence and the severity of clinical oral diseases. Terms like oral health-related quality of life (OHQoL), burden of oral diseases and impact of oral health were suggested to reflect the consequences of oral diseases to an individual. The conceptual framework of oral disease's consequences, as suggested by Locker³⁹, were pain, discomfort, functional limitation and disability and handicap. By investigating the oral health-related quality of life issue, the scope of the results was extended from clinical findings within the patient to the interaction between that patient and his/her environment. Slade and Spencer^{40,41} used the collective term "social impact" to refer to the consequences of oral disease in people's lives. They also showed the benefits of studying social impacts of oral health as: 1) for assessing the priorities for health/oral health care and 2) for gaining a better understanding of oral health related behaviour and

the determinants of oral health. Several indicators were proposed to measure oral healthrelated quality of life.

A group of Thai scholars who graduated from The University College London Medical School, England, have published several studies of Thai oral health-related quality of life since the 1990s'. Supreda Adulyanon et al. invented and applied measurement to evaluate impacts of oral diseases on individual's daily performances: physically, psychologically and socially; this index was later called Oral Impact on Daily Performances or OIDP index⁴². Patcharawan Srisilapanan et al. used a minor modification of the OIDP index exploring northern Thai older adults in several studies⁴³⁻⁴⁵. Then recently, Sudaduang Krisdapong (or Sudaduang Gherupong as appeared in several articles before 2008) simplified the index and used Child-OIDP in measuring school children's oral healthrelated quality of life⁴⁶⁻⁵⁰. Influenced by Sudaduang's studies, the Thai Ministry of Public Health used this Child-OIDP index to measure the OHQoL of 12 to 15-year-old Thai children in the sixth Thai national oral health survey in 2007⁵¹. The Thai studies of OIDP proposed the same message to the oral health service sector, especially the oral public health service. They suggested the new method of evaluating dental treatment needs in a more comprehensive and holistic fashion. The integration between OHQoL and clinical findings were needed to gain a better understanding of the population's treatment needs across every age group.

Despite of the popularity of OIDP used in Thai communities, this study deliberately selected another QHQoL index, the Oral Health Impact Profile (OHIP). OHIP was used in this study in order to explore more domains, not only the daily performances. Developed using Locker's conceptual framework, the Oral Health Impact Profile is a well known international indicator for measuring oral health-related quality of life for decades. Seven domains: Functional limitation, Physical discomfort, Psychological discomfort, Physical disability, Psychological disability, Social disability and Handicap, were measured to mirror the social impact of oral health. Forty-nine questions called OHIP-49, constructed by a qualitative-quantitative mixed approached study, covered a number of aspects of social impact of oral health. Statistical analysis showed great test results in terms of reliability and validity ⁴¹. In 1997, OHIP-14, the short form of OHIP-49, was developed and tested by the same researcher. OHIP-14 was tested and showed favorable results for its reliability,

validity and precision to OHIP-49⁵². Because of its statistically strong ground and its coverage to various domains, the OHIP index "is considered to be the most sophisticated measure of oral health"⁵³.

OHIP score has been used widely in the US and in Australia⁵⁴, as a main oral health outcome in the National Oral Health Survey, for studying the impact of oral health in cross-sectional studies and for monitoring the change in quality of life in longitudinal studies⁵⁵. OHIP was also being used as an indicator of successful clinical treatments. It has been used in the field of Orthodontics⁵⁶, Temporomandibular disorder study⁵⁷, Periodontology⁵⁸, Oral surgery⁵⁹ and Prosthodontics⁶⁰. The questionnaire has been translated into several languages and is being used in several social and cultural contexts around the world. The languages that OHIP was translated into were German⁶¹, Dutch⁶², Spanish⁶³, Brazilian Portuguese⁶⁴, Arabic⁶⁵, Japanese⁶⁶, Chinese⁶⁷ Malay⁶⁸ etc. In 2008, this research study translated, tested and used Thai OHIP-14 in Thailand for the first time.

1.4 Social capital as a social determinant of health/oral health

1.4.1 Social capital as a determinant of health

In the field of public health, several pathways were proposed to explain the link between social capital and health status. Campbell claimed that social capital influenced health status via the individual's psycho-social, behavioural and physiological pathways⁶⁹. Kawachi and Berkman proposed the same pathway; furthermore, they explained the effect via the aspect of social isolation. Social isolation, as the counter-attribute of social capital, was known as its association to poor health outcomes⁷⁰. The social capital was also associated with people's accessibility to health services. The communities with stronger bonds were more likely to defend budgets that benefited local health services compared to communities with less social capital could be associated with an individual's health. They suggested four explanatory ways of considering social capital as: 1) a pathway between income inequality and health status, 2) an element of social network, 3) a mediator of the health policies' performance and 4) an opposite variable of social deprivation.

Studies of health inequality can be traced back to the 70s. The Black Report ⁷² on health inequality in the United Kingdom called for public attention of this issue. In industrialised countries, categorising people into social classes was based on people's occupation: Professions was in social class I, intermediate profession-skilled workers, skilled non-manual workers, skilled manual workers, partly skilled workers and unskilled workers were grouped in social class II - V consecutively. The study reported that the mortality rate of British social class V was two times higher compared to people in the first social class. Several studies by Wilkinson found that the income inequality was one of the most significant health determinants. According to Wilkinson's, the association between income inequality among people in the community or in the country and their mortality rate was significant⁷³. People who lived in the countries with less income inequality were more likely to have a lower mortality rate compared to those in the country with a wider income gap. In a US study, Kawachi et al. found that social capital provided a pathway between income inequality and health. They found two elements of social capital: group membership and social trust as intermediate factors that associated with income inequality and mortality rate.⁷⁴. Social network affects health via psychosocial mechanisms. Peer pressure, group norm, violence, even access to health care contributes to individual's stress, health-risk behaviour, and health care utilisation. Social capital, which is found in the structure of relationship, could easily be seen as an element of the social network. Kawachi described how social capital could affect health outcomes via access to services and amenities. He reviewed the evidence from criminology and found that more cohesive communities were more politically favourable and got better health-related facilities⁷¹. Social capital could be considered as the opposite effect of social deprivation, as a metaphor of two sides of the same coin. Many studies have indicated the negative effects of the social deprivation to health⁷⁵⁻⁷⁸.

Several systematic reviews explored the roles of social capital as health determinants. Islam et al found a positive association between the level of social capital and health. They also proposed that the country's degree of economic egalitarianism played some role in that association⁷⁹. Access to health care could be considered as another critical variable for determining health. However, Pitkin Derose's systematic review⁸⁰ found a weak relationship between social capital and health care access. She

argued that the variety of social capital measurement and interpretation in the reviewed articles made it hard to draw the clear association between those two variables.

In Thailand, few studies concerning Thai social capital and health can be found. Thai social capital was studied in forms of social network, social support and even the application of Buddhism in health care⁸¹. Thai elders' dimension of well-being was found, in qualitative-quantitative mixed studies by Ingersoll-Dayton et al., as social capital in terms of harmony (Thai: สามัคคีปรองดอง) and interdependence (Thai: พึ่งพาอาศัยกัน)⁸²⁻⁸³. Kanttika Thanakwang found, on a provincial level, that there was no association between health behaviour and social network⁸⁴. However, her later study in a National-level survey, the Thai Elderly Survey, positive association between self-rated general health and social network could be found⁸⁵. Likewise, a study in 422 heart-failure Thai patients found no direct effect of social support and patient's quality of life⁸⁶. A network-oriented intervention was found to reduce methamphetamine use and to increase the practice of safe-sex in Thai youth⁸⁷.

1.4.2 Social capital as a determinant of oral health

Watt described the implications of social capital for oral health promotion strategy⁸⁸. He showed linkages between social capital, community participation and implementation of oral health programs. Social capital is viewed not only as a cause of individual's well-being but it could be considered as the result of "active involvement" by the community in oral health promotion programs.

Only few studies have investigated social capital and oral health. Aida et al.⁸⁹, explored social capital in the form of group memberships, and found positive association between the level of social capital in the elderly group and the number of remaining teeth. Pattussi et al. and Aida et al. conducted a set of studies exploring social capital and oral health among children and adolescents. These authors explored both individual and contextual variables that may contribute to social capital. An association between social capital and dental trauma was found in Brazilian adolescents⁹⁰. They also found a negative relationship between level of community empowerment and the severity of caries⁹¹⁻⁹². A more complex study of social capital and oral health was presented by Celeste et al. Homicide rate was regarded as community-level social capital and was

explored for the association with Brazilian adolescents' oral health, however, no association was found⁹³.

No published study of social capital and adult oral health could be found. However, many researchers could be considering exploring indirect effect of social capital to oral diseases. Given that income inequality was closely related to the level of social capital, a set of studies that explored the income inequality, gradient of socioeconomic status and the severity of oral diseases were published.

Lower household income was found as a risk factor for several oral diseases and as a factor associated with low oral health-related quality of life in many industrialised countries across the world. In Australia, Sanders et al. published a series of studies on the association of social gradient and self-rated oral health, oral health-related quality of life, and self-assessed tooth loss⁹⁴⁻⁹⁶. The same trend was observed in European countries^{96-⁹⁷and the US⁹⁸⁻⁹⁹. Not only did income inequality at an individual level play a role in determining oral health, income inequality in the higher level of residency, such as neighbourhood, also showed some effect on oral health. Turrell et al. found, in multilevel studies, the contextual effect of neighbourhoods on tooth loss and self-rated oral health¹⁰⁰⁻¹⁰¹. Living in affluent neighbourhoods was found to benefit an individual's oral health.}

Unlike other social indicators, there is no standard Thai social capital measurement method. Thai researchers generated social capital indicators to fit the context of the study populations including community enterprise, forest management, and drug use¹⁰²⁻¹⁰⁵. However, no study explored the social capital of north-east Thai small-scale farmers' perspectives and context. This study proposed that the Inpaeng network's social attributes may be useful in determining health/oral health of the Isaan rural communities. Tailor-made social capital indicators, which built on Inpaeng's concepts, could be more appropriate to use in order to explore the target population.

In summary, the reviewed evidence shows that 1) social capital could play a role as a social determinant of oral health 2) Thai rural communities are distinctive and may hold different forms of social capital compared to industrialised communities and 3) oral health problems in Thailand is increasing along the timeline, and a more comprehensive approach including social determinants of oral health should be considered. The research ideas to address these issues are conceptualised and displayed in the following section.



1.4.3 The pathway of Thai social capital and oral health: research conceptual framework

Figure 1.1: The research conceptual framework

This research is built on a conceptual framework that social capital exerts an upstream influence on oral health, acting within a complex set of causal effects exerted by other forms of capital and traditional predictors of oral health (Figure 1.1). These causal influences operate through mechanisms that utilize those forms of capital and through three other classical explanatory pathways: psychosocial, behavioural and health care. The conceptual framework includes "to be explored" boxes indicating the Thai social capital to be investigated in the qualitative phase study. The desire is that the qualitative phase will suggest some locally specific capital forms, and will rearrange and redefine these capitals in term of Thai social capital.

According to the literature review, capital could be categorised into three forms; financial, human and social. The relationship between the capitals: income, education, occupation, network, trust and oral health status were found via three explanatory pathways. Strong associations between traditional predictors: brushing frequency, fluoride use, smoking and frequency of dental service visiting and oral health status were also observed. The predictors were known for their association with oral health and can be explained via three pathways which are psycho-social pathways, behavioural pathways and health care utilisation. Several scholars suggested similar pathways when explaining how social capital contributes to health status^{69, 106}.

An explicit assumption of this framework is that utilising each form of capital determines health outcomes, not merely the presence of each form. Group actions and income equality were found as the utilisation or mechanisms that transform the capital to the desirable outcomes^{17, 73}. Communities may utilise the capitals differently. In industrialised communities, the free market and the policies of social equity could be seen as the mechanism to utilise the capital. However, in Thai rural communities, capital utilisation may be seen in different patterns as proposed in Parnwell's studies of neolocalism in the Thai north-east communities⁷.

This study proposed that being an Inpaeng network member helped people to utilise their capital wisely and this may contribute to better health/oral health. In other words, being an Inpaeng member could play a role as a mediator in the association between capital and health outcomes.

1.5 Conclusion: the research knowledge gap and research objectives

North-east rural Thai communities have unique social characteristics. Those characteristics were studied for the associations of several outcomes such as political participation⁵, ecological concern⁶ and poverty⁶. However, the association between distinctive north-east Thai rural characteristics and oral health has hardly been explored. The oral health predictors in terms of Thai social capital and capital utilisation were designed as the primary explanatory variables. Capital utilisation in this study was Inpaeng membership which was hypothesized as a mediator. This research also explored roles of traditional oral health predictors such as smoking, fluoride use and dental service utilisation in north-east Thai rural communities.

The research objectives were:

1. To identify Thai social capital and its utilisation in north-east Thai rural communities.

2. To describe people's oral health status, in terms of dental caries experience, clinical attachment loss and oral health-related quality of life.

3. To investigate the association between Thai social capital and the oral health status of the research participants.

4. To explore whether traditional oral health predictor variables could predict the oral health of research participants who are north-east Thai villagers.
Chapter 2 : Qualitative study method and results

2.1 Introduction

This chapter explores perceived Thai social capital among rural communities in Sakonnakhon, northeast of Thailand (or traditionally called Isaan; Thai: อิสาน). Social capital, as identified by this study, was transformed into several research variables in the form of a questionnaire.

The questionnaire was used to investigate the relationship between oral health among rural communities in Thailand, presented in the next chapter. The researcher observed social activities and interviewed some key informants between January and June 2008. Two groups of informants were acquired. The first group of informants were Inpaeng leaders who involved in Inpaeng network administration, training course, forest protection, community financial management and community business. Informants who were Inpaeng members with no administrative work were categorised into the second group. They were members who adopted the Inpaeng lifestyle. These informants were the living evidence confirming that living according to Inpaeng concept could be fruitful. All informants were informed about the research project before the interview took place and were asked verbally for the audio recording consent. Most of the observations and interviews took place in the Inpaeng centre, Kudbak district, Sakonnakhon province, seven hundred kilometers from Bangkok. The Inpaeng centre is the training venue and the administrative office of the Inpaeng network. Social events such as Inpaeng administrative meetings, staff meetings, informal meetings and network conferences also take place at the Inpaeng centre. However, some social events were observed outside the Inpaeng centre including shamanism traditional healing rituals, religious ceremonies, including cremation rituals and visits to Inpaeng members' farms.

2.1.1 Background of Inpaeng network

2.1.1.1 History

Inpaeng is the name of a social network and social movement that promotes sufficiency and an eco-friendly lifestyle among Thai rural small-scale farmers. It is one of a

number of NGOs (non-government organisations) that promoted the concept avidly since the 4 December 1997 birthday speech by King Bhumibol Adulyadej, though NGOs had previously promoted this concept based on increased dignity through economic selfsufficiency (setthakit phor-phiang; Thai: เศรษฐกิจพอเพียง), or self-reliance (pheung-toneng; Thai: พึ่งตนเอง),and a new localism (thongthin-niyom; Thai: ท้องถิ่นนิยม) – specifically a localism discourse known as "community culture" (watthanatham chumchon; Thai: วัฒนธรรมชุมชน).

Most of the network members live around the Phuphan mountain range (see map). This network has reinforced its concept of sufficient agricultural lifestyle to its members via seminar, training, dialoguing, and supplying resources.

The name "Inpaeng" is a combination of two words "In" and "Paeng". "In" is the name of a Hindu god "Indra", the lord of heaven and "Paeng" means to establish. Therefore, Inpaeng implies the land or area that has been established by an Indic deity. The name was given in 1990, to this network, by Mr Boasri Srisung: the chair of Thai-Isaan foundation. Mr Boasri visited the network near the Phuphan mountain range and was very impressed by its fertility; the land is incredibly fertile as if it were created and blessed by lord Indra.

The movement originated in 1986. Mr Thawatchai Kunwong, a young University graduate, was sponsored by the Village foundation to initiate a rural development project. He was assigned to study the lifestyle of the ethnic "Kaleang" (Thai: nɛtiâi) in Kudbak and used ethnographic approaches in his data collection. Thawatchai observed and talked to local scholars, the elders and the local leaders and also took part in community ceremonies and activities. He found much local wisdom concerning plantation, herbal medicine and forest management that was ignored and labeled as outdated concepts by the government development scheme. After the sponsored money was used up, he created his own "back to the roots" campaign in the same Kudbak area. The campaign aimed to revive local wisdoms integrated with new ecological movement. Thawatchai set some community meetings to analyze the situation of the village. Looking back to the past, evaluating the present and foreseeing the future, they found that, by blindly following the government-recommended programs of cash crop plantations, the

communities would finally collapse. It was concluded from the community meeting that in order to survive, they needed to change cash crop plantation into planting food crops to serve families needs. Meanwhile, the deforestation continues to be a very critical issue. In the villagers' perspective, the forest is the main source of food and household commodities. They found that food gathering from the forest was getting harder to locate, and also the reduced rainfall as an indicator of the depleted forests. In order to address such problems, an active group of thirteen farmers was formed to take action according to the concept of sufficiency. After a while, they formed a more extensive network by introducing friends and relatives to Inpaeng ideas. In 1988, they bought a piece of land and built Inpaeng centre as a place for the network's activities. From that time onwards, more and more people were attracted to the idea of economic selfsufficiency. In 2009, Inpaeng members increased to almost 30,000 people located in four provinces around the Phuphan mountain range.

2.1.1.2 Inpaeng's concepts and missions

As noted in the Inpaeng 2002-2003 annual report accompanied with some articles on Inpaeng network^{26, 107-108}, the main concepts can be summarised as follows.

Firstly, regarding the concept of reflection, members were asked to look back to the past, compare their quality of life to the present, and project the future situation. As a result of several conversations and meetings, it was seen that their quality of life at the present time was diminishing compared to the past and the trend looked like it would get worse in the future. In the near future, they predicted more serious droughts, lower product prices, more farm chemical use, more debts, worse physical health due to chemical exposure, and more family stress due to emigration for better jobs.

Secondly, with respect to the concept of community strength, Inpaeng members were encouraged to explore their communities' strengths. The strengths could be identified in several forms such as community norm, natural resources, community setting, local wisdom and the presence of local scholars. Inpaeng's believed that by focusing on communities' strengths, not on problems the members could design their sufficiency lifestyle better.

Thirdly, with the concept of evidence-based decision making, community research skills were introduced to the members. Inpaeng networks encouraged their members to analyse their annual food intake and household consumption. Local research, exploring community food consumption, was carried out. They found that most of the food consumed in the community could be produced by the people in the community. Then they were encouraged to change from monoculture cash cropping such as cassava, sugarcane, or eucalyptus forests to the mixed, varied, integrated farming systems. This concept of evidence-based decision making can be considered as the counterpart of the "blind follower" concept. People generally make decisions, particularly farming decisions, following neighbors' or government suggestions without adequate understanding to make their own decisions. For example, when cassava's price is rising, everyone changes their paddy field to cassava planting or plants eucalyptus trees for short-term profit (selling to pulp factory) without realising the long-term negative effects on soil fertility. For several decades, cash cropping has been followed by small-scale farmers. The Inpaeng diverse integrated system provided an alternative to market dependence. Inpaeng argued that instead of selling cash crops and gaining money to buy food, planting food to serve family needs was more sensible.

Finally, with regards to the concept of networking and next generation recruiting, the elderly were encouraged to share their learning experiences with the younger members. The knowledge transference, knowledge management and recruitment of new generation members ensured the sustainability of the network.

Inpaeng's missions are published in the same annual report. These missions, in other perspective, can be considered as the outcomes of the Inpaeng's concepts.

Inpaeng's first mission is to create locally-appropriated, sustainable agricultural system; including household food security, organic plantation and the protection of the Phuphan mountain range forest from depletion. They hoped that by sustaining household food security, the Phuphan depletion due to the hunting-gathering would be reduced. The distribution of Inpaeng members around that Phuphan mountain range, marked by Tambon location (yellow pins), was illustrated in Figure 2.1.

NOTE: This figure is included on page 25 of the print copy of the thesis held in the University of Adelaide Library.

Figure 2.1: The distribution of Inpaeng members by Tambon location (picture from Google map)

The second Inpaeng mission was to promote community entrepreneurship. Given that food security had been established, generally, forest-like plantations provided more than the family annual consumption. Food preservation and transformation were required to manage the excess. Marketing and financial management of the product should be implemented through community entrepreneurs. Local milling groups, organic fertiliser production, herbal medicine manufacturing and wild berry juice production were examples of the community entrepreneurship demonstrated through the Inpaeng centre.

The third mission was to establish the community welfare system. To promote community welfare, saving or microfinance groups have been formed. Members of the saving group don't need collateral to borrow money. The interest gained from lending is used for member's benefits such as money for hospital admission and funeral funds.

It is evident that these three missions were interconnected. When families established their food security, they were more likely to have excess production (first mission). The knowledge and technology were required to preserve, transform and manage excess production (second mission). Finally, a system was required for distributing the products to the market, for managing financial business and for strengthening community welfare (third mission).

A better understanding of Inpaeng's philosophy can be gained from its moral epithets and slogans. These could be seen as the simplification of abstract concepts into short and easy-to-remember rhyme form. Inpaeng trainers usually use these in the training sessions. Inpaeng members, as observed by the researcher, were more likely to remember these phrases and transform them into their practice, rather than perceived the Inpaeng concepts in the long descriptive text. The slogans can be categorised into several groups as followed.

First is the group that expressed the goals of Inpaeng network.

"Life-long food security and pride in living the farmers' life" (Thai: อยู่อย่างมีศักดิ์ศรี มีกินตลอดชีวิต)

This is the ultimate goal of Inpaeng lifestyle. This phrase shows the result of several concepts which are food security, product management and financial management.

"Phuphan is our life, friends are our strength, sufficiency is our hope, and Inpaeng is there for our community."

(Thai: ภูพานคือชีวิต มวลมิตรคือพลัง พึ่งตนเองคือความหวัง อินแปงยังเพื่อชุมชน)

This catchphrase focused on the significance of the Phuphan forest and the network. It also established self-sufficiency as a long term, ultimate goal.

Several catchphrases demonstrate the strategies to reach the Inpaeng goals.

"Plant everything you want to eat and eat everything that you've planted." (Thai: กินทุกอย่างที่ปลูก ปลูกทุกอย่างที่กิน) This could be considered as the most popular Inpaeng catchphrase. The catchphrase clearly suggested the way to achieve household food security. Changing the paradigm of plantation to establish food security is the first step in entering the Inpaeng lifestyle.

"Move Phuphan forest to your backyard." (Thai: ย้ายป่ามาไว้บ้าน ย้ายภูพานมาไว้สวน**)**

This catchphrase suggests the forest-like and local species plantation. It shows two significant Inpaeng ideas, which are forest protection and local species conservation. By planting (metaphor of moving) the forest (mixed species plantation, not cash crop plantation) to your backyard, this will help prevent the exploitation of the Phuphan forest.

Some catchphrases were ancient traditional Isaan sayings. These catchphrases have been restated, to describe sufficient and sustainable ideologies

"Walk one step at a time, a mouthful is enough for each bite" (Thai: เดินทีละก้าว กินข้าวทีละคำ)

This catchphrase illustrates the lifestyle of living in moderation. Living in moderation includes acting and consuming. It suggested the step by step, slow but steady paradigm.

"Wisdom leads money" (Thai: ปัญญานำหน้าเงิน)

This catchphrase proposed that money was not the goal of life. It counteracted the money-driven paradigm.

"Look backward before stepping ahead, don't be rushing to the gloomy way" (Thai: คันสิไป้เมือหน้าให้เหลียวหลังคืนเบิ่ง มันมะลึดทึดเท่าเซาก่อนซูฟ่าวไป้)

Again, this catchphrase suggested the theme of sufficient and circumspect lifestyle as a preferable lifestyle.

In conclusion, the Inpaeng network promotes self-reliance and sustainable integrated agricultural production, and in food security. Spiritually it promotes moderation, thoughtfulness/consideration, encourages ecological-friendliness and morality.

The researcher participated in all training sessions that took place in the Inpaeng centre during that period. Several key informants, who were Inpaeng network leaders and administrators, were interviewed.

2.2 Findings

2.2.1 The Inpaeng perspective of health and happiness

The World Health Organization (WHO) definition of health as "the state of complete physical, mental and social well-being" was widely embraced¹⁰⁹. However, many scholars argue that, from a practical perspective, there is no "complete" well-being, especially in the physical domain. They suggested that one should look at health as a "balanced" status of each domain. Moreover, illness may not be considered as an undesirable condition. Being "not complete" could be a chance for the individual to realise the uncertainty of life. Capra¹¹⁰ critiqued the western modern reductionism concepts of health and compared them to the eastern holism perspectives. The modern biomedical concept considered the environment as one of the extrinsic "factors", either as "risk factors": the negative elements that could worsen health or health promoting factors: the positive elements that could promote health. However, the eastern concept emphasises the "interconnectedness and interdependence" of people and environment.

According to Asian traditional medicine, the human body is the replication and the expression of the universe ¹¹⁰⁻¹¹¹. In Thai traditional medicine, the human body consists of the elements of earth, water, air and fire. Diseases are caused by the imbalances of those elements. This can be considered in two ways, the unbalancing of the elements within one's body and the unbalancing that is due to the interaction of the body and its surroundings¹¹²⁻¹¹³. Moreover, the concept of interconnectedness of body-mind-environment influenced by Buddhist teachings could be observed in the traditional Thai medicine. Buddhist principles considered the physical ailment as a tool to understand the uncertainty of life¹¹⁴. Being ill, in this sense, is not always the negative condition. It can be one's chance to meditate and gain a more understanding of the life's uncertainty. PA Payutto, one of the most acclaimed Thai Buddhism scholars, stated that it's unavoidable for the body to be ill, however it's possible to have a happy mind even in the suffering body¹¹⁵. He also suggested the interconnectedness beyond patient's body and mind. He

indicated the physical and mental healing process that involves patients, their relatives and health care practitioners¹¹⁶.

The influences of Buddhist world views could be observed in the field. Researcher found that healers usually suggested patients to practice five or eight precepts, chanting accompanied with the prescribed herbal medicine. This holistic health concept went well with the Inpaeng's concepts. As recorded from several meetings, Inpaeng members always draw the connection between the imbalance of their surroundings and their health. They always referred to the older generations as the healthy one. They hypothesised that the longevity of previous generations was due to their living in accordance with their surroundings. They claimed that "modern" diseases and disorder such as diabetes and cancers were not the problems of their grandparents' generations. Those diseases became more prevalent in the present generation because of the intoxicated surroundings, farm chemical use and consuming preserved food.

Inpaeng communities appreciate not only modern medicine, but they also promote the self-care lifestyle that is based on traditional and alternative medical wisdom.

This qualitative study explored both western and eastern perspectives of health in Inpaeng communities, by the methods of participant observations and interviews.

According to the Thai language, health (Thai: quanw) literally means the stage of happiness. Exploring health in Thai rural villagers, it is inevitable to investigate the concept of the villagers' happiness. Therefore, in order to understand "health" in every dimension, this research was focused on the people's perception of happiness, physical health and health service utilisation. As argued by many scholars, the aspects of happiness not only focus on the material or "to have" aspect, but also involves the mental and spiritual or "to be" aspect. P.A. Payutto categorised happiness into two categories, dependent and independent¹¹⁷. Happiness in the "to have" perspective could be grouped in the dependent category. This "to have" happiness can be gain from consuming physical material in order to satisfy one's psychological needs. Food, recreation, entertainment, even sexual activities are examples of physical materials that cause dependent happiness. While independent happiness can be gained not by material consuming but by mental culturing. One can develop the happy state of mind by having the right interaction within

one's body, within one's community and within one's surroundings. The ultimate happiness state of mind is described as the mind of the enlighten ones. The mind that totally liberated and is free from suffering shows its characteristics of "free, peaceful, unadulterated and unclouded."

As described in many studies^{82-83, 118}, Thai people.s perceptions, particularly the elderly, of health/happiness have been found to be related to the concept of "Kin dee, Yuu dee" (eat well, live well; Thai: กินดีอยู่ดี).

Literally "Kin dee, yuu dee" means eat well, live well ("Kin": eat, "Yuu": live, being and Dee: well). However, "dee" conveys several meanings of desirable characteristics such as good, positive, decent and fertile. Therefore, the phrase can be fully described as life conditions that involve having enough food to eat, and living in the present environment in a decent neighborhood. It can be seen that "Kin dee, yuu dee" suggests both the goal of happiness (or health) and the means to achieve it. Moreover, according to this notion, health and happiness are not confined to the individual being. Personal health and happiness seem to have interconnectedness with one's neighbors and environment.

"Kin dee, yuu dee" of Inpaeng's perspective shared the same core value of the general meanings. However, the additional values have been observed.

Food security is the most obvious additional Inpaeng "Kin dee" value. According to the Inpaeng catchphrase, "Plant everything you want to eat and eat everything that you've planted", the ideas were generally adopted by its members. When asked "what is your happiness", an informant answered that the first priority to achieve his happiness is "having my own food". He simplified the meaning of food security in his own word.

"...when I'm leaving home for several days, I don't have to worry at all. I'm assured that my family (members) always has some food to eat. Our farm supplies lots of food, vegetable is everywhere, fish are in the pond, sick of fish? just get a chicken, plenty there" (informant#4 transcript from the interview)

Organic cultivation is another value, added onto "Kin dee", which has been promoted by Inpaeng. Almost all of the informants indicated, "Kin dee" as eating the chemical-free food. One of the fifteen foundations for Inpaeng communities is the ability to produce organic fertiliser and EM (Effective Microorganisms) multi-purpose liquid. The liquid could be used as a replacement for chemical fertiliser, pesticide and herbicide. According to Inpaeng self-care recommendation "fresh food" is the first option to eat. They believe that foods that have been canned or pickled are not good for their health. An informant noted that:

... "eating long shelf life foods, shorten the eaters' life. Eating short shelf life foods, longer the eaters' life"

... "buying some market foods, one needs to know how to detox it, make it cleaner before eating" (informant#7 transcribe from the interview)

As the seasons change, tropical forests supply the surrounding communities with various kinds of food. Eating well, in their senses means eating the fresh food that can be harvested during the season. The Inpaeng network promoted the plantation of local species. An informant with a very important role promoting herbal medicine for the Inpaeng network, gave a statement regarding this idea.

"(Happiness is).....when ground mushroom arrives, we have ground mushroom to eat. When it's time for log mushroom, we have log mushroom to eat" (informant#7 transcript from the interview)

In conclusion, the ideal characteristics of Inpaeng food are local, fresh, seasonal and free from chemical contamination.

The elements of "Yuu dee" was investigated in Ingersoll-Dayton et al's study of Thai elderly⁸². In their findings, the "Yuu dee" (in their term "well-being") of Thai elderly includes Harmony (Thai: สามัคคี ปรองดอง), Interdependence (Thai: พึ่งพาอาศัยกัน), Acceptance (Thai: ยอมรับ), Respect (Thai: เคารพ นับถือ) and Enjoyment (Thai: เบิกบาน). Those characteristics can also be observed from Inpaeng network. The Inpaeng's notion of "Yuu dee", however, had some additional characteristics. The forest and the environment play a very important role in the Inpaeng's "Yuu dee" notion. The fertility of the forest was a critical factor for Inpaeng's "Yuu dee" or well-being. The interconnectedness of an individual and their surrounding could also be found in Buddhist teachings¹¹⁷. Therefore, it can be

claimed that some of the Inpaeng's concept have been developed on the Buddhist teaching basis.

The notion that always accompanies "Yuu dee" is "Yuu yen" (Thai: agistin). Literally, "yen" means cold. In a tropical climate like Thailand, cold metaphorically illustrates some desirable characteristics. Yen covers the meanings of shady, relaxing, calm and peaceful. According to these positive definitions, "Yuu yen" can be interpreted as the condition of living that is relaxing, worry-free and peaceful. For Inpaeng members, "Yuu yen" sometimes literally means living in a cool, shady, breezy place. Not only forest protection programs, but the forest-like plantation in the backyard also provides a pleasant climate to live nearby.

To complete the phrase, the words that follow "Yuu yen" are "Pen suk" (Thai: រើរអ តុរា). "Yuu yen, pen suk" can be considered as the most common Thai blessing phrase. "pen suk" simply means "be happy". It can be seen that, "kin dee, youe dee" (eat well, live well) is the mean while "Yuu yen, pen suk" (live peacefully, be happy) is the goal of living.

2.2.2 The Health service utility

Several perspectives of health services in Thai rural communities have been explored. Regarding western bio-medical services, public and private health clinics were observed. The spectrum of traditional healings and shamanism were also studied. Finally, the integrations and collaborations of western bio-medicine and traditional medicine were investigated.

According to the national universal *public health coverage scheme (known as the 30 Baht scheme or "30 Baht treat all" program),* every Thai person is eligible for public health care. Most of the services were free of charge. This program first commenced in 2001. Several studies praised the program as an achievement for reducing health inequity and promoting primary health care. However, several problematic consequences, such as the high-cost treatment procedures the private sectors' participation and the role of local government agencies for the program implementation, could also be observed¹¹⁹⁻¹²¹. Three hierarchical levels of care were structured according to care intensity and the severity of the disease symptom. For minor illness, villagers are entitled to use the community health centre. Health services are given in health centre by qualified health officers or nurses. The community hospital is responsible for secondary health care. At least one doctor supplies the service in a community hospital. The size of the community hospital can be vary from a ward with 10 beds to several wards with up to 120 beds, up to the number of the area's population. Provincial and university hospitals are for tertiary care. People with serious illnesses are eligible for the services given by medical specialists such as orthopedists, OB-GYNs, ENTs and surgeons³⁰.

Apart from public health services, the private medical care service was also an option for rural people. The smallest scale of private service is the clinic. Generally, a private clinic is run by a medical doctor and an assistant. In the rural context, most of the clinics run before and after public hospital working hours. This is because most of the general practitioners also work full time as public hospital staff.

The highest ranked medical service in private sector is the private hospital. Private hospitals are usually business chain hospitals. They are accredited by well-known luxurious private hospitals in Bangkok. It can be observed from my field study that private hospitals are the most preferable place for rural people to go when they are ill.

Getting health service from a provincial hospital requires many hours. A case study that reflected the frustration of a lay person waiting to meet a medical doctor is recorded in the field note below.

"Last Tuesday, Mrs Dang, my neighbour, asked me if I can accompany her to the provincial hospital. I said yes. Dang is Jan's aunt. Jan is a 15 year old girl, she was suffering by the rash on her limbs, face, knees and she also has pain on her shoulders. Jan met a Gen. Med. doctor at a private hospital in the city of Sakonnakhon several months ago. The doctor told her that, she's got DLE (Discoid Lupus Erythematosus) and prescribed her some medicine that she could get for free (she is in the UC program) at the community hospital near her home. Jan kept having medicine from community hospital for two months. Her symptom was not better. Moreover, she wants to move to Bangkok to live with her mother and to enrol to a senior high school there. So, she would like to have some better medications and wanted a referring document for free treatment at Bangkok. Her GP works with two hospitals, office hours in public hospital and any other hours in private hospital. To save some money, they decided to meet him at the public provincial hospital.

We arrived at the hospital at 9:00 AM, hundreds of patients were there at that time. First we contacted the reception to check if Jan is eligible for free service there. The reception requested a copy of her document, luckily Dang prepared this document beforehand (if not, maybe we would have lost an hour or more just to make a photocopy and come back to the queue again!). Then we were told to wait at the Gen Med department, know nothing, only the magic words "just wait here" at that time more than a hundred patients were waiting there. Not a single medical doctor was there until 10:00 AM.(Officially, Thai public office start their service at 8:00 AM) Dang told me that some doctors spent their time working for private hospital in the early morning. But to be fair, I know that another reason to be late for OPD service is the morning in-patient examination or morning ward-round. We waited patiently until noon; a nurse told us that the doctor would have a lunch break and will be back at 1:00 PM. However, our Gen Med doctor went back and started his work again at 1:30 pm. We finally met him at 2:30 pm. He could remember Jan and had a brief talk to her, the clinical diagnosis took less than 10 minutes to finish. He confirmed that Jan should continue using the same medication and made an appointment for a DSE antibody blood check next month. He prescribed the same pills and didn't give useful information about the referring system.

In conclusion, we waited 5 hours in order to have the same medication (at least we don't have to pay for the pills and doctor fee). This is the classic circumstance that everyone (who has no connection) could face: long and hopeless waiting, belated doctors (due to private hospital, or private clinic work), main shift complaints had not been considered, powerless patient, and doctor's opinions outweighed everything."

Apart from public health services, many genres of traditional healings were investigated. They can be defined as any healing activities that are not based on a western bio-medical paradigm.

According to the Ministry of Public Health, herbal medicine and Thai massage are categorised into the genre of Thai traditional medicine. These two healing activities are legally accepted as options of health service. Ministry of Public Health controlled these two healing genres by launching a bill for healer registration.

The promotion of this genre, on one hand, was initiated in the public and academic sectors. Along with the establishment of the Department for Development of Thai Traditional and Alternative Medicine, Ministry of Public Health in 2002, several Thai traditional academic training programs and degrees were set up. Pharmacological effects of herbal medicine and the effects of Thai massage were studied scientifically. Several public hospitals set up a department of Thai traditional medicine. Physicians incorporated the Thai traditional medicine and massage as treatment options. They may prescribe a course of body massage along with / as a replacement of Methyl Salicylate analgesic balm and a dose of NSAIDs for patients with muscle pain.

On the other hand, the movement that was also promoted separately by the private or NGOs sectors could be observed. The Sakonnakhon Traditional and Herbal Medicine Association, a group of herbalists and massagers who meet and exchange their knowledge regularly, could be considered as the biggest non-government association of traditional medicine in Sakonnakhon. Its members can be categorised into many groups. Some of them are professional herbalists who wandered around the areas according to the patients' appointments. Some are farmers who don't give treatment service for living, but are interested in this field. Some are offspring of the late famous herbalists, trying to conserve the knowledge of their ancestors. An Inpaeng member, who is the manager of the herbal medicine project for the network, is also a member of this association.

A monthly meeting of the association was observed and an interview with the chair of the association and two herbalists was conducted. A guest herbalist master from another province was invited to share his herbal medicine knowledge. It was a lecture-like meeting in the main hall. After the lecture, some of the members had an after class discussion, some took herbal medicine to share and change with each other. According to the interviews, several styles of disease diagnosis were told. One of them required date and time of birth of the patient for a astrological analysis before selecting the treatment methods which has range from minor to severe illness. While one of them considered traditional medicine as a treatment for discomfort or minor illnesses such as fatigue, muscle pain, constipation, food poisoning or any other non-fever diseases and not for serious illness like bone fractures, or symptoms with high fever. However, every herbalist agrees that the being an herbalist required a higher level of morality than lay people. According to their opinions, chanting regularly and practicing meditation should be a routine activity for Thai traditional medicine practitioners. The five precepts are the basic rules that must be strictly practiced. Moreover, the value of compassion-outweighedmoney practice must be the fundamental mindset of the Thai traditional medicine practitioner.

It is evident that Thai traditional medicine has been established as a health service option for Thai people, particularly for rural people. Unlike many decades ago, lawful health services are not monopolised by hospital-based bio-medical health practitioner anymore. However, the Ministry of Public Health still holds some degree of controlling. Only herbalists, who have passed the examination test and are registered with the Ministry, are entitled to practice.

The Inpaeng network encouraged one of its members to finish a diploma on traditional medicine. This can be considered as a big reinforcing factor for promoting the self-reliance lifestyle. That member has been appointed as Thai traditional medicine manager of the Inpaeng network. Basic herbs, which are essential for the first aid care and its usage, have been introduced to Inpaeng members. Moreover, a small factory to transform herbal medicine into easy-to-use forms such as capsules or pre-pack set has been established in Inpaeng centre.

The healings that are based on the paradigm of intervened spirituality (e.g. through exorcism, spirit blessing), which rely heavily on supernatural power rather than the physical effect of drugs or massage, are categorized in the shamanism genre. A shaman can be defined as a healer who makes contact with and uses other world power for healing. Illnesses and diseases can be considered as the possession of bad spirits or the renunciation of the guardian spirits or both.

Shamanism can be considered as an option of health services for rural people. In a shamanism ceremony, the whole community members are concerned as much as the patient. A "Yao" ceremony was participated in and described. The following paragraphs are transcribed from this research field note, describing the ceremony.

"...ancient healing ritual called "Yao" or "Phi Fah". They believed that some symptoms (such as the haunting feeling or some psychological illness) are caused by forest spirit, ghost or supernatural power. The aim of the ritual is to plead and ask "Phi" (ghost or spirit) to leave the patient and ask the ghost to bless that patient before leaving. In this case, an older lady in her mid seventies felt uncomfortable and disharmony within her body. She called for the Yao ceremony. The ceremony took place at the lady's house, a vast, elevated single floor wooden house. Almost fifty people participated in the ceremony; this includes the healer master (shaman), the healer assistants, almost all of the patient's family members, the neighbours, and the people that were healed by this healer master. Some of them helped preparing talismans (made from banana leaves, and trays of glutinous rice) to use in the ceremony. Some worked in the kitchen to prepare meals. Some are the "Kan masters", who played the Isaan traditional musical instrument called Kan. Kan rhythms were played along with the ceremony. (Some were just observers, like me). This ritual took more than six hours to finish. The healer master prayed and chanted to the holy spirits and begged them to bless the patient.

The Shaman was also a lady in her seventies. She did not perform the healing for a living. She was one of the small-scale farmers in the same village. She performed many healing ceremonies around the area as a charity activity. Her patients, after being healed were regarded as her disciples. Many of her disciples were in this ceremony to help prepare the ceremony and encourage the healing. In this ceremony, the shaman did not show any signs of trance or being possessed by the Holy Spirit. I was informed later that there are many types of shamanism, the "Yao" regarded spirits as the higher divine being. The spirits required the worship and pleaded for the blessing. While some schools of shamanism considered the spirit as an evil being that need to be eliminated or expelled from the patients' bodies.

The shaman performed her chanting and dance along with the Kan song from the beginning to almost the end of the ceremony. Unlike many rituals that are showed in movies, this ceremony was performed in a more relaxing atmosphere. The participants chatted to each other, greeted the new visitors; walked over the area to help prepare food and talisman needed in the ceremony. Some of them even sipped whiskey! A few hours after the beginning, some objects such as an ancient sword, sped, rice bucket and fishing implements were brought out to accompany the dance. Then, a free lunch was offered to all of the participants. (Many visitors took fresh food such as vegetables and some meat and became involved in the kitchen, preparing a big lunch for everyone.)

After lunch, the patient's relatives got involved in the ceremony. All of them held some white threads in their hands; the thread was used to tie at the patient's wrists. It looked to me as if they were performing the Tham Khwan ceremony within "Yao" ceremony (the idea of Khwan is also explored in this chapter). Most of them gave some gift or money to the patient.

After that, the patient was blessed by the Shaman. She was blessed by her family members. At the end, by those blessing, the patient changed her dress and put on a bandanna, it looked like the same type of bandanna that the Shaman was wearing. Then, the patient actively led all participants for the dance around a bucket of water in order to cast the spell transforming the bucket water into holy water. Then, every participant was sprinkled with that holy water by the patient and the Shaman. Surprisingly, there was a heavy shower at the climax of the ceremony (we were then in the middle of summer and it's quite unusual to have rain at this time of the year). The rain encouraged the participants as a sign that indicated that the spirits had provided the blessing.

Lots of symbolic objects were used in the ceremony. The glutinous rice and banana leaves may refer to the abundance of planting. The spade and the fishing instruments may refer to the power to harvest. Most interestingly, this ceremony supplied all felt needs that a small-scale farmer could desire. The social and moral support from family members, care from neighbours, and hope for the abundance in the harvesting season are the most common things that a small-scale farmer ever wants. These symbols are all expressed directly and indirectly in this six hour ceremony. Moreover, at the end of the ceremony the patient changed her clothes. She put on the same articles as the healer and led all participants to make the sacred water. This is a very important aspect of the ceremony, because it showed that the power was transferred from the spirit or the Shaman to the patient. At the end, the patient had the power to control herself; she was transformed into an active person not a passive patient." A different school of shamanism performed in another village was observed. This shaman was also a woman. She was a well-dressed lady in her sixties. Her healing process was performed through a trance. She claimed to be a medium of the Holy Spirit. This spirit was the divine ancestor of the local ethnic *Phutai* (Thai: nln). Phutai are members of the Tai-Kadai language group and inhabit both sides of the Mekong River. This ethnic group entered Thailand from Laos in the reign of King Rama III (year 1824-1850 AD). They speak dialect of Thai and shared similar Buddhist culture¹²².

When possessed with the spirit, the shaman's voice turned deep and husky. Smoking throughout possession she spoke in the ancient Phutai language; some words couldn't be understood by contemporary Phutai speakers. Unlike the previous ceremony, this ceremony was more like a service given in private medical clinic. Many patients (or clients) queued to meet the shaman one at a time. Most of the patients were from neighbouring villages. The requests were told to the shaman. Their requests ranged from individual illness to any other problems involving the supernatural domains for example, ghost haunting, indicating an auspicious day for a wedding ceremony and a blessing for the starting of a new business. The shaman responded to almost every request by her spell casting. The way she casted the spell was by blowing her breath to the objects of interest, which could be legs, back, shoulders or pictures of the person that needed to be blessed.

This shaman seemed to know her limitations in healing. A patient with renal failure, who did not want to continue the hospital's hemodialysis, requested the shaman if she could heal the kidney problems. The shaman simply replied: "you need to see the doctor."

Comparing western biomedicine and observed shamanism, several issues could be ascertained:

Firstly, the patient is active agent in the healing process. Western medicine regards the patient as an object of interventions for medical procedure to act upon. Michael Foucault's idea of power defined the role of patient as a political object. A person, as a passive object, should allow the doctor to run medical procedures for the goal of producing the healthy compliant citizens¹²³. Hahn stated that the western biomedical

practice, based on the paradigm of materialism and positivism, has excluded the nonmeasurable entities out of their frame of practicing¹²⁴. According to these western perspectives, patient was considered as a powerless object waiting to be diagnosed piece by piece, system by system then comply to what the doctor prescribes. However, patient's role in the observed in the first shamanism healing was different. The patient was not a passive object to be acted upon by health specialists, but viewed as an active agent of an interconnected system of healing. As stated by Capra¹¹⁰, Shamanism's view of illness is not limited to the individual. "...Illness is the belief that human beings are integral parts of an ordered system and that all illness is the consequence of some disharmony with the cosmic order." He also suggested that the ceremony, in some senses, healed both the individual and the community. Indicated in this research's field note, many village members' participation was required to set the ceremony. The disputes between the patient and his/her neighbours were objects of forgiveness and, by participating in the ceremony those who were aggrieved by the patient forgave her. Moreover, the ceremony provided the chance for participants who had been fighting to make up with each other.

Considering the power structure, the role of healer in the Phutai shamanism and the western bio-medical genres were the same. Patients have the least amount of power over themselves, as most of the powers and the interventions were administered by the healers. According to trance shamanism healing, power is given by divine being to the healer; the spells were cast and were regarded as the magic bullet to cure every illness. In western bio-medical genres, the power is given to the certified practitioners by law and regulations. Only graduated doctors or nurses can inject or prescribe medication (the medications could be as mysterious to the farmers as the spells) to the patients and also be regarded as the magic bullet.

Secondly issue to be discussed is the competency of the healers. The competencies of a biomedical doctor are formed on his/her ability to diagnose and treat according to the evidence-based knowledge and technology. The competencies of Thai traditional healers, on the other hand, could be seen in their roles of psychological supports via the ceremony. Apart from the shamanism healing ceremonies, two events that may be considered as the integration of western bio-medicine and traditional medicine were observed.

The first event was a program called "for our friends": palliative programs that targeted HIV-AIDS patients and people around them. A part of the field note describing this program is posted below.

"For our friends"- a project that aims to educate and empower HIV-AIDS patients. This project is hosted by a monastery, the abbot worked with four community hospitals around the Sakonnakhon area. This three day and two night program combined the "modern training" paradigm of educating, motivating and meditation training methods. Ten working staff and sixty patients were divided in small groups to participate in many lectures, demonstrations and self-reflecting activities. The Abbot was the main facilitator for almost all the program. He worked as a social worker (rather than "old style preaching monk") to advocate, mediate and enable the participants. His reputation made it easier to motivate and to change people's behaviour. He also motivated public health workers to change their working style. For example, when educating infected patients about food and nutrition, he replaced the lecture style with the participating style. He asked people in each group to list their 10 most favorite dishes that they always eat. Then he let the nutritionist explain the good and bad nutritional effect of each food, and also how to modify the bad food to be better for HIV-AIDS patients to eat. Most importantly, at the climax of the program the monk led the group therapy. All of the participants were together and expressed their feelings freely. Along with the group activities, the monk tried to draw them back to the core of the Dharma (Buddhist teaching) to alleviate the frustrated minds of the participants. This program was the best example of the integration of "mind" healing (by Dharma) and body healing (by Health education).

Secondly, the mobile Thai traditional medicine service was witnessed. Generally, the traditional medicine masters are solo practitioners. However, The Sakonnakhon Traditional and Herbal Medicine Association, with some financial support by health authorities, adopted polyclinic and mobile service concepts and setup a mobile service. The aim of the unit is to gain health service accessibility for people living in remote areas. Sub-specialty of traditional medicine was structured in the unit. For example, people with lower back pain were sent to Mr A, the massager, while patients with diabetes who would like to control their blood sugar were referred to Mrs B who would prescribe some herbs to help reduce their high blood sugar. This mobile unit can be considered in the way that this genre was trying to establish their status at the community level. It was done by adopting the same pattern of "community activity" as done by the hospital mobile unit.

Compared to city residents, rural people may not have adequate access to several technologies and specialists of the western bio-medical services. However, more genres of health services are available for them to utilise. It appears that remote rural people may try several methods of healing before making a decision which means is the best for them. From the observations, people could identify the level of healing or health service that matches the severity of the diseases. For minor illness such as rash or food poisoning, people usually use the herbal medicine for first aid treatment. However for a more serious condition such as fever in small children or joint pain, people switch their mode of service into local health centre or community hospital. It can be assumed that, in their perception, there is no categorization of health services. People utilised all available service, either western or traditional ones, according to their severity of illness and their trust to the practitioners.

A tragic case study of the switching utilisation of varied health services has been monitored. Miss N, a little girl of an Inpaeng leader, was sick from a symptom similar to food poisoning (constipation, vomiting, and stomach ache). Her parents started seeking help by taking her to community hospital. They received a vague diagnosis and no particular treatment was given. Nevertheless, her symptoms were alleviated. Several weeks later, the symptoms returned almost once every two weeks. Then, the parents took her to the biggest private hospital in the province. The doctor took her blood sample for further investigation and gave her some vitamins made an appointment two weeks later. During the period, an elder suggested to set a sacrifice ceremony to the ghost of a child. A story about a child spirit, who was drowning in the pool near the girl's house, was told. They underwent a quick small and simple ceremony led by the girl's grandmother. A boiled chicken, a bottle of local whiskey and some glutinous rice were arranged in several trays made from banana leaves. The grandmother said to the spirit to take the offerings and leave the girl. Meanwhile, a traditional medicine master taught this girl to identify "bad food" that may harm the girl's health. This help her to select food that match her body's needs (according to the traditional medicine concepts) Months later, her symptom reached to the most severe stage. Her parents took her to the Sri Nakharin hospital, the biggest University hospital in Thailand's northeast region, where they detected a cancer on her pancreas. The girl was referred from Sri Nakharin and admitted at Ramathibodi hospital, Bangkok, the best public hospital in the whole country. Spending weeks in Ramathibodi, specialists could not find the best treatment despite palliative care. Distressingly, her parents decided to bring her back home. They decided to adopt natural therapy. Dharma and meditation that were taught to her since the very beginning of the illness were emphasised for handling the final stage of her disease. Finally, she was ordained and spent her last weeks before passing away peacefully as a nun.

2.2.3 The Social capital of the Inpaeng network

The relationship between social capital and health can be reviewed from many studies^{70, 74, 125}. In recent years, concepts of social capital have been studied for the benefit of health promotion. Social capital can be defined as characteristics that reflect the connectedness of community members and neighborhood. These characteristics include social network, social norms, social engagement, social cohesion and trust ¹²⁶⁻¹²⁷. Social capital can be inferred to all forms of social aggregation, bounding and bridging for the purpose of its members' mutual benefit¹²⁸. Social capital can be considered as a determinant of health and well being. Putnam argues that people who live in high social capital communities have lower risk for premature death and many major diseases including cancer and heart attacks compared to those who live in low-social capital communities⁹. In the field of oral health, Watt suggests that social capital should be an important framework for oral health promotion⁸⁸. Some research shows the studies of social capital and oral health or oral health-related issues^{99, 129}.

Seri Pongphit, a leading Thai scholar on community development, suggested that social capital was a significant element of community development^{25-26, 130}. Survival, Sufficiency and Sustainability were three domains Seri proposed as the characteristics to address the poverty²⁴. Based on those domains, this study adjusted these concepts and used them for the description of social capital in the context of Inpaeng's experience. I have used these terms

2.2.4 Survival, Sufficiency, Sustainability as Inpaeng's social capital

The contemporary world is seen as being driven by a high dependency on the market economy, especially for small farmers the price for cash crops. Farmers are frequently caught in the debt cycle and ignoring local knowledge brings about inevitable poverty. In Seri's definition, "survive" means surviving from financial threats, "sufficient" life means living and consuming in moderation, and "sustainable" means establishing a sustainable system of local economy and networking. Seri illustrated 3Ss as the foundation of "the pyramid of life". These 3Ss domains, accompanied with the learning process and the managing process, formed a complete pyramid of life. Seri did not reject the role of money and power to solve the poverty problem, but he argued that money and power should be used as supporting factors, not the core, when constructing the pyramid of life.

The following paragraphs illustrate the social phenomena observed from the Inpaeng network according to each domain.

2.2.4.1 Survival

The first domain of Thai rural social capital is Survival. Ability to survive from financial constraints was analyzed. According to the observations and interviews, "Inpaeng's survival" concerned food security, social welfare (with health care accessibility) and the competency to produce major items for farmers' lives.

To survive financial constraints, Inpaeng established the perception of money and happiness in contrast to the mainstream capitalism perception that money is happiness. During the first to the third Thai economic development plan, the notion of "work is money, money is work, this is the way to happiness" was promoted as the Thai social value¹³¹. Rural people take loans to pay for non-performing entities such as paying back another loan or for buying luxurious commodities. This could be considered as "a vicious cycle of debt". Inpaeng's notion of "wisdom leads money" reflected their view of money. They did not reject money's significance but advocated wise management of money as more critical. Inpaeng supported the knowledge of money management and saving

system, accompany with a self-reliance lifestyle, to help their members out of vicious debt cycle.

As mentioned in the Inpaeng's mission, food security, achieved by the forest-like plantation, is one of the most critical issues of the network. This study found several indicators required to build up the food security of a household. First of all, the procession of land is very important. On average, each Thai small scale farmer has 3 Rai (4,800 square metres) for the plantation³. A lesson learned from the past indicated that it is not the amount, but the usage of the land that contributed to the "Survival". Before adopting the Inpaeng concepts, many families expanded their land for cash crop plantations by mean of deforestation. They found that the more land one processed the more expenses were needed for every process of cash crop plantations from the beginning to the harvest. This did not always mean more profit. Besides, the adverse effects of deforestation cannot be underestimated. They witnessed extreme climate changes which had started from previous decades, less or delayed rain, more pests and drier soil. Theoretically, Inpaeng's members allocated their land into cash crop areas, fishery pond areas, chicken coop or pig pen areas and forest-like plantation areas. Having various kinds of food to consume is the second indicator of food security. Local food is regarded as better food than the "idiot food" (Thai: อาหารปัญญาอ่อน) (market, industrialized, preservative added foods). According to the concept of traditional health, the best food that fit one's physical needs can be gathered around the area where one was born (Thai: เกิดที่ไหน กินที่นั่น). In his back to the roots journey, Seri Pongphit found that local river fish, local vegetables and Namwha bananas are "his" food (Thai: กินปลาเป็นหลัก กินผักเป็นยา กล้วย น้ำว้าบำรุงกำลัง).

Local foods around the Phuphan mountain range are innumerable; they range from local vegetables, several kinds of bamboo shoots and mushrooms to animals such as feral pigs and several species of insects. These local species plantations, some vegetables, mushrooms, insects can be harvested only at a specific time of the year. Local species plants requires less care compared to cash crops. The plants grow and survive with little or no chemical intervention (such as pesticides and herbicides). Therefore, consumers are less exposed to chemical agents. This idea of consuming organic products, or "clean food" in their words, very much concerns the rural people. Many Inpaeng members regard the availability of clean food as the main factor contributing to longevity.

In the generations of our great grandfather, people died because of old age. We hardly heard that great grannies suffered from diseases like diabetes or cancer. But look at our generation, people are suffering from diabetes and many of them died from cancer, I think that was because we have been exposed to chemical fertiliser, pesticide and herbicide too much. There was no chemical usage in previous generations. We are not only exposed to those chemicals as users, but we also eat them via market food and even food from our farms.

Or

Eating long (shelf) life food, shortens the consumer's life.

Eating short (shelf) life food, lengthens the consumer's life.

In conclusion, food security means not only having sufficient food for family members to consume throughout the year, but it also requires that foods which are local, fresh, harvested according to the season, varied and uncontaminated with chemical.

Apart from food security, the local welfare system was also found to be a critical issue that contributed to Survival. For city people, having welfare care when one is in old age could simply mean holding enough money to maintain quality of life. But for Inpaeng members, welfare could refer to both money and the abundance of their forest-like fields. They believe that the forest supports infinite benefits, so a family owning a forest is the best way to establish life welfare when getting old. The benefit gained by having a forest in one's backyard is not limited to the owner's sake. An Inpaeng member, whose field is a study site for new members, said that her greatest satisfaction is that she can share her products from the forest with her siblings, relatives and friends. The area acts like a free supermarket where everyone can come to pick food they want. When questioned whether it would take two decades in order to gain some benefits from the

forest, it may not be worth investing in this activity, Mr Kamduang, one of the Esann scholars, said "Either you do it or not, the clock is always ticking. Twenty years will come to you."

A new way to celebrate a baby being born has been established among Inpaeng members. The parents would carefully select and plant several kinds of trees they considered which as the birthday gift to the new born. A baby boy of an Inpaeng staff, Mr K, was born during the study. Mr K collected 2,000 seedlings of various trees that could be used as food, building material and shade and planted those seedlings on his farm land to celebrate. He believes that this is the best investment for his son. The trees will grow as the boy grows up. This forest-like field area will supply plenty of food for the young boy. After twenty or thirty years, this boy will turn into a man and may want to get married; he can cut some hard wood trees in his field to build a new house for his future family. Then, if he keeps adding trees to the forest the benefits from selling products to others will be his best welfare when he is old and retired.

Finally, the ability to produce household items was included in the "Survival" domain of social capital. An unpublished Inpaeng study found that one third of money spent by Inpaeng households concerns the costs of food and household groceries. Knowing that most raw materials for producing household groceries could be planted in the area, the Inpaeng network encouraged their members to plant several species of trees to produce juices and wine (e.g. local berry: "Kor" Thai: An unpublished received their members to plant several species of trees to produce juices and wine (e.g. local berry: "Kor" Thai: Angew" Thai: ang), snack (e.g. sticky rice, bananas), body care products (e.g. tamarinds for body lotions, "Anchan" Thai: Angen for hair shampoo). Several training courses on making household products were held in the Inpaeng centre. More than sixty items of food, medicine and household items including body soap, hair shampoo, body cream, herbal medicine, mosquito repellant, herbal tea, snacks and clothing material can be produced using raw materials from the network. By using the local product, it can be expected that Inpaeng members can save a certain amount of money.

In conclusion, several dimensions to describe the "survival" domain of social capital were investigated in the Inpaeng network. The competency to survive from financial threats, in that context, consists of having food security, establishing one's welfare and the ability to produce household groceries.

2.2.4.2 Sufficiency

Sufficiency is the second domain of Inpaeng social capital, explored in this research. Sufficiency is the idea of promoting a balanced, moderate, wisdom-driven lifestyle. It is the counterpart of consumption based on greed and a money-driven way of life. The Inpaeng suggested that members change their points of view, aims of life, and values of living before changing their behaviour. An Inpaeng leader expressed the Inpaeng way of training their members as follows:

"Plant the (ideas into the) man, before the trees."

Inpaeng members were given the big picture of how capitalism and consumerism leads to the collapse of communities. However, people cannot live in a primitive lifestyle that depends heavily on the fertility of soil and the abundance of natural resources. A new paradigm that appreciates the ancient wisdom of sharing, compassion and respect for Mother Nature, while adopting modern concepts of networking, empowering and resource managing is needed.

The characteristics of the Sufficiency domain were explored in two aspects. The first aspect considered process in one's mind. This aspect involved mindfulness and the five precepts of practicing. The outcome of those qualities of mind is expressed and explored in the second aspect which is the household financial management.

Sufficiency, for the first aspect, is the consonant idea with the Buddhist sermons. The "unimpeachable path", suggested in the Buddhist Canon, reveals three practices that will lead to a peaceful and useful stage of life. Those practices are 1. control of the senses (Pali: Indriya-samvara, Thai: อินทรียสังวร) 2. moderation in eating (Pali: Bhojane-mattannuta, Thai: โภชเนมัตตัญญุตา) and 3. practice of wakefulness (Pali: Jagriyanuyoga, Thai: ชาคริยานุโยค)¹³². In short, to develop the sufficient lifestyle, one should "know" and "control" desires. It can be claimed that the notion of mindfulness is common and well-known for Thai rural farmers, particularly around Inpaeng network area; Sakonnakhon. The area is known by the Thai Buddhists as "the cradle of the enlighten monks". Tropical forests surround the province of Sakonnakhon were the areas that Venerable Ajaan Mun (1870-1949), the monk who established the ascetic forest monk tradition, wandered around to practice meditation a century ago. Hundreds of monasteries proceeding Ajann Mun's Buddhist forest tradition, have been formed by his monk disciples all over this area. For this reason, it is not an overstatement to claim that people there know, with no need for further clarification, what mindfulness is.

This study found that mindfulness is the fundamental quality of one's mind to develop "Sufficiency". Metaphorically, mindfulness is a gate keeper who watches over senses that pass six gates. Those gates are eyes, ears, nose, tongue, touch and mind. Mindful mind can separate the desires and physical needs apart. Consuming according to physical needs but not by desire, in the Buddhist point of view, is the wisdom-driven life. One's level of mindfulness can be explored via money expenses. People with higher levels of mindfulness tend to buy things because of it is need, not by desires. Moreover, monitoring one's expense list is believed to be the activity to gain the awareness of spending money. During the data collection, several government campaign programs promoting household expense recording were enacted.

In order to adopt the Inpaeng concept efficiently, one needs a certain level of mindfulness or, in plain language, needs to have a strong-minded in order to overcome the money-driven lifestyle. The Inpaeng proposed the changing notion of "money as the core of everything" or "money leads wisdom" into "wisdom leads money". They proposed the changing of "money as a goal of working" into "sufficiency and self-dependency as a goal of working".

During the data collection period, a project called "start jotting down to wipe out poverty" (Thai: พอเริ่มจด ก็เลิกจน), initiated by the Bank of Agriculture and Agricultural cooperatives (BAAC), was launched. BAAC promoted expense recording behavior to farmers' families. Recording family expenses might be the best way to monitor and control money spending. The family financial record activity has been observed in Inpaeng communities.

The Inpaeng network has provided its members with some reinforcing structures to have a sufficient life, in term of money management. Many community saving groups or local banks have been established in Inpaeng villages. Despite the offering of lower interest rate loans, the main objective of these saving groups is promoting a monthly household saving scheme. Members are encouraged to give their word of honor for saving a certain amount of money each month. Unlike a bank, these saving groups work as hosts for group meetings for monthly deposits, rather than for individual financial inquiries. Once a month, all members meet in community halls and deposit money into their account. This research found the meetings were a chance for saving group members to meet and exchange their stories of money management. It is the best chance to evaluate one's financial situation by comparing to neighbours living in the same village, and generally, ranking in the same socio-economic status. The meetings are a chance to exchange and learn from each other.

Participating in merit (Pali: *puñña*, Thai: บุญ) ceremonies (Thai: งานบุญ); can also be considered as activities that promote sufficiency. Punna ceremonies mean social events that call for the assistance of communities' members in terms of labour, money and any other resources. According to Isaan tradition, the Twelve Traditions (Thai: ฮีตสิบสอง), the date of the full moon is the date for a Buddhist ceremony. The Twelve Traditions Punna ceremonies usually take place at local monasteries and are hosted by everyone in the village. Each month requires different food and objects or talisman to use in the ceremony. For example, rice-egg crackers are needed for the Punna ceremony of the second moon, the parade telling the story of a Bodhisattva (a compassionate higher being or Buddha-to-be) is needed for the fourth moon Punna ceremony and the big column of candle is made in the occasion of eighth moon Punna. Moreover, several Punna ceremonies apart from the Twelve Traditions, hosted by families, such as newborn cerebrations, weddings, ordinations and funerals could be observed. According to Isaan tradition, participating in Punna ceremonies is the expression of social cohesion. The one who misses several Punna ceremonies would be considered skeptical and could be disregarded from the community members. Therefore, Punna ceremonies can be considered as social events for its member to meet monks and practice Buddhist precepts, to confirm their community belonging, to share information and resources and to conserve traditional art and culture.

While the economic aspect of the Survival domain explored the ability to produce commodities to save some money, the "Sufficiency" domain explored factors to ensure that the money is saved and spent mindfully.

In conclusion, Sufficiency explored in the Inpaeng network is the ability to "think before spending and consuming". To develop that ability, it involves the practice of mindfulness, the participation in religious ceremonies as chances to meet monks and chances to practice Buddhist precepts. Moreover, the locally appropriate financial organisation is also one of the factors to reinforce that ability.

2.2.4.3 Sustainability

Unlike Survival and Sufficiency, the domain of Sustainability is not the characteristics of an individual or a household; it is the attribute of the aggregated units. Sustainability concerns the characteristics of participants' communities and their perceptions of those communities. Sustainability involves social engagement, social trust, environmental issues, the local natural resource management, and the perception to the young generation.

Explored in rural communities, social groups can be categorised into several groups according to the objectives of those groups such as recreation groups, volunteer groups, financial groups, saving groups, religious groups, occupational groups, and administrative groups.

Inpaeng network presents a variety of activities for its members to subscribe. Its activities range from administrative groups of Inpaeng trainers, Inpaeng administrators and staff to volunteer groups, local radio DJ groups, bush fire prevention patrol groups, community ecologists groups to saving groups to occupation groups of seedling, herbal medicine, wine maker group, bio-diesel group and others.

According to rural Isaan community context, the sense of social trust is expressed in the way their houses are set up. People who live in the same village know each other. Most of the houses are elevated one floor houses with an open ground area. The area is used as the multi-purpose space. It can be interchangeably utilised as a dining area, living space, greeting area, meeting hall or even as a children's play ground. The rough fences around village houses are for preventing animals, such as cattle and stray dogs, not people, to enter the area. It is a common tradition to talk to strangers entering the village. After knowing each other, it is also very common to call the strangers for a dinner. This trust issue can be observed through the Inpaeng training courses. The accommodation area in Inpaeng centre can host up to thirty trainees. However, if there are more trainees who are participated in a 3-day training program, they would spend their nights in villagers' houses around the centre. It can be assumed by the evidence above that the level of people trust in the area of study is high.

Many Inpaeng leaders gain trust from the members. Although some of the Inpaeng leaders are also public authorities such as village headmen or Tambon headmen, but a large number of them are not.

This study found that concern with the young generations is an important issue. These concerns can be categorised into two groups. Firstly, it is a worry about reckless behaviours of youngsters living in the villages. The issues of drunk driving, motorcycle racing, drugs, sexual misbehavior and gangs fighting in the young generation were concerned by the older adults. When asked what factors contributed to the violence in the village, many of the participants referred to "those youngsters". Concerned by this issue, the Inpaeng network has some constructive programs established for the younger generations to keep them from those risk behaviours.

The "Dek hak Tin" (Thai: เด็กฮักถิ่น) or "kids love homeland" program was initiated by the Inpaeng network. The program trained the local adolescents to understand the interconnectedness between the trainees and their ecosystem. A project showing that everything is intertwined with everything was introduced.

A program called "Inpaeng community ecologists training" aimed to draw the young adult generation back from working as cheap labour in big cities, to sustainable, selfreliance farming in their hometown.

The research field note below describes Inpaeng community ecologists are as follows:

"...the Inpaeng elderly would like them (the community ecologists) to understand soil, sky, Mother Nature and seasons. They want their offspring to realise the power and the value of farmers. Self-reliant farmers are much better than unskilled labours in big cities."

Inpaeng's community ecologists were trained in many courses to develop their selfreliance competencies such as building the earth house, Phuphan's biodiversity, hill tribes' local wisdom of forest management, Thai traditional medicine, herbal medicine, organic agriculture, team management, network management or even website programming.

These training courses were generated or sponsored by Inpaeng administrators who encouraged the youngster to set their own program of self-reliance agriculture. The elders expected that those youngsters can skip through the pitfalls of failed agricultural patterns and learn from the experience of former generations.

The initial outcome of this program is that the community ecologists hold their own projects that they can make a living of it. Then, the long-term objectives are to practice the self-reliant agriculture, to keep the Phuphan Mountain range forest from depletion, and finally to cool down the globe.

Environment seems to be the key outcome of all Inpaeng activities. Inpaeng people know how to live with the forest. The most challenging mission of the network is to balance the two extreme attitudes about the forest. First group: considering the forest as an unlimited resource to exploit without concerning the effect of depletion. Another group thinks of the forest as strictly untouchable arenas conserved for the sake of the environment. This study found that Inpaeng concept did not fit in either two extremes. The issue that concerns the Inpaeng is the "interaction" between people and the forest. They wanted to use the forest without depleting it. In Inpaeng perspectives, the forests help people to gain the self-reliance competency. At the same time, the self-reliance lifestyle directly and indirectly generates less environment impact compare to the industrialized lifestyle.

In conclusion, this component of the research found that Thai social capital has three components Survival, Sufficiency, and Sustainability (3Ss). These attributes were the combination of local wisdom and modern management. Promoting Thai social capital, or 3Ss, did not mean require that people live in the ancient way of life. It may seem that the "good old days" in Thai rural area was the ideal community to live in. However, according to the situations mentioned earlier in this chapter and in chapter 1, it is impossible to live "back to the past". Rather, the concept of Thai social capital encouraged people to live "back to the roots". To go "back to the roots", people needed to analyse their lifestyle, their environment, their networks and others. In short, people needed to gain a deep understanding on their culture¹³³, knowing the strengths, weaknesses, opportunities and threats and to utilize all forms of capital they had in order to "stand by their own roots" or to manage their own lifestyles wisely and realistically.

2.2.5 Summary of findings from qualitative research

Inpaeng's perception of health integrated the Buddhist teaching of interconnectedness and interdependence. People were bound to each other and to their environment. This bonding defined people's health. According to that perception, health services could be seen in many forms apart from the modern western medical service. Herbal medicine, traditional massage, even shamanism were regarded as the variety of ways of health care utilisation.

Social capital, derived from Inpaeng's experience, involved three domains: Survival, Sufficiency and Sustainability. Food security, social welfare, accessibility to various forms of health care and competency to produce major items for farmers' lives were the elements for "Survival" from financial constrains. The lifestyle of living in moderation and with mindfulness, thinking thoroughly before consuming, and effective financial management were the characteristics of the "Sufficiency" lifestyle. Finally, "Sustainability" incorporated the social trust, social engagement, social support, the concern of environmental issues. This last domain integrated the traditional social capital concept accompanied with the specific Isaan's context of ecological concerns.

2.3 The transcription of the qualitative findings to the questionnaire

Lifestyle according to 3Ss concepts was selected as the upstream determinant of health and oral health for this research project. Ideas, phrases and sentences from the interviews accompanied with social phenomena acquired from the participatory observations were collected. Themes concerning 3Ss were collected and transformed into questionnaire using one or both of the following criteria. Firstly, they should be the characteristics that emerged repeatedly in the interviews or the observations. Secondly, they were indicated in the Inpaeng's training course(s) or Inpaeng's documents such as books, booklets, training course(s) proceedings or meeting summaries.

Main characteristics found in those three domains were transcript into questions. Each question was designed to fit the Likert rating scale pattern for the benefit of statistical analysis.

The amount and the use of land may not reflect the quality of Survival in the Inpaeng network. Traditional quantitative questions like "How many Rai (Thai unit of land measurement equal to 1600 square meters) do you have?" and "What kind of crops do you plant?" did not reflect the Inpaeng concept of land utilisation in the forest-like fashion. The subjective, outcome based questions were designed for the research questionnaire. Those questions were "Do you have sufficient land for agriculture?" and "Does the production from your farms, orchards provide a sufficient financial return to support your family?" Two questions explored the food consumed. They asked "Do you always eat various kinds of food" and "Are the foods that you eat contaminated with chemicals?" A question investigated the use of farm chemicals "Do you use chemicals in your farm?" Moreover, the issue of welfare, in term of monetary and non-monetary welfare was also explored in this Survival domain. "Do you have a reliable welfare when you're getting older?"

Sufficiency mirrored lifestyle of mindful, moderate and sensible consumption. Found in the study, these attributes were enabled by the practicing of Buddhist five precepts and participating in religious ceremonies. The consuming in moderation and the mindfulness were also explored. "How often did you attend religious ceremonies?" "Do you always practice the five precepts?" and "Are you an aware person?" were questions asked concerning Sufficiency. Moreover, two questions investigating the self-control of money spending have been constructed. Those questions were "Do you spend most of your money on necessities rather that what you just want?" and "Do you always record your financial expenses?"

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For Sustainability domain, questions exploring the perception of one's community were designed. Two questions explored the issues of the environment; "Do you agree that the environment, natural resource that surrounds your community are abundant and fruitful?" and "Do you have secured natural resources?" The issue of trust was explored in other 3 other questions "Do you trust your community leaders?" "Can you rely on the young generation in your community?" and "Is your community peaceful?" Finally, the perception of community performance was also asked in two questions: "Do you have an excellent community bank?" and "Are your community groups or organisations effective?"The whole question layout was displayed in the quantitative method, in chapter 3.

In conclusion, this chapter described the Inpaeng network background, its concepts and how these concepts were conceptualised into social capital variables for Thai Isaan people. The next chapter will describe the method of quantitative data collection. It will show all variables that need to be collected and how to collect them.
Chapter 3 : Research Method

3.1 Study design

A cross section survey study design was used, with a sampling plan that was optimal to address the study's aims of examining contextual influences of social capital on oral health. The target population was adult residents of rural villages in a defined region of north east Thailand. This chapter describes how villages and people were sampled, the justification for a target sample of 650 people, the data that were collected from villages and people, and the methods of data analysis. The sampling design of this research is stratified, clustered random sampling

3.2 Research sampling

A four stage stratified clustered random sampling design was implemented. The diagram of this study sampling design is illustrated in Figure 3.1

3.2.1 Sampling frame

This study acquired population data and other demographics from the Inpaeng Centre, the Thai Ministry of Interior and the Ministry of Public Health's databases. The data gained from those databases were Inpaeng membership, postal address, the number of people per household and the name and age of people living in target Tambons.



Figure 3.1: Four stage sampling design used in this study

Stage I: Tambons were categorised by period of Inpaeng membership registration

A four stage sampling design was used. The objective of the first stage of sampling was to select Tambons (Sub district, Thai: ກຳນລ). This study selected all Tambons that accommodated Inpaeng members. According to the Inpaeng database, there were 70 Tambons which held approximately 500,000 people, including Inpaeng members. These Tambons were categorised into three strata: Tambons that had been registered from 1993 to 1997, from 1998 to 2001 and from 2002 to 2008.

Stage II: Tambons were selected by using a stratified sampling technique

Four Tambons were randomly selected from each stratum. Twelve randomised numbers from an electronic randomiser (<u>http://www.randomiser.org/form.htm</u>) were used. Within each group of four Tambons, one Tambon was randomly selected as the reserved site. Therefore, at the end of this stage, nine target Tambons and three reserved Tambons were selected.

The sampling results of this stage is shown in Table 3.1

Tambon	Province	Stratum	Participated in Inpaeng Since	
Namong (Thai: นาม่อง)	Sakhon Nakhon	Ι	1993	
Kambor (Thai: คำบ่อ)	Sakhon Nakhon	I	1997	
Phasuk (Thai: นาม่อง)	Kalasint	I	1997	
Natan (Thai: นาทัน) (Reserve)	Udon-thani	I	1997	
Wattana (Thai: วัฒนา)	Sakhon Nakhon	II	2001	
Phon-gnam (Thai: โพนงาม)	Sakhon Nakhon	II	2001	
Umejan (Thai: อุ่มจาน)	Sakhon Nakhon	II	1999	
Huiyang (Thai: ห้วยยาง) (Reserve)	Sakhon Nakhon	II	2001	
Koksi (Thai: โคกสี)	Sakhon Nakhon	III	2005	
Na-hee (Thai: นาฮี)	Sakhon Nakhon	III	2005	
Nongbor (Thai: หนองบ่อ)	Nakorn-phanom	III	2005	
Samphong (Thai: สามผง) (Reserve)	Nakron-phanom	III	2005	

Table 3.1: Results from stage I sampling

Stage III: From selected Tambons, stratify households into Inpaeng and non-Inpaeng households

Based on Inpaeng network's database, researcher could identify households with Inpaeng members in target and reserved Tambons. Those households were nominated as Inpaeng households. Other households were identified as non-Inpaeng households.

All people aged 35 years or older, living in Inpaeng households, were called Inpaeng people. There were 417 households accommodating 940 Inpaeng people in the target Tambons and 168 households accommodating 336 Inpaeng people in the reserved Tambons. This research planed to collect data from all Inpaeng people.

For non-Inpaeng group, in target Tambons, there were 21,013 non-Inpaeng households accommodating 31,590 people aged 35 years or older. In reserved Tambons, there were 9,159 households accommodating 12,889 people. Equal numbers (940 from target Tambons and 336 from reserved Tambons) as Inpaeng people will be randomly select in stage IV. The selected people will be called non-Inpaeng people.

According to the observations in the qualitative phase, the age of 35 years is the period that people's lives settle, in other words, the period when they start to collect and

to utilise their social capital. Moreover, Ministry of Public Health used 35 years as the cut point of being in "adult group" in the Thai national oral health survey. Therefore, this research selected people who were 35 years or older as the research participants.

Stage IV: Randomised and selected non-Inpaeng households and people

Every non-Inpaeng household was sorted by house number. Non-Inpaeng households were systematically randomly selected by house number to meet the equal number of Inpaeng households for each Tambon. Every person aged 35 years or older, living in non-Inpaeng households, was selected as non-Inpaeng people. Therefore, this stage designated 417 non-Inpaeng households and 940 non-Inpaeng people from nine target Tambons. In reserve, 168 non-Inpaeng households and 336 non-Inpaeng members from four reserved Tambons were selected (Table 3.2).

	25 types rold		Innaang	Non-
Tambon	Population	Households	neonle	Inpaeng
	ropulation		people	People
Stratum I				
Namong	4,771	2,972	100	100
Kambor	5,306	3,263	52	52
Phasuk	5,269	3,645	128	128
Natan (Reserve)	4,845	3,077	164	164
Total Stratum I	20,191	12,957	444	444
Stratum II				
Wattana	2,420	1,474	94	94
Phon-gnam	2,836	2,019	102	102
Umejan	3,734	2,482	184	184
Huiyang (Reserve)	5,064	4,160	110	110
Total Stratum II	14,054	10,135	409	409
Stratum III				
Koksi	4,364	3,010	50	50
Na-hee	1,680	1,242	100	100
Nongbor	2,510	1,491	130	130
Samphong (Reserve)	3,380	2,090	62	62
Total Stratum III	11,934	7,833	292	292
Grand Total	46,179	30,925	1145	1145

Table 3.2: Result from stage IV sampling.

In conclusion, 12 Tambons that held a total of 2,552 Inpaeng and non-Inpaeng people were randomly selected from 70 Tambons of 500,000 people, as the research target group.

Sample size determination

The calculated sample size was 199 in each of two groups (total size = 398 participants). This figure was calculated using EpiInfo (version 6), given $1-\delta = 95\%$ and $1-\beta = 80\%$. The estimate of the odds ratio (OR) = 1.8 was taken from a study of relationship between stress and periodontitis in people aged 50 and over comparing odds of periodontitis between high and low stress group ¹³⁴. However, this study planned to collect data more than the calculated figure, in order to gain statistical analysis power. It also allowed for a response rate of 60%.

3.3 Data collection planning

3.3.1 Protocol development

The protocol for oral epidemiological examinations was developed from the protocol used in the Australian National Survey of Adult Oral Health (NSAOH) 2004/06 (Appendix I).

3.3.2 Inclusion/exclusion criteria

Participants were excluded from this research, if they met one or more of the following criteria.

aged less than 35 years or older than 80 years

had a congenital heart murmur

had a cardiac valve(s) disorder

had bacterial endocarditis

had Rheumatic fever

had a kidney disorder that required renal dialysis

had blood coagulation disorder

unable to answer the questions verbally or in writing

unable to sign the consent form

3.4 Participants appointment and locations for research data collection

Two methods of appointing participants were implemented. For Inpaeng members, the leader of each Tambon was requested to contact the Inpaeng members in that Tambon for the research data collection. For non-Inpaeng selected people, appointments were done by Health Centres' local health workers or village health volunteers.

The research data collection took place in several settings. The areas were selected based on the accessibility of the research participants. Data collection usually took place in primary school halls, community centres, health centres, temples or in village headmen's houses.

3.5 Information sheet and Informed consent sheet

Every eligible appointed participant was requested to read the information sheet and consent form and was encouraged to ask any questions about the research. The information sheet (shown in the Appendix II) indicated the objectives of the research, data collection methods, time consumed, risk and benefit of participation, risk prevention protocol, data confidentiality, and ability to discontinue participation. In order to certify their willingness to participate and be assured that they knew all necessary information; participants were required to sign the consent form. For those who could not read, the interviewer read to them all of the content in the information sheet and consent form.

3.6 Ethical implications and approvals

This study received research ethical approval from two organisations: 1) The Human Research Ethics Committee, Research Ethics and Compliance Unit, The University of Adelaide and 2) The Human Research Ethics Committee, Department of Health, Ministry of Public Health, Thailand. The data collection began after Ethics approval was given.

3.7 ResearchID coding system

Each participant had a specific code for this research called researchID code. The code consisted of eight scripts. The coding system can be indicated as the symbol "AAA-123-45". The first three letters indicate the name of the Tambon where the participants lived. The Tambon codes are listed.

Tambon's name	Code
Namong	NAM
Kambor	KAM
Phasuk	PHA
Natan	NAT
Wattana	WAT
Phon-gnam	PON
Umejan	UME
Huiyang	HUI
Koksi	КОК
Na-hee	NAH
Nongbor	NON
Samphong	SAM

Table 3.3: Tambon coding

The next three numbers indicated the household's code. Each selected household was given a three-digit code. The last two numbers represented the participant code. Everyone in the selected household who met the inclusion criteria was matched with a two-digit running number starting from 01. According to this coding system, the researchID of NAM-075-01 belongs to the first person in the household coded 075 in the Tambon of Namong.

3.8 Data collection methods

After signing the consent form, participants participated in two data collection procedures: an interviewer-completed questionnaire and a clinical oral examination.

3.8.1 The Questionnaire

Questions were asked to participants by an interviewer who filled in the eleven page questionnaire survey form. These questions covered general demographics, self rated health/oral health, health/oral health care seeking, oral health behaviours, oral health-related quality of life (measured by the Oral Health Impact Profile or OHIP-14)⁴¹, general health status and behaviour such as tobacco consumption, health care seeking, mental health (measured by the Thai Mental Health Indicator or TMHI score), socioeconomic characteristics and the rural Thai social capital index (3Ss score). The 3Ss score was developed in the qualitative phase, and measured the level of social capital in Thai rural communities in three domains: Survival, Sufficiency and Sustainability. This index is discussed in detail in the following paragraphs. The full questionnaire is shown in the Appendix.

For verification, the questionnaire was piloted among Inpaeng administrative staff. A group of 12 Inpaeng leaders were involved. They were asked to comment on the understandability of the language. Some words concerning financial status, farming cultivation and accessibility to public services were changed into more understandable terms. Questionnaire adjustments were made accordingly and it was retested among the same group.

3.8.2 Questionnaire items and scales

According to the questionnaire layout, questions were grouped into nine sections. They were: 1) oral health, 2) oral health-related quality of life, 3) general health and health behavior, 4) smoking history, 5) social capital, 6) self-sufficiency, 7) financial status and self-perceived social standing, 8) mental health and 9) demographics.

In parts 1 and 2, twenty five questions explored the frequency of oral health service utilisation, reasons for oral health service visiting, health care card holding, tooth brushing frequency, the use of fluoride toothpaste, the use of mouth rinse, and self-rated oral health and oral health-related quality of life (OHIP-14). A five-point Likert rating scale was used to explore self-rated oral health and OHIP-14, the frequency of tooth brushing and mouth rinsing per two weeks were recorded as continuous variables.

In part 3; general health, the questions asked if participants had been diagnosed diabetes, cardio-vascular disorder and hypertension. Health service utilisation and accessibility to modern health care, along with the alternative health service (such as herbal medicine, traditional medicine, shamanism), were asked. Nutritional status of the participants was measured by two items, body weight in kilograms and height in meter,

using standard instruments. Then, they were converted into Body Mass Index (BMI) and categorised into groups¹³⁵.

The participants were categorised according to their BMI score using the following thresholds:

Underweight group	BMI < 18.50
Normal range	$18.50 \le BMI \le 24.99$
Overweight group	$25.00 \le BMI \le 29.99$
Obesed group	25.00 < BMI

The frequency of alcohol consumption and smoking were investigated. For alcohol consumption, the frequency of drinking any kind of alcoholic beverage in a week was asked.

Variables collected in this part would be used for two reasons. Firstly, these variables were for investigating the association between some systemic diseases, such as diabetes, cardiovascular disorder and obesity, and social capital^{12, 136}. Secondly, the data would be used as a precaution before performing the oral health examination.

In part 4, tobacco consumption, the composite index of smoking status, was investigated¹³⁷. Smokers were asked the number of cigarettes they smoked per day and the duration of smoking in years since they started smoking. Those who had stopped smoking were asked the duration and the number of daily cigarettes smoked. The index was calculated by the following formula:

$$Pack - year = \frac{Number of cigarattes consumed per day \times Number of smoking years}{20}$$

Then, they were categorised into groups using the following criteria

Light smoker	0 < pack - year score < 4.45
Moderate smoker	$4.45 \le \text{pack} - \text{year score} \le 15$
Heavy smoker	15 < pack – year score

In part 5, thirty three questions were asked in order to explore the level of social capital. These questions were presented in the 5-point Likert rating scale, with answers ranging from "strongly agree" to "strongly disagree" and with a "don't know" option. These questions were grouped into three domains, developed from the qualitative phase of this study, which were Survival, Sufficiency and Sustainability.

In the Survival domain, twelve questions explored whether the participants had enough land and food in order to survive physiologically and financially. The questions in this domain also asked whether participants undertook organic farming and the level of chemicals to which they were exposed. Two other aspects that reflect Survival were participants' accessibility to a variety of health care services and the availability of their communities' basic infra-structure. The questions for investigating Survival domain were listed as followed.

I have sufficient land for agriculture.

Since last year, I've had sufficient food to eat.

Production from my farm, orchard provide a sufficient financial return to support my family.

I always eat various kinds of food. Foods that I eat are not contaminated with chemicals. I hardly use chemical in my farming. I always use herbal medicine. I have skill in Thai traditional massage. I am of receiving full and adequate public modern health care. I am satisfied with my public facilities e.g. roads, electricity. I have no problem accessing information from media or people. I have a reliable welfare when I get older.

Ten questions explored the Sufficiency domain of the participants. They were concerned with participants' mindfulness and live-in-moderation lifestyle. Several questions in this domain applied the Buddhist five precepts practicing and mindfulness. The following are questions exploring Sufficiency.

I always eat in moderation.

My lifestyle will promote longevity. I always practice the five precepts. (Buddhist morality practice) I am an aware person. I frequently attend religious ceremonies. Compared to the last 3 years, I have greater saving resources. Compared to the last 3 years, I have less financial debt. Most of my money is spent for the necessities rather than "what I want". I always record my financial expenses. Most of my household commodities are produced locally.

Sustainability was defined as the characteristics of participants' communities. The questions explored participant's perceptions of the communities' competencies, communities' environmental issues and trust. The Sustainability questions following were used in this study.

My community is peaceful. I can rely on the young generation in my community. I trust my community leaders. I believe that, in the future, natural resources would not be used up. I have secure natural resources. My community acts according to the community master plan. My community has a community master plan. Most of my community groups or organisations are effective. My community has an excellent community bank. I am a lifelong learner. I have a secure job.

Each question in part 5 was scored as 1 for "Strongly disagree", 2 for "Disagree", 3 for "Neutral", 4 for "Agree" and 5 for "Strongly agree". A sum score for each domain was calculated and called Survival score, Sufficiency score and Sustainability score respectively.

Questions in part 6 were categorised into two groups. The first group asked if the participants engaged in the concept of "sufficiency economic"²⁴ and were asked how

many social or community groups they belonged to in which they participated in groups activities such as group meetings. The second group of questions asked the participants to rate their ability to produce five main items for a small-scale farmer's family, such as rice, food, household groceries, herbal medicine and fertilizer²⁵. The rating scales ranged from buy 100%, buy 75%-produce 25%, buy 50%-produce 50%, buy 25%-produce 75% to produce 100%.

In part 7 the questions investigated financial status and occupation. Three questions asked them to rate their annual savings, property and debt. The questions were asked with a rating scale from 0 to more than 100,000 Baht, with a "don't want to answer" option. Two questions asked about the perception of their living condition. One of them asked in four-level rating scale ranging from living comfortably, coping, difficult to very difficult. The last question in this part explored their self-perceived social standing. The participants were asked to evaluate their position, by marking an "X" on one of twelve steps on the ladder, illustrated in the questionnaire. The ladder represents the position where people stand in the community. The highest step is the position of the people who have the best of everything in the community.

Fifteen questions were asked in part 8 to explore the participants' mental health. This set of questions is called the Thai Mental Health Index or TMHI¹³⁸, and was developed by the Department of Mental Health, Ministry of Public Health, Thailand. The scale used for these questions was the four-level Likert rating score. Each question, such as: I can cope with life's serious problems, has four choices of answer which are Strongly disagree, Disagree, Agree and Strongly agree. This part explored mental health, because it could be a potential explanatory pathway in the research conceptual framework.

Five questions exploring demographic data were asked in part 9. Participants were asked for their gender, age, marital status, education level and the period of Inpaeng network membership.

3.8.3 Questionnaire validation

In part 2 of the questionnaire, the OHIP-14 questions were translated into Thai by the researcher, which was then sent to a professional translator, who converted the questions back into English. The new English version was then sent to the creator of the OHIP index to check for validity of the translation. After two cycles of translations and validations, the OHIP-14 Thai version was completed.

As mentioned earlier, the questions in part 5 of the social capital questionnaire were tested in a pilot group, for the understandability of the words used. The members of this pilot group were members of Inpaeng administrative committees. The suggestions gained from this meeting were used to adjust the wording in part 5 of the questionnaire.

3.8.4 Oral epidemiological examinations

After completion of the questionnaire, participants were asked to take part in an oral epidemiological examination. They were informed that the examination would be conducted by a qualified and trained dentist. The examination took approximately 20 minutes and recorded tooth status, gingival and periodontal status. Most of the examinations took place at Tambon health centres, or at village meeting areas.

3.8.5 Examiner training and reliability

The examiner was trained according to the protocol of Australian National Survey of Adult Oral Health 2004/06. Two sessions of trainings and the reliability test were done in the school of Dentistry at the University of Adelaide, Australia on November 2007. As a result of the second session, percent agreement between the examiner and the gold standard dentist was more than ninety percent in every measurement.

An intra-examiner reliability test was done by using a 5% duplication of the participants. The weighted Kappa of probing pocket depth, clinical attachment loss and DMFT were 0.50, 0.57, and 0.96 respectively.

3.8.6 Infection control

Dental mirrors and periodontal probes that came in contact with saliva and blood of the participants were brushed after being soaked in commercial washing agent. Autoclave or pressure sterilisation was used to sterilise the instruments. Disposable examination gloves and face masks were used in the examinations. Contact surfaces were wrapped in plastic film and were changed for every participant. Other infection control procedures were done according to the guidelines in Infection control guidelines for the prevention of transmission of infectious diseases in the health care setting¹³⁹.

3.8.7 Examination instruments

Hu-Friedy's CP-2 Color-Coded Periodontal Probes (code PCP2), with black bands at 2-4-6-8-10-12 millimetres and standard dental mirrors were used to record oral epidemiological indices. Examiner masks, disposable gloves, gauze, cotton rolls, infection control supplies (containers, trays, bags, detergent etc.) were used in the examination. A traveler LED head lamp was used for lighting instruments. No x-ray imaging was taken and no treatment was provided.

3.8.8 Removable Denture assessment

Participants were asked if they were wearing removable dentures. If they answered yes, they were asked to remove the denture(s) and put it on the tray. The dentures were identified and recorded as full or partial dentures. The wired-with-the-tooth acrylic dentures that were made by illegal practitioners were also recorded as partial dentures.

3.8.9 Oral clinical assessment

In this chapter, the detail of the examination protocol is not fully described and only major features of the examination are reported. For more details, please consult the Protocol for Oral Epidemiological Examination in the Appendix.

3.8.9.1 Oral mucosal tissue assessment

Lips, labial mucosa and sulcus, buccal mucosa and sulcus, alveolar ridges, tongue, floor of mouth, hard and soft palate were examined for signs of oral lesions including oral cancer, aphthous ulcers, herpetic lesions and traumatic lesions.

3.8.9.2 Plaque, calculus and gingival index examination

Up to six indicator teeth were examined for plaque, calculus and gingival index. They were the most anterior molar teeth in each quadrant (up to four teeth), tooth 11 and tooth 13. Before moving to the next tooth, each tooth was examined for calculus first, then plaque and gingivitis as the last examination. For the calculus examination, the visibility of calculus on buccal or lingual surface was recorded. Plaque was recorded with its visibility only on the buccal surface.

3.8.9.3 Tooth Status

All remaining crowns and roots were examined separately for caries experience. The options of statuses were: Missing, Remaining root, Decayed, Filled, Sound, Other or Excluded. The root surfaces of remaining teeth were also examined. They were recorded as Decayed, Filled root, Sound or Not visible.

3.8.9.4 Periodontal destruction

All remaining teeth, except for third molars, were assessed for periodontal destruction. Four sites were measured for each tooth. The sites were Mesio-buccal, Disto-buccal, Mesio-lingual and Disto-lingual.

Gingival Recession (REC), Probing Pocket Depth (PPD) and Bleeding were three indicators of assessment. REC was defined as the distance from Cemento-Enamel Junction (CEJ) to the free gingival margin at the site. According to the definition, REC can be recorded as a positive or negative value. Negative REC could be recorded when the free gingival margin covers the CEJ, as observed in the swollen gingiva. PPD was defined as the distance from the free gingival margin to the bottom of the periodontal crevice or periodontal pocket. Bleeding was defined as the presence of blood at the gingival margin at the moment the probe was removed and was coded as Yes or No.

3.10 Completing the examination and discharging the study participant

After the examination, the following procedures were implemented. Participants were informed of the examination's findings. If needed, the participants were referred to the nearest community hospital for further diagnosis and treatment. Participants were provided with a tooth brush and toothpaste pack.

3.11 Computer data entry

Electronic forms in Microsoft Access 2003 format were used for electronic data entry. Data from questionnaires was recorded onto paper before being transcribed into electronic format, while the oral health examination data was recorded on a computer simultaneously during the examination by an assistant. The examination data entered onto the computer was printed out automatically as a backup hard copy after finishing each participant's oral examination.

3.12 Participants' confidentiality

Every participant's name was matched with the researchID code. The matching file was kept separately and was not involved in the data analysis. Only researchID codes were shown in the data analysis programs as the reference code.

3.13 Data Cleaning

After the questionnaire was completed, the interviewer re-checked the paper to ensure that all questions were answered. If not, the participants were asked to answer those questions. However, if they could not, the following protocol was implemented for data cleaning.

In part 1 of the questionnaire: oral health, part 3: general health and health behavior, part 4: smoking history part 7: financial status and self-perceived social stand and part 9: demographics, the missing data were treated as missing values during the data analysis.

In part 2: an OHIP-14 question, the whole part was excluded from the analysis if at least one of fourteen questions was not answered.

In part 5: Social capital, the missing data and the "don't know" answer were transformed into the answer of "neutral".

In part 6: ability to produce main items for a small scale farmer, the missing data was transformed into the answer of "buy-50% produce-50%".

In part 8): mental health, the whole part was excluded from the analysis if at least one of fifteen questions was not answered.

Input edits for wrong or missing oral examination data entry was programmed using Microsoft Access's feature. Therefore, the missing data was fixed immediately at the moment of error. The final stage of data cleaning was to run a frequency table exploring the outliers and checking the unmatched data (e.g. If the name of a village and name of Tambon did not match).

3.15 Data Analysis

3.15.1 Variables

Data gained from questionnaires and oral examinations were transformed into variables.

The variables were described using several criteria. Firstly, according to the aims of this study, variables were grouped into outcome variables, predictors and covariates. Secondly, they were grouped by their characteristics of data as continuous, nominal (categorical), ordinal or dichotomous. Thirdly, they were categorised according to the level of the referencing unit they represented, which were individual level (individual variables) or community level (contextual variables).

The contextual variables are variables at a community level which may affect the relationship between outcome variables and predictors. For this study, there were two groups of contextual variables, Tambon contextual variables and village contextual variables. The proportion of Inpaeng people in the Tambon were collected as Tambon contextual variables, while village contextual variables included village population and the distance to the nearest dental service. All contextual variables gained from the local databases. These databases were provided by the Tambon health centres.

The three main outcome variables: DMFT, CAL and OHIP were calculated by the following formulas. DMFT was defined as participant caries experience. The sum of all teeth in the mouth, despite third molars, that were coded as D, M, F, R were calculated. The CAL, which was defined as the distance from the CEJ to the bottom of the pocket, was calculated after the examination by the sum of REC and PPD. For oral health-related quality of life, two variables were calculated; OHIP severity and OHIP extent. OHIP severity is the sum score of all OHIP-14 questions. The sum score of fourteen questions was calculated as the OHIP severity score¹⁴⁰. The number of items responding "fairly often" or "very often" were counted and reported as OHIP extent.

The main predictor variables, Survival score, Sufficiency score and Sustainability score, were calculated by the sum score of questions in each domain.

The following table illustrates all variables in this study.

Variables	Type of variables	Level	Category
DMFT	Continuous	Individual	Outcome
Decayed teeth	Continuous	Individual	Outcome
Missing teeth	Continuous	Individual	Outcome
Root caries	Dichotomous	Individual	Outcome
Filled teeth	Continuous	Individual	Outcome
Proportion of sites with CAL>4mm.	Continuous	Individual	Outcome
Proportion of sites with PPD>5 mm	Continuous	Individual	Outcome
Bleeding	Categorical	Individual	Outcome
OHIP	Continuous	Individual	Outcome
Self-rated oral health	Ordinal	Individual	Outcome
Self-rated physical health	Ordinal	Individual	Outcome
Diagnosed Periodontitis	Dichotomous	Individual	Outcome
Self-production score	Continuous	Individual	Outcome
Self-perceived social standing	Ordinal	Individual	Outcome
Mental Health	Continuous	Individual	Outcome
Survival	Continuous	Individual	Predictor
Sufficiency	Continuous	Individual	Predictor
Sustainability	Continuous	Individual	Predictor
Inpaeng membership	Dichotomous	Individual	Predictor
Social group membership	Continuous	Individual	Predictor
Years of Inpaeng membership	Continuous	Individual	Predictor

Table 3.4: The research variables

Variables	Type of variables	Level	Category
Last dental visit	Ordinal	Individual	Covariate
Reason for visiting	Categorical	Individual	Covariate
Brushing frequency	Continuous	Individual	Covariate
The use of tooth brush	Dichotomous	Individual	Covariate
Type of brushing instrument	Categorical	Individual	Covariate
Frequency of mouth rinse using	Continuous	Individual	Covariate
Type of mouth rinse used	Categorical	Individual	Covariate
BMI	Continuous	Individual	Covariate
Systemic disease	Categorical	Individual	Covariate
Alcohol consumption	Ordinal	Individual	Covariate
Body weight	Continuous	Individual	Covariate
Body height	Continuous	Individual	Covariate
History of cigarette smoking	Dichotomous	Individual	Covariate
Years of smoking	Continuous	Individual	Covariate
Pack-year smoking	Continuous	Individual	Covariate
Annual Saving	Ordinal	Individual	Covariate
Property Value	Ordinal	Individual	Covariate
Debt	Ordinal	Individual	Covariate
Occupation	Categorical	Individual	Covariate
Coping with household income	Ordinal	Individual	Covariate
Gender	Dichotomous	Individual	Covariate
Age	Continuous	Individual	Covariate
Marital Status	Categorical	Individual	Covariate
Health centre with dental nurse	Dichotomous	Contextual/village	Covariate
Distance to health centre	Continuous	Contextual/village	Covariate
Distance to community hospital	Continuous	Contextual/village	Covariate
Village population	Continuous	Contextual/Village	Covariate
Inpaeng proportion in Tambon	Continuous	Contextual/Tambon	Covariate
Tambon population	Continuous	Contextual/Tambon	Covariate

Table 3.5: The research variables (cont.)

3.15.2 Data analysis

The analysis addressed the research objectives described in Chapter 1: to explore social capital of Thai rural communities, focusing on its role in oral health and to test if the well-established determinants (such as socioeconomic status, smoking, oral health care utilisation) could determine oral health of Thai rural people. All data analysis was done using SAS 9.1.3 Service Pack 4 computer software.

The estimation of dental disease prevalence in the population was not this study's objective. Therefore, the statistical analysis was done giving the same weight to both Inpaeng and non-Inpaeng participants¹⁴¹. Selection bias will be discussed in the discussion chapter.

Because some predictor variables were created in the qualitative phase of this study, several tests of these variables needed to be implemented. Survival score was the variable that was calculated by the sum of seven questions, while Sufficiency and Sustainability were calculated by the sum of six and seven questions respectively. These variables were tested for internal consistency, Cronbach's alpha and factor analysis.

Cronbach's alpha for each variable was calculated to indicate the variable's reliability. Then the correlations between each question and the sum score of the main predictor variables were calculated.

Factor analysis was done for the questions in the Survival, Sufficiency and Sufficiency domain. The results were used to confirm whether the questions in the same domain were grouped into the same factor.

The univariate analysis aimed to describe the main characteristics of participants. These characteristics were age, sex, occupation, education, marital status, financial status etc. This type of analysis also described the central tendency (mean, median and mode) of continuous, ordinal and categorical variables. The distribution of the data was described by standard deviation, kurtosis and skewness. The interpercentile measure of variability for predictor variables was done in order to group people by the level of predictors. Most of the predictor variables were grouped according to tertile scores. The comparison of outcome variables among the groups was done using inferential statistic analysis.

For bivariate inferential statistics, the main questions to test was whether the people in different predictor levels had different levels of oral behaviour, oral health status and oral health-related quality of life. The other question was to test whether the participants in different predictor levels had different levels of mental health, self-rated physical health, and self-perceived social standing. The comparison among groups of least square means with 95% confidence limits was done by the Analysis of Variance (ANOVA) with the Bonferroni pairwise comparison technique at the significance level of p<0.05. The analysis was done in two ways: crude and age adjusted. All covariates were analysed in the same way as main predictors.

Four multivariate analyses were conducted. The first model calculated the relationship of predictor and outcome variables without any effect of covariates. In the second model, non-clinical covariates that have the relationship with outcome variables in the bivariate analysis were added to the model. The clinical covariates were put into the third model. Finally, the fourth model included the interaction between variables, such as the interaction of Inpaeng membership and Survival score.

Multilevel analysis is defined as the technique that simultaneously examine of the effects of group and individual variables on individual outcome variables while accounting for the non-independence of observations within groups. People were classified according to their village and Tambon. Village population and distance from the village to the nearest oral health service are variables that were used as village level predictors, while Tambon population and proportion of Inpaeng households in that Tambon were predictor variables for Tambon level.

Chapter 4 : Quantitative study results

This chapter aims to answer the questions according to the research objectives. As mentioned in the previous chapter, those research objectives were:

to describe people's oral health status, in terms of dental caries experience, clinical attachment loss and oral health-related quality of life.

to investigate the association between Thai social capital and the oral health status of the research participants.

to explore whether traditional oral health predictor variables could predict the oral health of research participants who are north-east Thai villagers.

This chapter consists of two parts. The first part describes the characteristics of research participants in several dimensions. These characteristics include response rate, distribution by demographics, financial status, health care utilisation, self-rated variables, and Thai social capital. The second part describes the prevalence of the participants' oral health status and the variables that may determine them.

4.1 Part I Characteristics of the research participants

4.1.1 Response Tambon

The research data collection, by means of questionnaire and clinical oral examination, was conducted from January to June 2008. Participants were randomly selected from nine Tambons. Six of them are in Sakonnakhon province and the other three were from Udonthani, Kalasin and Nokhonphamom provinces. However, due to coordination problems across the provincial area, accompanied with the limitation of time and resources, only six Tambons in Sakonnakhon were explored. All six Tambons were registered as Inpaeng network members. Two of them had been registered as Inpaeng members before 1997, two of them in 2001 and the rest in 2005.

4.1.2 Response Rate

According to the sampling frame (described in the previous chapter), all Inpaeng households were selected. An equal number of non-Inpaeng households in the same Tambon, regardless of Tambon population, were randomly selected. All members aged 35 years or older who lived in these households were selected as the research target sample for this research. Almost one fourth of the target sample could not be contacted. This was because they had either died or moved to other areas, or because of an error in the local population database. Finally, 992 individuals could be contacted. Sixty five percent of them gave their consent to participate in the research data collection. The response rate ranged widely from 44 to 90% between Tambons

Table 4.1: Participants and percent of participation this research study categorised b	y
Tambon	

Tambon	Tambon Population	Inpaeng households (house)	People who could be contacted	People who gave consent	Percent of participation
Namong	11,946	42	260	156	60
Kambor	13,397	26	96	56	58
Umejan	10,021	80	188	175	91
Phon-gnam	8,041	51	217	137	63
Koksi	11,207	25	81	63	78
Na-hee	4,947	49	150	66	44
Total	59,559	282	992	653	65

Categorised by Inpaeng membership, shown in Table 4.2, almost 60% of the participants were not Inpaeng members. For those who were Inpaeng members, almost 60% of them were in the beginning stage of Inpaeng membership (1-4 years membership).

Table 4.2: Distribution of research participants by Inpaeng membership

Inpaeng membership	Ν	%
Non-Inpaeng	368	57.2
1-4 years membership	158	24.5
5+ years membership	118	18.3

Only four participants had discontinued their membership after years of being Inpaeng members. Therefore, it can be assumed that almost all of the Inpaeng group members were still active in Inpaeng group activities.

The proportion of research participants who were Inpaeng members for each Tambon, ranged from 25% to 55% (Table 4.3). Years since Tambons were involved in Inpaeng activities reflected the mean years of Inpaeng participants' membership.

Table 4.3: Proportion of Inpaeng participants and mean years of membership categorised byTambon

Tombon	Year	% Inpaeng	Mean years of
Tampon	registered	participants	membership (95% CI)
Namong	1993	25.3	6.8 (5.6–7.9)
Kambor	1997	42.9	7.3 (5.8–8.8)
Umejan	1999	44.1	5.3 (4.4–6.0)
Phon-gnam	2001	55.5	6.1 (5.3–6.9)
Koksi	2005	47.6	2.2 (0.9–3.6)
Na-hee	2005	50.0	1.9 (0.7–3.3)

4.1.3 Response bias

Seventy percent of the female target sample gave consent while only 60% of males did. Mean age of the target samples who participated in the research was 52 years, whereas the mean age of people who did not give their consent was 50 years. Grouped by Inpaeng membership, almost 70% percent of the target Inpaeng sample participated in the research, while only 55% of non-Inpaeng samples did.

The number of female Inpaeng participants was more than males by 10%, whereas in Non-Inpaeng groups, females outnumbered males by 20%. The difference in the education level was also significantly different. Twenty three percent of Inpaeng participants had 6 years or more of school education, while only 8% of non-Inpaeng participants did (Table 4.4).

	In	Inpaeng Non-Inpa.			Inpaeng		Non-Inpa		
-	Ν	%	Ν	%	-	Ν	%	Ν	%
Sex					Occupation				
Male	123	44.4	142	38.8	Small-scale farmer	231	83.4	321	87.7
Female	154	55.6	224	61.2	Business	9	3.2	8	2.3
					Employee	11	3.9	11	3.0
Age group					Public officer	25	9.0	13	3.6
35-49	124	44.8	153	41.9	Retired	1	0.3	13	3.6
50-59	98	35.4	107	29.3					
60-69	46	16.6	72	19.7	Education				
70+	9	3.2	33	9.1	None	9	3.2	1	0.3
Marital status					6-12 years	206	74.4	334	91.3
Single	7	2.5	10	2.7	12+ years	62	22.4	31	8.4
Married	224	88.1	314	85.8					
Others	26	9.4	42	11.5	Health card				
					UC card	238	86.6	333	91.4
					Soc .welfare	5	1.8	5	1.4
					Others	32	11.6	26	7.2

Table 4.4: Demographic characteristics categorised by Inpaeng membership

4.1.4 Examiner reliability

An intra-examiner reliability test was done by using a 5% duplication of the participants. The weighted Kappa of probing pocket depth, clinical attachment loss and DMFT were 0.50, 0.57, and 0.96 respectively.

4.1.5 The Management of Thai social capital variables

Although thirty three aspects gained from qualitative phase study were tested and showed a favorable result in the pilot study, some problematic issues emerged when applied among the research participants of 653 people. When collecting research data, it was observed that, participants showed some confusion when asked these questions: I am a lifelong learner., I have a secure job., I am of receiving full and adequate public modern health care., I am satisfied with my public facilities e.g. roads, electricity., My lifestyle will promote longevity., and I have no problem accessing information from media or people. Most of my household commodities are produced locally. The ambiguity of the words was observed during interviews. Many participants felt they were satisfied with electrical supply but not roads, had no problem accessing information from television program, but hardly accessed the news magazines. Moreover, they may receive full and adequate modern public health care for only some of the year. Furthermore, most of the participants did not know the community master plan as asked in two questions: **My community has a master plan and My community acts according to the community master plan.** The ambiguity of the terminology of from those questions, observed in the data collection, may affect the validity and reliability of the variable. For these reasons, the questions mentioned in this paragraph were omitted from the social capital measurement.

The questions concerning Thai traditional medicine: I always use herbal medicine. and I have skill in Thai traditional massage. were excluded from Thai social capital domains and analysed separately. Likewise, the questions concerning financial issues: Compared to the last 3 years, I have greater saving resources. and Compared to the last 3 years, I have greater saving resources and Compared to the last 3 years, I have greater saving resources and Compared to the last 3 years, I have less financial debt. were also excluded from the social capital domain and analysed as financial variables.

Finally, twenty questions were assigned as the variables to measure Thai social capital. Factor analysis was analysed to test the correlations between Thai social capital variables. The result is shown in Table 4.5.

	Farming	Food and eating	Community's asset	Aspects of Buddhism	Group effectiveness	Welfare
Survival Domain						
I have sufficient land for agriculture.	0.79					
Since last year, I've had sufficient food to eat.	0.77					
Production from my farm, orchard provide a sufficient financial return to support my family.	0.71					
I always eat various kinds of food	0.48	0.45				
Foods that I eat are not contaminated with chemicals.		0.45				
I hardly use chemical in my farming		0.69				
I have a reliable welfare when I'm getting older.						0.54
Sufficiency Domain						
I always eat in moderation.		0.76				
l always practice the five precepts. (Buddhist morality practice)				0.65		
l am an aware person.				0.66		
I frequently attend religious ceremonies.				0.73		
Most of my money is spent for the necessities rather than "what I want".				0.49		
I always record my financial expenses.						0.70
Sustainability Domain						
My community is peaceful			0.47			
I can rely on the young generation in my community			0.49			
l trust my community leaders			0.56			
I believe that, in the future, natural resources would not be used up			0.79			
I have secure natural resources			0.77			
Most of my community groups or organisations are effective					0.79	
My community has an excellent community bank					0.80	

Table 4.5: Factor analysis of 20 Thai social capital variables (display only factor loading>0.4)

According to the factor loading in factor analysis, questions in Survival domain were grouped into three factors concerning farming, food, and welfare.

In Sustainability domain, two questions concerning community group efficiency were grouped in a factor. Other questions in Sustainability domain were grouped into the same factor.

The questions exploring aspects of Buddhism in Sufficiency domain were grouped into the same factor. Although the question I always eat in moderation. was grouped in the same factor concerning food and eating aspect, and the question I always record my financial expenses. was grouped in the factor concerning welfare. Statistically, they should be grouped into the Survival domain. However, theoretically, these two questions were developed from the notion of self-control which is one of the Buddhism core concepts. These two questions were deliberately kept in the Sufficiency domain.

4.1.6 Characteristics of research participants

4.1.6.1 Demographics

Apart from sex and age, the participants shared homogeneous demographic characteristics. As shown in Table 4.6, almost 90% of them were married small-scale farmers, holding a universal coverage health care card (gold card) and had a school education of six years or less. Considering age distribution, the proportions decreased across the older age groups. Forty percent were 35-49 year olds, almost one-third were 50-59 year olds and the rest were 60 years or older.

	Ν	%		Ν	%
Sex			Occupation		
Male	268	41.2	Small-scale farmer	556	85.5
Female	382	59.8	Business	18	2.8
			Employee	22	3.4
Age group			Public officer	38	5.8
35-49	279	42.8	Retired	16	2.5
50-59	206	31.7			
60-69	121	18.6	Education		
70+	44	6.8	None	10	1.5
Mean 52.1 (95	5% CI: 51	.2-52.9)	4-6 years	547	84.2
			6-12 years	52	8.0
Marital status			12+ years	41	6.3
Single	17	2.6			
Married	558	86.8	Health card holding		
Others	68	10.6	Universal coverage	571	89.4
			Soc .welfare	10	1.5
			Others	58	9.1
Number of Ch	ildren				
Mean 3.4	(95% CI:	3.2-3.5)			

Table 4.6: Demographic characteristics of sample

The distribution of demographics by age group is presented in Table 4.7. There was a greater percentage of females than males in all age group other than 60-69 year olds. The proportion of widowed participants was higher (almost one fourth) in older age groups (60 years or more) compared to younger age groups (less than one tenth). There was no difference in the proportion of health care card holders among age groups. The proportion of participants that were retired in the group of 70 years or older was double (11.9%) compared to that of those aged 60-69 years old (5.1%). The proportion of six or more years of school education decreased across successive ages. One-fifth of participants aged 35-49 years had completed high school, whereas no one had in the oldest age group.

	Age group (years)					
	35-49	50-59	60-69	70+	Total	
N	278	205	118	42	643	
		Column perce	ent			
Sex						
Male	38.5	40.0	49.2	42.9	41.2	
Female	61.5	60.0	50.8	57.1	58.8	
Marital status						
Single	3.6	1.5	3.4	0.0	2.6	
Married	92.1	90.7	72.9	71.4	86.8	
Others	4.4	7.8	23.7	28.6	10.6	
Health card						
Gold card	86.3	91.2	92.4	92.5	89.3	
Social welfare	3.2	0.5	0.0	0.0	1.6	
Others	10.5	8.3	7.6	7.5	10.1	
Occupation						
Small-scale farmer	82.4	90.2	85.6	88.1	85.8	
Business	3.6	2.0	2.5	0.0	2.6	
Employee	5.4	2.0	2.5	0.0	3.4	
Public officer	7.9	5.4	4.2	0.0	5.9	
Retired	0.7	0.5	5.1	11.9	2.3	
Education						
None	1.4	1.5	0.8	4.8	1.6	
4-6 years	77.0	87.3	90.7	95.2	84.0	
6+years	21.6	11.2	8.5	0	14.5	

Table 4.7: Demographic characteristics by age group

4.1.6.2 Dental health utilisation, dental health behaviour and general health characteristics

Almost half of the participants have never been to a dental service. For those who did, their main reason for visiting dental clinic was pain (Table 4.8). The distance from participants' accommodation to the nearest public dental health service (provided by dental nurses or dentists) varied from 1 to 48 kilometers, with the mean distance being 11.8 kilometers. Thirty percent of participants were diagnosed by their physicians, with Diabetes Mellitus (DM) or a type of cardiovascular diseases (CV). People with both diseases were reported as DM. About one-fourth of the participants were categorised as overweight or obese according to the criteria of the World Health Organization (WHO)¹³⁵. Almost the same proportion was categorised as having poor mental health, who need psychological professional help¹³⁸, according to the criteria from the Thai Ministry of Public Health. The majority of participants were non-smokers. For those who smoked, more than 90% of them were males and more than two-thirds were categorised as moderate or heavy smokers¹³⁷.

	Ν	%		N	%
Last Dental visit			BMI		
Never	286	44.2	Underweight (BMI<18.5)	54	8.3
Five+ years	120	18.5	Normal (18.5-24.9)	423	65.1
Less than five years	241	37.3	Overweight (25.0-29.9)	145	22.3
			Obesity (BMI>29.9)	28	4.3
Reasons for Dental visit					
Pain	284	76.5	Mental health		
Check up	33	8.9	Poor	146	22.5
Other	54	14.6	Fair	361	55.5
			Good	143	22.0
Distance to OH Tx					
<10 Kms	372	57.2	History of Smoking		
10-20 Kms	198	30.5	No	421	65.4
20 Kms+	80	12.3	Yes	224	34.6
Mean 11.80 kms					
(95% CI 10.82-12.77)			Class smokers		
Range 1-48 Kms			Non-smoker	421	65.4
			Light	50	7.8
Brushing Frequency			Moderate	108	16.6
Less than once / day	266	41.5	Heavy	66	10.2
Once or more / day	375	58.5	Mean	12.22 pa	ack years
			(95%	CI: 10.7	78-13.66)
Fluoride toothpaste			Range 0.1	-53.7 p;	ack years
Yes	454	70.5			
Νο	190	29.5	Systemic Disease		
			No DM/CV	455	70.0
			DM	21	3.2
			CV	174	26.8

Table 4.8: Dental health/health variables

4.1.6.3 Accessibility to health care service and mode of self-care treatment

Almost all participants were entitled to free public health oral service (UC card holders). Participants reported use of several levels of accessible public health care services (Table 4.9). Participants could indicate multiple health services. Most of the people could access the public health service provided by the Ministry of Public Health. However, only three percent of the participants reported that they could access to the tertiary care given by the University hospitals.

Apart from public health utilisation, participants were able to access several alternative health services. Seventy two percent of participants could buy some overthe-counter medicine from local chemists. Herbal medicine was the most popular alternative health service. More than half (54%) of participants could access herbal medicine cures.

	N	%
Public health service		
Health centre (Primary care)	643	100
Community Hospital (Primary & Secondary care)	568	88.3
Provincial Hospital (Secondary care)	490	76.4
University Hospital (Tertiary care)	22	3.3
Private/Alternative health utilisation		
Private clinic	638	99.2
Chemist	462	72.4
Herbal med. master	344	53.9
Thai Massage	91	14.3
Spiritual healer (Shamanism)	34	5.3

Table 4.9: Health care service accessibility

As cited in Table 4.10, almost 90% of participants reported the use of herbal medicine as their self care treatment. One fifth of the participants (18.01%) said that they were skilled massagers.

	Ν	%
Use of herbal medicine for self care treatment		
No	78	12.1
Sometimes	364	56.5
Frequently	202	31.4
Skill in Thai traditional massage		
No	390	60.6
Moderately skilled	138	21.4
Skilled	166	18.0

Table 4.10: Self-care; herbal medicine and Thai traditional massage

4.1.6.4 Financial characteristics

This research explored their financial status through five variables shown in Table 4.11. More detailed descriptions of these financial variables are reported in the qualitative and method chapters.

The range of participants, who selected N/A for questions about saving, property and debt, ranged from 10 to 23% percent. Sixty three percent of participants had annual savings of less than 10,000 TBH (Baht: Thai currency), which is equal to almost \$400 Australian. More than half (56%) of participants evaluated their household property value (including assets such as house, land and vehicle) 100,000 TBH or more.

Compared to the last three years, half of the participants (56%) had more savings; almost the same proportion said their debts had not decreased.

	N	%		N	%
Household annual saving					
N/A	150	23.4			
<1,000 THB	269	41.8	Last 3 years saving incre	easing	
1,000 -10K THB	135	21.0	Strongly disagree	21	3.3
10K -100K THB	81	12.6	Disagree	139	21.6
>100K THB	8	1.2	Neutral	114	17.9
			Agree	276	42.8
Household Property			Strongly agree	92	14.3
N/A	114	17.7			
<1,000 THB	6	0.9	Last 3 years debt decrea	asing	
1,000 -10K THB	14	2.3	Strongly disagree	42	6.5
10K – 100K THB	145	22.5	Disagree	210	32.6
>100K THB	364	56.6	Neutral	107	16.8
			Agree	191	29.7
Household Debt			Strongly agree	93	14.4
N/A	68	10.6			
<1,000 THB	98	15.2			
1,000 -10K THB	21	3.3			
10K – 100K THB	290	45.1			
>100K THB	166	25.8			

Table 4.11: Financial characteristics

4.1.6.5 Self-rated oral health/ health variables

The participants' self perception of oral health, general health, living conditions and their perception of longevity is reported in Table 4.12. The majority of participants (43.29%) believed that their lifestyle would promote longevity. Participants were requested to place a mark on a twelve-step ladder diagram in order to indicate their level of social status (self-perceived social standing) compared to their neighbours. For questions of self-rated oral health, living conditions and self-perceived social standing rating, the majority of participants rated themselves in the middle categories. For selfrated health and longevity, most of them belonged to the highest category.

	Ν	%
Self-rated Oral Health		
Good	284	44.4
Fair	289	45.2
Poor	67	10.5
Self-rated Health		
Good	344	53.5
Fair	286	44.5
Poor	13	2.0
Living conditions		
Comfortably living	68	10.6
Coping	546	84.9
Difficult	29	4.5
Self-perceived social standing		
Mean 6.82 steps (9	5% CI 6.68	3-6.97)
R	ange 1-12	2 steps
Lifestyle promotes longevity		
Agree	472	43.3
Neutral	155	24.1
Disagree	17	2.6

Table 4.12: Self-rated health, oral health/perceived social status

4.1.7 Thai social capital of the participants

4.1.7.1 Thai Social capital score

The univariate statistics of each social capital score are cited in Table 4.13.

Tabl	e 4.13: U	nivariate stat	istics of Sur	vival, Sufficie	ency and Sustai	nability scores.
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	Survival	Sufficiency	Sustainability
N	651	651	651
N of items	7	6	7
Mean	26.58	22.40	26.62
Median	27.00	22.00	27.00
Mode	28.00	21.00	27.00
Std. deviation	3.62	2.47	3.20
Coeff. Of Var.	13.63	11.03	12.01
Skewness	-0.31	0.43	-0.44
Kurtosis	1.20	0.87	2.32
Minimum	8.00	14.00	12.00
Maximum	35.00	30.00	35.00

4.1.7.2 Survival score

The first aspect of Thai social capital measured for this research was Survival. It explored aspects of participants main occupation; small-scale farmer. Survival also investigated self-perceived social welfare. As cited in Table 4.14, the majority of participants selected agree in most of the Survival questions except: foods that I eat are not contaminated with chemicals, where most of them responded neutral.
	Strongly	Strongly Disagree	Neutral	Δgree	Strongly
Questions	disagree	Disabies		1.8.00	agree
		Ro	w percent		
I have sufficient land for agriculture.	5.8	16.9	11.8	50.0	15.5
Production from my farm, orchard provide a	20	12.0	127	E 2 2	10 0
sufficient financial return to support my family.	2.0	15.0	15.7	52.5	10.2
Since last year, I've had sufficient food to eat.	1.2	4.5	8.5	67.7	18.0
I always eat various kinds of food.	0.8	1.1	6.8	58.2	33.1
Foods that I eat are not contaminated with	0.5	ГО	40.1	40.2	11 0
chemicals.	0.5	5.9	42.1	40.2	11.5
I hardly use chemicals in my farming.	1.7	6.5	14.4	56.2	21.1
I have a reliable welfare when I'm getting older.	0.9	7.1	28.7	46.1	17.1

 Table 4.14: Percent distribution of answer in each Survival score question.

As described in the method chapter, two cut points were assigned to the ascending sum scores in order to categorize people into three Survival score groups. The distribution of this categorisation is shown in Table 4.15.

 Table 4.15: Survival score categorisation

	Score	Ν	%
Survival group			
Low	7-25	224	34.4
Medium	26-28	253	38.9
High	29-35	174	26.7

4.1.7.3 Sufficiency score

Sufficiency was considered as the lifestyle of mindful, moderate and sensible spending and consuming. It involved the practicing of five precepts (Buddhist morality practice) and the participation in religious ceremonies.

For Sufficiency score questions, as shown in Table 4.16, more than 80% of the participants selected agree or strongly agree except for the financial expense recording item. More than half of participants had never recorded their financial expenses.

Questions	Strongly	Disagree	Neutral	Agree	Strongly
Questions	disagree				agree
		Ro	w percent		
I always eat in moderation.	0.7	2.9	11.1	73.9	11.4
I always practice the five precepts.	0.2	2.8	21.7	56.9	18.4
I frequently attend religious ceremonies.	0.2	0.6	5.6	63.7	30.0
l am an aware person.	0.0	0.9	4.0	65.5	29.5
Most of my money is spent for the	1.2	2.0	9.3	65.8	21.6
I always record my financial expenses.	51.2	12.4	20.5	12.1	3.7

Table 4.16: Percent distribution of answer in each Sufficiency score question.

Table 4.17 showed the Sufficiency score group categorisation, as discussed in the method, two cut points were assigned to the ascending score. Three groups with the most equal number of participants were assigned.

Table 4.17: Sufficiency score categorisation

	Score	Ν	%
Sufficiency group			
Low	6-21	274	42.1
Medium	22-23	196	30.1
High	24-30	181	27.8

4.1.7.4 Sustainability

Sustainability explored the strength of the community in several perspectives such as functioning, environmental care and trust given to their community leaders.

Reported in Table 4.18, the majority chose agree for their answers to almost all Sustainability questions. However, for the question: I believe that, in the future, natural resources would not be used up, more than half of the participants answered neutral, disagree or strongly disagree. The question: My community is peaceful had the highest strongly agree proportion whereas one third of them (32%) strongly agreed that their community was peaceful.

Quartiana	Strongly	Disagree	Neutral	Agree	Strongly
Questions	disagree				agree
		R	ow percent		
My community has an excellent	1.9	7.3	10.4	61.8	18.6
Most of my community groups or	0.9	4.5	10.7	65.7	18.2
organisations are effective.					
I have secure natural resources.	0.5	5.3	28.1	56.9	9.2
I believe that, in the future, natural	2.2	20.5	34.0	36.0	6.3
I trust my community leaders.	0.5	1.8	9.9	74.5	13.3
I can rely on the young generation	0.6	6.8	28.6	54.8	9.2
My community is peaceful.	0.6	0.9	6.8	59.4	32.3

 Table 4.18: Percent distribution of answer in each Sustainability score question.

The group distribution of Sustainability score was shown in Table 4.19. Three groups, with the most equal number of participants as possible, were assigned using the ascending Sustainability score.

Table 4.19: Sustainability score categorisation

	Score	N	%
Sustainability group			
Low	7-25	195	30.3
Medium	26-27	209	32.4
High	28-35	240	37.3

The distribution of participants' Thai social capital score is illustrated using boxplots in Figure 4.1. Each of the scores was fairly symmetrically distributed around its median which was similar to the mean. The interquartile range was greatest for the survival score, and there were 11 or fewer extreme values.



Figure 4.1: Boxplot of participants' social capital score

4.1.7.5 Social groups and self-production score

Participants were asked for the number of active social or local groups in which they had memberships. Saving groups, lending groups, village administrative groups, health volunteer groups and others were referred to when this question was asked. On average, a participant belonged to four active groups. The univariate statistics are cited in Table 4.20.

Groups me	Groups membership		
N	641		
Mean	4.08		
Mode	2		
Standard Deviation	2.65		
Skewness	2.11		
Kurtosis	11.75		

Table 4.20: Univariate statistics number of group membership

For small-scale farmers, the ability to produce five critical items: rice, food, household items, herbs and fertiliser, reflects their self-sufficiency level¹³⁰. Most of the participants didn't buy rice for their consumption; more than 70% of them gained more than half of their food and herbs from their farm. Production of the household items such as cloth, fishing utilities and basketworks were the lowest compare to other four items. Most of the participants were doing semi-organic agriculture, less than 10% of them produced organic fertiliser while 15% use only chemicals for their farms (Table 4.21).

	Buy 100%	Buy 75% Produce 25%	Buy 50%	Buy 25% Produce 75%	Produce 100%
			Row Perce	nt	
Rice	3.6	1.7	5.6	7.8	81.3
Food	4.3	10.3	45.4	38.1	1.9
Household Items	25.9	12.2	41.5	18.5	1.9
Herbs	13.5	6.5	20.2	28.9	30.9
Fertilizer	15.7	8.5	35.8	33.3	6.7

Table 4.21: Self-production score items distribution

4.2 Part II: Prevalence of oral diseases, oral health-related quality of life and the determinants of oral health

4.2.1 Tooth Loss

All participants were examined for tooth loss, which was defined as the teeth missing due to dental decay and periodontal disease. Third molars were not included in this examination. Table 4.22 indicates that 60% of participants had partial tooth loss. Only four participants were edentulous.

Table 4.22: Distribution of tooth loss from all causes

	Ν	%
No tooth loss	261	39.9
1-27 tooth loss	388	59.5
Edentulous	4	0.6

Mandibular left first and second molars (tooth number 36 and 37) were two of the most common missing teeth (19.2% of all lower left molars were missing) due to dental decay or periodontal disease.

Only 12 participants (1.83%) lost their teeth from other causes such as congenital missing. For those 12 people, mandibular incisors were the most common missing teeth followed by maxillary lateral incisors.

The univariate values of tooth loss in dentate participants are shown in Table 4.23.

Table 4.23: Descriptive univariate statistics of Tooth Missing due to dental decay

Tooth loss				
N of participants	644	Coeff. Var.	172.14	
Mean	2.77	Skewness	2.93	
Median	1.00	Kurtosis	9.68	
Mode	0.00	Minimum	0	
Std. dev.	4.53	Maximum	27	

4.2.2 Dental decay

More than half (51%) of the participants had at least one decayed tooth. The second molars were the most common decayed tooth. The maxillary right second molar (tooth number 17) was the most common one (5.7%), followed by the maxillary left second molar (tooth number 27), mandibular left second molar (tooth number 37), and mandibular right second molar (tooth number 47) (4.0%, 3.2% and 2.8% respectively). The univariate value of dental decay is shown in Table 4.24.

Table 4.24: Descriptive univariate statistics of Coronal Dental Decay

Dental Decay				
N of participants	644	Coeff. Var.	166.08	
Mean	1.55	Skewness	2.93	
Median	1.00	Kurtosis	11.54	
Mode	0	Minimum	0	
Std. dev.	2.58	Maximum	20	

4.2.3 Root Decay

One fifth (20%) of the participants had one or more teeth with root decay. The four most common teeth with root decay were all maxillary molars (tooth number 17, 26, 16, 27) with the prevalence of root decay of 3.37%, 3.37%, 3.06%, and 2.91% of all participants, respectively. The univariate value of root decay is shown in Table 4.25.

	Root Dec	ау	
N of participants	644	Coeff. Var.	257.32
Mean	0.37	Skewness	4.60
Median	0	Kurtosis	32.99
Mode	0	Minimum	0
Std. dev.	0.94	Maximum	11

4.2.4 Tooth restoration

Six percent of participants had at least one filled tooth. Mandibular molars were the four most commonly filled teeth. The percentages of participants, who had their restored lower molars, were 2.2, 1.8, 1.2 and 1.1 percent on tooth number 46, 37, 47, 36 respectively. The univariate value of filled teeth for tooth decay treatment is shown in Table 4.26.

Table 4.26: Descriptive Univariate Statistics of Filled tooth

	Tooth res	toration	
N of items	28	Coeff. Var.	478.80
Mean	0.13	Skewness	7.71
Median	0	Kurtosis	8.54
Mode	0	Minimum	0
Std. dev.	0.60	Maximum	9

4.2.5 Severity of dental decay experience: DMFT

The average number of decayed, missing or filled teeth per person (DMFT) in research participants was calculated to indicate the severity of dental decay experience. This indicator did not include third molars. Almost three quarters of participants (73.97%) had dental decay experience (DMFT≥1). The univariate analysis of DMFT is reported in Table 4.27.

	DM	FT	
N of items	28	Coeff. Var.	134.67
Mean	4.45	Skewness	2.06
Median	2.00	Kurtosis	4.18
Mode	0	Minimum	0
Std. dev.	5.99	Maximum	28

Table 4.27: Descriptive univariate statistics of DMFT

The distribution of participants' caries experience could be illustrated in Figure 4.2.



Figure 4.2: Boxplot of participants' caries experience

The distributions of tooth decay experience by tooth position were illustrated in **Figure 4.3** and **Figure 4.4**.



Figure 4.3: Upper Tooth decay experience distribution by tooth number



Figure 4.4: Lower Tooth decay experience distribution by tooth number

4.2.6 Bivariate analysis of dental caries experience

In the crude analysis, all demographic variables showed an association with at least one of the five caries experience variables (Table 4.28). Participants who were widowed, older, male, small-scale farmers, with low school education, had more severe caries experience. However, after adjusting for the influence of age, the influences of marriage and occupation on caries experience disappeared (Table 4.29). Moreover, the number of fillings was the only outcome variable that showed a difference among demographic groups. After adjusting for age, females with higher school education and holding social welfare cards were more likely to have more tooth fillings compared to their counterparts.

	z	Decay	Missing	Filling	Root Caries	DMFT
		Mean (95%CI)				
Sex						
Male	265	1.52 (1.21-1.83)	2.86 (2.02-2.94)	0.05 (0.12-0.25)	0.30 (0.19-0.41)	4.43 (3.74-5.12)
Female	378	1.61 (1.35-1.87)	2.48 (2.31-3.41)	0.19 (*-0,12)	0.41 (0.32-0.51)	4.28 (3.70-4.86)
p-value		p value = 0.66	p value = 0.29	p value <0.01	p value = 0.12	p value = 0.74
Age						
35-49 y.o.	277	0.72 (0.44-1.01)	1.10(0.64-1.57)	0.23(0.19-0.31)	0.22 (0.12-0.33)	2.06 (1.49-2.63)
50-59 y.o.	205	1.63 (1.30-1.97)	2.29(1.74-2.83)	0.07(*-0.15)	0.46 (0.34-0.59)	3.99 (3.33-4.65)
60-69 y.o.	118	2.61 (2.17-3.05)	4.23(3.51-4.95)	0.03(*-0.13)	0.55 (0.38-0.72)	6.86 (5.99-7.74)
70+ y.o.	42	4.00 (3.27-4.73)	9.81(8.61-11.01)	0.00(*-0.18)	0.26(*-0.54)	13.81 (12.34-15.28)
p-value		p value <0.01	p value <0.01	p value<0.01	p value<0.01	p value <0.01
Marriage						
Single	17	1.18 (*-2.41)	0.88 (*-3.00)	0.00 (*-0.29)	0.12 (*-0.56)	2.06 (*-4.73)
Married	558	1.53 (1.31-1.74)	2.39 (2.02-2.76)	0.13 (0.08-0.18)	0.35 (0.28-0.43)	4.05 (3.58-4.51)
Other	68	2.01 (1.47-2.71)	5.07 (4.01-6.13)	0.16 (0.02-0.31)	0.53 (0.31-0.75)	7.32 (5.98-8.66)
p-value		p value = 0.19	p value <0.01	p value =0.61	p value =0.18	p value <0.01
Occupation						
Farmer	552	1.64 (1.42-1.86)	2,64 (2.26-3.02)	0.11 (0.06-0.16)	0.36 (0.29-0.44)	4.39 (3.91-4.86)
Business	17	0.35 (*-1.59)	1.00 (*-3.15)	0.29 (0.01-0.58)	0.18 (*-0.62)	1.65 (*-4.35)
Employee	22	0.77 (*-1.86)	1.86 (*-3.75)	0.18 (*-0.43)	0.45 (0.06-0.84)	2.82 (0.44-5.20)
Public officer	38	1.45 (0.62-2.27)	2.42 (0.99-3.86)	0.37 (0.18-0.56)	0.45 (0.15-0.74)	4.24 (2.43-6.05)
Retired	14	2.29 (0.93-3.64)	6.29 (3.92-8.65)	0.00 (*-0.32)	0.29 (*-0.77)	8.57 (5.59-11.55)
p-value		p value = 0.12	p value = 0.02	p value = 0.07	p value = 0.86	p value = 0.01
Education						
No school	10	1.60 (0.00-3.20)	4.70 (1.90-7.50)	0.10 (*-0.47)	0.40 (*-0.98)	6.40 (2.87-9.93)
-6 school years	540	1.72 (1.50-1.94)	2.80 (2.42-3.18)	0.09 (0.03-0.14)	0.39 (0.31-0.47)	4.60 (4.12-5.08)
6 school years	93	0.75 (0.23-1.28)	1,47 (0.56-2.39)	0.38 (0.25-0.50)	0.22 (0.03-0.40)	2.60 (1.44-3.76)
p-value		p value <0.01	p value = 0.01	p value <0.01	p value =0.24	p value <0.01
Health card						
UC card	571	1.62 (1.14-1.83)	2.68 (2.31-3.06)	0.10 (0.05-0.15)	0.38 (0.30-0.45)	4,40 (3.93-4.87)
Social welfare	10	0.80 (*-2.38)	0.60 (*-3.42)	0.60 (0.23-0.97)	0.00 (*-0.58)	2.00 (*-5.54)
Other	58	1.03 (0.37-1.69)	2.34 (1.17-3.51)	0.34 (0.18-0.49)	0.29 (0.05-0.53)	3.72 (2.25-5.19)
n-value		p value =0.16	p value =0.32	p value <0.01	p value =0.37	p value =0.30

Table 4.28: Crude bivariate ANOVA analysis of participants' caries experience and theirdemographic characteristics

	:				Dant Casino	NAAET
	N	Decay	Buissilai	Sumu	NOOL CALLES	DINIT
		Mean (95%CI)				
Sex						
Male	265	1.44 (1.15-1.73)	2.68 (2.19-3.16)	0.05 (0.12-0.24)	0.41 (0.32-0.51)	4.44 (3.94-4.94)
Female	378	1.67 (1.42-1.91)	2.59 (2.18-3.00)	0.18 (*-0.13)	0.29 (0.18-0.40)	4.17 (3.57-4.76)
Test of significant		p value =0.24	p value =0.79	p value<0.01	p value =0.09	p value =0,49
Marriage						
Single	17	1.60 (0.44-2.76)	1.76 (*-3.68)	0.00 (*-0.24)	0.15 (*-0.59)	3.32 (0.97-5.67)
Married	558	1.60 (1.40-1.80)	2.54 (2.20-2.88)	0.12 (0.07-0.17)	0.36 (0.28-0.43)	4.26 (3.85-4.67)
Other	68	1.35 (0.75-1.94)	3.52 (2.53-4.51)	0.25 (0.09-0.39)	0.47 (0.24-0.69)	5.12 (3.90-6.32)
Test of significant		p value=0.73	p value=0.13	p value=0.14	p value=0.42	p value=0.30
Occupation						
Farmer	552	1.62 (1.41-1.82)	2.59 (2.25-2.93)	0.11 (0.06-0.16)	0.36 (0.28-0.44)	4.31 (3.90-4.73)
Business	17	0.70 (*-1.86)	1.77 (*-3.69)	0.26 (*-0.55)	0.21 (*-0.65)	2.74 (0.39-5.08)
Employee	22	1.23 (0.21-2.25)	2.87 (1.18-4.57)	0.14 (*-0.39)	0.50 (0.11-0.89)	4.24 (2.17-6.31)
Public officer	38	1.70 (0.93-2.48)	2.98 (1.69-4.27)	0.34 (0.15-0.53)	0.47 (0.18-0.77)	5.03 (3.45-6.60)
Retired	14	1.16 (*-2.45)	3.81 (1.66-5.96)	0.11 (*-0.43)	0.17 (*-0.66)	5.08 (2.46-7.71)
Test of significant		p value =0.51	p value =0.67	p value =0.18	p value =0.73	p value =0,58
Education						
No school	10	1.37 (*-2.87)	4.18 (1.68-6.68)	0.12 (*-0.49)	0.38 (*-0.95)	5.68 (2.62-8.73)
4-6 school years	540	1.65 (1.45-1.86)	2.65 (2.31-2.99)	0.09 (0.04-0.14)	0.38 (0.30-0.46)	4.39 (3.98-4.81)
>6 school years	93	1.13 (0.63-1.63)	2.34 (1.51-3.17)	0.34 (0.22-0.46)	0.25 (0.06-0.44)	3.81 (2.80-4.83)
Test of significant		p value =0.16	p value =0.37	p value<0.01	p value =0.45	p value =0.40
Health card						
UC card	571	1.60 (1.41-1.80)	2.64 (2.31-2.97)	0.10 (0.05-0.15)	0.37 (0.30-0.45)	4.40 (3.94-4.75)
Social welfare	10	0.80 (*-2.38)	0.60 (*-3.41)	0.60 (0.22-0.97)	0.00 (*-0.57)	2.00 (*-5.53)
Others	58	1.03 (0.37-1.69)	2.34 (1.17-3.51)	0.34 (0.18-0.49)	0.29 (0.05-0.53)	3.72 (2.25-5.19)
That of similians			- unline _ 0.24			No V

Table 4.29: Age adjusted, ANOVA bivariate ANOVA analysis of participants' cariesexperience and their demographic characteristics

As reported in Table 4.30 and Table 4.31, Thai social capital (Survival, Sufficiency and Sustainability scores) as well as the numbers of group membership, Self production score and years of Inpaeng membership, were analyzed for the association with participants' caries experience. A non-linear relationship could be observed between decayed teeth, missing teeth, root caries and Survival score, and between DMFT and Sustainability score. Findings from , after adjusting for age, showed that people who belonged to four or more social groups were more likely to have less decayed teeth, less missing teeth and lower DMFT compared to those who belonged to fewer social groups. People in the highest Survival score tertile had the lowest number of decayed teeth compared to those in the lowest tertile. On the contrary, people with the highest self-production score had the highest number of decayed teeth. An inverted U relationship between Survival score and root caries as well as between self production score and missing teeth were observed. Participants who scored in the middle tertile group were more likely to have the worst oral health conditions followed by the lowest and the highest tertile groups.

	z	Decay	Missing	Filling	Root Caries	DMFT
		Mean (95%CI)				
Group membership						
0-3 gr	311	1.72 (1.43-2.01)	2.88 (2.37-3.38)	0.17 (0.10-0.23)	0.31 (0.20-0.41)	4,77 (4.13-5.41)
4+ gr	330	1,45 (1,16-1.73)	2.42 (1.93-2.91)	0.09 (0.03-0.16)	0.42 (0.32-0.52)	3.96 (3.34-4.58)
Test of significant		p value=0.18	p value=0.21	p value=0.11	p value=0.11	p value=0.07
Survival						
low	221	1.86 (1.52-2.20)	2.07 (1.48-2.67)	0.17 (0.09-0.25)	0.33 (0.20-0.45)	4.10 (3.34-4.86)
med	251	1,58 (1.26-1.90)	3.10 (2.54-3.66)	0.09 (0.02-0.17)	0.47 (0.36-0.59)	4.77 (4.06-5.48)
high	172	1.20 (0.82-1.59)	2.67 (2.00-3.35)	0.13 (0.04-0.22)	0.26 (0.12-0.39)	4.01 (3.15-4.86)
Test of significant		p value=0.04	p value=0.05	p value=0.39	p value=0.04	p value=0.30
Sufficiency						
low	270	1,44 (1.13-1.75)	2.70 (2.16-3.25)	0.13 (0.06-0.20)	0.31 (0.20-0.43)	4.27 (3.59-4.96
med	195	1.52 (1.15-1.88)	2.90 (2.26-3.53)	0.14 (0.06-0.23)	0.37 (0.24-0.50)	4,56 (3,75-5.36)
high	179	1.84 (1.46-2.22)	2.23 (1.57-2.90)	0.11 (0.02-0.20)	0.44 (0.30-0.57)	4.18 (3.34-5.03)
Test of significant		p value=0.25	p value=0.35	p value=0.83	p value=0.40	p value=0.79
Sustainability						
low	195	1.50 (1.14-1.87)	2.48 (1.84-3.11)	0.14 (0.06-0.23)	0.36 (0.23-0.49)	4.12 (3.32-4.92
med	209	1.79 (1.44-2.14)	3.24 (2.63-3.86)	0.11 (0.03-0.20)	0.41 (0.29-0.54)	5.15 (4.37-5.92
high	240	1.45 (1.12-1.78)	2.23 (1.65-2.80)	0.13 (0.05-0.20)	0.33 (0.21-0.44)	3.80 (3.08-4.52
Test of significant		p value=0.34	p value=0.05	p value=0.89	p value=0.62	p value=0.04
Self-production						
low	177	1,12 (0.74-1.50)	2,49 (1.82-3.16)	0.16 (0.07-0.25)	0.32 (0.18-0.46)	3.77 (2.92-4.61
med	248	1.53 (1.21-1.85)	2.78 (2.22-3.35)	0.17 (0.09-0.24)	0.40 (0.28-0.51)	4.48 (3.76-5.19
high	218	2.01 (1.67-2.35)	2.59 (1.99-3.20)	0.06 (*-0.14)	0.37 (0.24-0.49)	4.66 (3.89-5.42
Test of significant		p value<0.01	p value=0.79	p value=0.09	p value=0.73	p value=0.28
Years of Inpaeng						
membership						
0	368	1.85 (1.58-2.11)	2.92 (2.46-3.39)	0.09 (0.03-0.15)	0.38 (0.28-0.47)	4,86 (4.28-5.44
1-3 years	143	0.99 (0.56-1.41)	2.21 (1,47-2.95)	0.22 (0.12-0.32)	0.41 (0.25-0.56)	3.42 (2.48-4.36
4-8 years	73	1.38 (0.79-1.98)	2.63 (1.59-3.67)	0.19 (0.05-0.33)	0.30 (0:09-0.52)	4.21 (2.90-5.52
8+ years	60	1.55 (0.90-2.20)	1.85 (0.70-3.00)	0.07 (*-0.22)	0.27 (0.03-0.50)	3.47 (2.02-4.91
Text of cignificant						

Table 4.30: Crude bivariate ANOVA analysis of participants' caries experience and theirsocial capital

	z	Decay	Missing	Filling	Root Caries	DMFT
Contra		Mean (95%CI)				
0.2 or	244	1 70 /1 E1 3 NEL	2 NO 13 EE 2 AN	126 U 0U VI 24 V	IN A AC AL FC A	100 10 20.5 10
	222					140 V JU UI UL U
Tast of similiant	000	fear-orth cort	100,72,0011 ACT	101.0.50.01 01.0	120.0-20.01 24.0	a unitaria na
lest of significant		p value=0.04	p value=0.03	p value=0.17	p value=0.12	p value<0.01
Survival						
low	221	2.02 (1.70-2.34)	2.40 (1.86-2.94)	0.15 (0.07-0.23)	0.33 (0.21-0.46)	4,58 (3.92-5.23)
med	251	1.52 (1.22-1.81)	2.96 (2.46-3.46)	0.10 (0.02-0.17)	0.47 (0.35-0.58)	4.57 (3.96-5.18)
high	172	1.09 (0.73-1.45)	2.43 (1.82-3.03)	0.14 (0.05-0.23)	0.25 (0.11-0.38)	3.65 (2.92-4.39)
Test of significant		p value<0.01	p value=0.25	p value=0.59	p value=0.04	p value=0.11
Sufficiency						
low	270	1.57 (1.28-1.87)	3.00 (2.51-3.48)	0.12 (0.04-0.19)	0.32 (0.21-0.43)	4.69 (4.10-5.28)
med	195	1.36 (1.01-1.70)	2.54 (1.97-3.10)	0.16 (0.08-0.25)	0.35 (0.22-0.49)	4.05 (3.36-4.75)
high	179	1.81 (1.46-2.17)	2.17 (1.58-2.76)	0.11 (0.02-0.20)	0.43 (0.30-0.57)	4.09 (3.37-4.81)
Test of significant		p value=0.19	p value=0.09	p value=0,66	p value=0.46	p value=0.29
Sustainability						
low	195	1.63 (1.29-1.98)	2.76 (2.19-3.33)	0.13 (0.05-0.22)	0.38 (0.25-0.51)	4.53 (3.83-5.22)
med	209	1.67 (1.33-2.00)	2.96 (2.42-3.51)	0.13 (0.05-0.21)	0.39 (0.27-0.52)	4.76 (4.09-5.43)
high	240	1.45 (1.14-1.76)	2.22 (1.72-2.73)	0.13 (0.05-0.20)	0.32 (0.21-0.44)	3.80 (3.18-4.42)
Test of significant		p value=0.59	p value=0.13	p value=0.99	p value=0.71	p value=0.09
Self-production						
low	177	1.21 (0.85-1.56)	2.70 (2.10-3.29)	0.16 (0.07-0.24)	0.33 (0.19-0.47)	4.06 (3.33-4.78)
med	248	1.64 (1.33-1.94)	3.04 (2.53-3.54)	0.15 (0.08-0.23)	0.40 (0.28-0.52)	4.83 (4.21-5.44)
high	218	1.80 (1.48-2.13)	2.11 (1.57-2.65)	0.08 (*-0.16)	0.35 (0.22-0.47)	3.99 (3.33-4.46)
Test of significant		p value=0.04	p value=0.04	p value=0.29	p value=0.71	p value=0.13
Years of Inpaeng						
0	368	1.79 (1.54-2.03)	2.77 (2.36-3.19)	0.09 (0.03-0.15)	0.37 (0.27-0.46)	4.65 (4.15-5.16)
1-3 years	143	1.14 (0.74-1.54)	2.56 (1.90-3.22)	0.21 (0.11-0.31)	0.42 (0.27-0.57)	3.91 (3.10-4.71)
4-8 years	73	1.51 (0.96-2.07)	2.92 (2.00-3.85)	0.18 (0.04-0.32)	0.31 (0.10-0.53)	4.62 (3.49-5.74)
8+ years	60	1.41 (0.79-2.02)	1.52 (0.50-2.54)	0.08 (*-0.23)	0.25 (0.02-0.49)	3.01 (1.76-4.25)
		A value-0 05	A unline 0.1A	AL VERTICAL	a ushia=0.65	r value n n7

Table 4.31: Age adjusted bivariate ANOVA analysis of participants' caries experience andtheir social capital

The relationship between participants' caries experience and their financial status is shown in Table 4.32 and Table 4.33. Net assets showed no association with caries experience in both crude and age adjusted analysis. Amount of annual saving and the increment of saving in the last three years were two significant explanatory variables for caries experience. People who had more annual savings were more likely to have less tooth decay and DMFT. Participants whose savings had increased compared to three years ago tended to have less tooth decay, less missing teeth and less DMFT compared to those who had less savings. The relationship between saving increment and tooth decay, missing teeth and DMFT still persisted even after adjusting for the influence of age.

A relationship between the amount of debt and number of filled teeth was found. In crude analysis, people with the lowest debt level tended to have the highest missing teeth and DMFT. However, after adjusting for age, these relationships became statistically non-significant. Other relationship became statistically significant after adjusting for age: people with the highest debt were more likely to have filled teeth compared to the lower debt groups.

	z	Decav	Missing	Filling	Root Carles	DMFT
		Mean (95%CI)				
Annual Saving						
No/Low	269	1.87 (1.56-2.18)	3.07 (2.53-3.61)	0.11 (0.04-0.18)	0.35 (0.24-0.46)	5.04 (4.36-5.73)
Mod. Saving	135	1.48 (1.05-1.92)	2.45 (1.69-3.22)	0.22 (0.12-0.32)	0,40 (0.24-0.56)	4.16 (3.19-5.12)
High Saving	68	0.88 (0.34-1.41)	1.60 (0.66-2.54)	0.16 (0.03-0.28)	0.37 (0.18-0.56)	2.63 (1.45-3.81)
N/A	150	1.56 (1.15-1.97)	2.65 (1.92-3.37)	0.06 (*-0.16)	0.35 (0.20-0.50)	4.27 (3.36-5.18)
Test of significant		p value=0.02	p value=0.06	p value=0.13	p value=0.97	p value<0.01
Net Assets						
Low	20	0.80 (*-1.94)	1.30 (*-3.29)	0.15 (*-0.42)	0.15 (*-0.56)	2.25 (*-4.76)
Mod.	145	1.48 (1.05-1.90)	2.17 (1.43-2.91)	0.10 (0.00-0.20)	0.31 (0.16-0.46)	3.75 (2.82-4.68)
High	364	1.66 (1.40-1.93)	2.88 (2.41-3.34)	0.12 (0.05-0.18)	0.40 (0.31-0.50)	4.66 (4.07-5.24)
N/A	114	1.57 (1.09-2.05)	2.69 (1.86-3.53)	0.19 (0.08-0.30)	0.35 (0.18-0.52)	4.46 (3.41-5.51)
Test of significant		p value=0.49	p value=0.23	p value=0.63	p value=0.53	p value=0.15
Debt						
Low	119	1.85 (1.38-2.32)	4.19 (3.39-5.00)	0.03 (*-0.13)	0.34 (0.17-0.50)	6.07 (5.05-7.09)
Mod.	290	1.59 (1.29-1.89)	2.16 (1.65-2.68)	0.10 (0.03-0.17)	0.39 (0.28-0.50)	3,85 (3.20-4.51)
High	166	1.42 (1.03-1.82)	2.28 (1.60-2.97)	0.18 (0.09-0.27)	0.39 (0.25-0.53)	3.89 (3.02-4.75)
N/A	68	1.43 (0.81-2.04)	2.79 (1.73-3.86)	0,31 (0,17-0,45)	0.25 (0.03-0.47)	4.53 (3.18-5.88)
Test of significant		p value=0.54	p value<0.01	p value<0.01	p value=0.68	p value<0.01
Saving Incre.						
No/Low incre.	160	2.23 (1.83-2.63)	3.73 (3.04-4.43)	0.09 (0.00-0.19)	0.39 (0.25-0.54)	6.06 (5.18-6.93)
Mod. Incre.	116	1.52 (1.05-1.99)	2.91 (2.09-3.72)	0.12 (0.01-0.23)	0.37 (0.20-0.54)	4.54 (3.52-5.57)
High Incre.	368	1.31 (1.05-1.57)	2.07 (1.61-2.53)	0.14 (0.08-0.21)	0.35 (0.26-0.45)	3.52 (2.95-4.10)
Test of significant		p value<0.01	p value<0.01	p value=0.68	p value=0.88	p value<0.01
Debt Decre.						
No/Low Decre.	252	1.61 (1.29-1.93)	2.34 (1.78-2.90)	0.15 (0.07-0.22)	0.42 (0.31-0.54)	4.10 (3.39-4.80)
Mod. Decre.	108	1.04 (0.55-1.53)	1.67 (0.82-2.52)	0.17 (0.05-0.28)	0.32 (0.15-0.50)	2.87 (1.80-3.94)
High Decre.	284	1.75 (1.45-2.05)	3.26 (2.73-3.78)	0.10 (0.02-0.17)	0.33 (0.22-0.44)	5.11 (4.44-5.77)
Test of significant		p value=0.04	p value<0.01	p value=0,47	p value=0.43	p value<0.01

Table 4.32: Crude bivariate ANOVA analysis of participants' caries experience and their

financial characteristics

	z	Decay	Missing	Filling	Root Caries	DMFT
		Mean (95%CI)				
Annual Saving						
No/Low	269	1.87 (1.56-2.18)	3.07 (2.53-3.61)	0.11 (0.04-0.18)	0.35 (0.24-0.46)	5.04 (4.36-5.73)
Mod. Saving	135	1.48 (1.05-1.92)	2.45 (1.69-3.22)	0.22 (0.12-0.32)	0,40 (0.24-0.56)	4.16 (3.19-5.12)
High Saving	89	0.88 (0.34-1.41)	1.60 (0.66-2.54)	0.16 (0.03-0.28)	0.37 (0.18-0.56)	2.63 (1.45-3.81)
N/A	150	1.56 (1.15-1.97)	2.65 (1.92-3.37)	0.06 (*-0.16)	0.35 (0.20-0.50)	4.27 (3.36-5.18)
Test of significant		p value=0.02	p value=0.06	p value=0.13	p value=0.97	p value<0.01
Net Assets						
Low	20	0.80 (*-1.94)	1.30 (*-3.29)	0.15 (*-0.42)	0,15 (*-0.56)	2.25 (*-4.76)
Mod.	145	1.48 (1.05-1.90)	2.17 (1.43-2.91)	0.10 (0.00-0.20)	0.31 (0.16-0.46)	3.75 (2.82-4.68)
High	364	1.66 (1.40-1.93)	2,88 (2,41-3.34)	0.12 (0.05-0.18)	0.40 (0.31-0.50)	4.66 (4.07-5.24)
N/A	114	1.57 (1.09-2.05)	2.69 (1.86-3.53)	0.19 (0.08-0.30)	0.35 (0.18-0.52)	4.46 (3.41-5.51)
Test of significant		p value=0.49	p value=0.23	p value=0.63	p value=0.53	p value=0.15
Debt						
Low	119	1.85 (1.38-2.32)	4.19 (3.39-5.00)	0.03 (*-0.13)	0.34 (0.17-0.50)	6.07 (5.05-7.09)
Mod.	290	1.59 (1.29-1.89)	2.16 (1.65-2.68)	0.10 (0.03-0.17)	0.39 (0.28-0.50)	3.85 (3.20-4.51)
High	166	1.42 (1.03-1.82)	2.28 (1.60-2.97)	0.18 (0.09-0.27)	0.39 (0.25-0.53)	3.89 (3.02-4.75)
N/A	68	1.43 (0.81-2.04)	2.79 (1.73-3.86)	0,31 (0,17-0.45)	0.25 (0.03-0.47)	4.53 (3.18-5.88)
Test of significant		p value=0.54	p value<0.01	p value<0.01	p value≈0.68	p value<0.01
Saving Incre.						
No/Low incre.	160	2.23 (1.83-2.63)	3.73 (3.04-4.43)	0.09 (0.00-0.19)	0.39 (0.25-0.54)	6.06 (5.18-6.93)
Mod. Incre.	116	1.52 (1.05-1.99)	2.91 (2.09-3.72)	0.12 (0.01-0.23)	0.37 (0.20-0.54)	4.54 (3.52-5.57)
High Incre.	368	1.31 (1.05-1.57)	2.07 (1.61-2.53)	0.14 (0.08-0.21)	0.35 (0.26-0.45)	3.52 (2.95-4.10)
Test of significant		p value<0.01	p value<0.01	p value=0.68	p value=0.88	p value<0.01
Debt Decre.						
No/Low Decre.	252	1.61 (1.29-1.93)	2.34 (1.78-2.90)	0.15 (0.07-0.22)	0.42 (0.31-0.54)	4.10 (3.39-4.80)
Mod. Decre.	108	1.04 (0.55-1.53)	1.67 (0.82-2.52)	0.17 (0.05-0.28)	0.32 (0.15-0.50)	2.87 (1.80-3.94)
High Decre.	284	1.75 (1.45-2.05)	3.26 (2.73-3.78)	0.10 (0.02-0.17)	0.33 (0.22-0.44)	5.11 (4.44-5.77)
Test of significant		p value=0.04	p value<0.01	p value=0,47	p value=0.43	p value<0.01

Table 4.33: Age adjusted bivariate ANOVA analysis of participants' caries experience and their financial characteristics

Period since the last dental visit was the strongest explanatory variable among five oral health behaviours (Table 4.34). People who had never visited a dentist or who could not recall the period since their last visit had lower mean DMFT than people who had seen a dentist. This relationship persisted even after adjusted for age (Table 4.35). After adjusting for age, participants who had their last dental visit because of pain were more likely to have more decayed teeth and a higher mean DMFT compared to those who had other reasons for a dental visit.

Distance from the village to the nearest dental service and the use of fluoridated toothpaste had no influence on the participants' caries experience.

After age adjusting, people who brushed their teeth more than once a day, had fewer missing teeth than people who brushed less frequently, but they also had more root caries, compared to those who brushed less than once a day.

	z	Decay	Missing	Filling	Root Carles	DMFT
		Mean (95%Ci)	Mean (95%CI)	Mean (95%CI)	Mean (95%CI)	Mean (95%CI)
Last Dent Visit					17 2 2 10 10 0 0 0 0 0 0 0 0 0 0	
Never/can't recall	284	1.51 (1.21-1.80)	2.13 (1.60-2.65)	0.02 (*-0.09)	0.32 (0.21-0.43)	3.65 (2.99-4.31
Five+ years	117	1.98 (1.52-2,45)	2.82 (2.00-3.64)	0.13 (0.02-0.24)	0.52 (0.35-0.69)	4,93 (3,90-5,96
Less than 5 years	239	1.41 (1.08-1.73)	3.11 (2.53-3.68)	0.26 (0.18-0.34)	0.34 (0.22-0.46)	4.77 (4.05-5.49
Test of significant		p value=0.12	p value=0.04	p value<0.01	p value=0.12	p value=0.03
Reasons for Dent Visit						
Pain	279	1.88 (1.59-2.17)	3.46 (2.96395)	0.15 (0.06-0.24)	0.15 (0.06-0.24)	5.49 (4.87-6.11)
Check up	33	0.45 (*-1.30)	1.12 (*-2.56)	0.09 (*-0.35)	0.09 (*-0.35)	1.66 (*-3.47)
Other	54	0.67 (0.00-1.33)	1.89 (0.77-3.01)	0.56 (0.35-0.76)	0.56 (0.35-0.76)	3.11 (1.68-4.52)
Test of significant		p value<0.01	p value<0.01	p value<0.01	p value=0.24	p value<0.01
istance to nearest OH						
service						
≤10 kms	368	1.51 (1.24-1.78)	2.37 (1.91-2.83)	0.15 (0.09-0.21)	0.30 (0.21-0.40)	4.03 (3.45-4.62)
11-20 kms	195	1.76 (1.40-2.13)	3.26 (2.62-3.89)	0.08 (0.00-0.17)	0.49 (0.36-0.52)	5.10 (4,30-5.91)
>20 kms	79	1.42 (0.84-1.99)	2.34 (1.34-3.34)	0.13 (*-0.26)	0.34 (0.14-0.55)	3.89 (2.62-5.15)
Test of significant		p value=0,46	p value=0.07	p value=0.43	p value=0.08	p value=0.08
Brushing Freq						
<once a="" day<="" td=""><td>262</td><td>1.75 (1.44-2.06)</td><td>3.50 (2.96-4.04)</td><td>0.06 (*-0.14)</td><td>0.29 (0.18-0.41)</td><td>5.31 (4.63-5.99)</td></once>	262	1.75 (1.44-2.06)	3.50 (2.96-4.04)	0.06 (*-0.14)	0.29 (0.18-0.41)	5.31 (4.63-5.99)
≥once a day	373	1.42 (1.16-1.68)	1.97 (1.52-2.41)	0.17 (0.11-0.24)	0.42 (0.32-0.51)	3.55 (2.99-4.12)
Test of significant		p value=0.11	p value<0.01	p value=0.03	p value=0.11	p value<0.01
Toothpaste						
Fluoridated	449	1.47 (1.23-1.70)	2.55 (2.14-2.96)	0.10 (0.05-0.16)	0.33 (0.25-0.42)	4.12 (3.60-4.64)
Others	189	1.77 (1.41-2.14)	2.69 (2.05-3.33)	0.19 (0.10-0.28)	0.44 (0.31-0.57)	4.66 (3.85-5.46)
Test of significant		p value=0.17	p value=0.71	p value=0.09	p value=0.18	n value=0.27

Table 4.34: Crude bivariate ANOVA analysis of participants' caries experience and oral healthbehaviour/oral health service utilisation

	z	Decay	Missing	Filling	Root Caries	DMFT
		Mean (95%CI)				
Last Dent Visit				5		
Never/can't recall	284	1.42 (1.14-1.69)	1,91 (1,45-2.38)	0.03 (*-0.10)	0.31 (0.20-0.42)	3.35 (2.79-3.92)
Five+ years	117	1.99 (1.56-2.43)	2.83 (2.10-3.55)	0.13 (0.02-0.24)	0.51 (0.34-0.68)	4.94 (4.06-5.83)
Less than 5 years	239	1.50 (1.20-1.81)	3.34 (2.83-3.84)	0.25 (0.17-0.33)	0.35 (0.23-0.47)	5.09 (4.47-5.71)
Test of significant		p value=0.08	p value<0.01	p value<0.01	p value=0.13	p value<0.01
Reasons for Dent Visit						
Pain	279	1.78 (1.50-2.06)	3.19 (2.75-3.63)	0.17 (0.08-0.26)	0.41 (0.30-0.52)	5.14 (4.59-5.69)
Check up	33	0.82 (*-1.64)	2.12 (0.84-3.40)	0.02 (*-0.29)	0.20 (*-0.53)	2,96 (1.36-4.56)
Other	54	0.91 (0.27-1.55)	2.55 (1.55-3.55)	0.51 (0.31-0.71)	0.33 (0.07-0.59)	3.97 (2.72-5.22)
Test of significant		p value=0.01	p value=0.20	p value<0.01	p value=0.46	p value=0.02
Distance to nearest						
OH service						
≤10 kms	368	1.58 (1.33-1.83)	2.52 (2.10-2.93)	0.15 (0.08-0.21)	0.30 (0.21-0.40)	4.24 (3.74-4.75)
11-20 kms	195	1.65 (1.31-1.99)	3.00 (2.43-3.57)	0.09 (0.01-0.18)	0.48 (0.35-0.61)	4.74 (4.05-5.44)
>20 kms	79	1.37 (0.83-1.91)	2.24 (1.35-3.13)	0.13 (0.00-0.26)	0.34 (0.13-0.54)	3.74 (2.65-4.83)
Test of significant		p value=0.69	p value=0.26	p value=0.62	p value=0.11	p value=0.27
Brushing Freq						
<once a="" day<="" td=""><td>262</td><td>1.53 (1.24-1.82)</td><td>3,04 (2.55-3.52)</td><td>0.09 (0.01-0.16)</td><td>0.27 (0.16-0.38)</td><td>4.65 (4.05-5.25)</td></once>	262	1.53 (1.24-1.82)	3,04 (2.55-3.52)	0.09 (0.01-0.16)	0.27 (0.16-0.38)	4.65 (4.05-5.25)
≥once a day	373	1.56 (1.32-1.81)	2.27 (1.87-2.68)	0.16 (0.10-0.22)	0.43 (0.33-0.52)	4.00 (3.50-4.50)
Test of significant		p value=0.86	p value=0.02	p value=0.14	p value=0.04	p value=0.10
Toothpaste						
Fluoridated	449	1.45 (1.22-1.67)	2.50 (2.13-2.87)	0.10 (0.05-0.16)	0.33 (0.24-0.41)	4.05 (3.60-4.51)
Others	189	1.81 (1.47-2.15)	2.77 (2.20-3.34)	0.19 (0.10-0.27)	0.44 (0.31-0.57)	4.76 (4.07-5.46)
Test of significant		p value=0.08	p value=0.44	p value=0.11	n value=0.15	PO Deauley n

Table 4.35: Age adjusted bivariate ANOVA analysis of participants' caries experience andoral health behaviour/oral health service utilisation

The Body Mass Index (BMI) showed a strong relationship (p value <0.01) with participants' caries experience. Participants with lower BMI had more decayed teeth, missing teeth and DMFT. This relationship was the same after adjusting for age. Statistical analysis showed that participants who smoked had the same severity of decayed and missing teeth but fewer filled teeth compared to those who did not. People who were not suffering from diabetes or cardiovascular disease were more likely to have more missing teeth and DMFT after adjusting for age.

BMI	z	Decay Mean (95%CI)	Missing Mean (95%CI)	Filling Mean (95%CI)	S R
Under wt.	52	2.90 (2.21-3.60)	5.85 (4.46-7.05)	0.02	(*-0.18)
Normal	420	1.61 (1.37-1.86)	2.68 (2.26-3.10)	0.1	3 (0.08-0.19)
Over wt.	144	1.10 (0.68-1.52)	1.51 (0.78-2.23)	0.1	17 (0.07-0.27)
Obesity	27	1.04 (0.07-2.00)	1.81 (0.15-3.48)	0	04 (*-0.27)
Test of significant		p value<0.01	p value<0.01	p۷	alue=0.41
Mental health					
poor	142	1.95 (1.52-2.38)	3.15 (2.40-3.89)).11 (0.01-0.21)
mod.	359	1.55 (1.28-1.82)	2.59 (2.12-3.06)		0.12 (0.06-0.18)
good	142	1.28 (0.86-1.71)	2.23 (1.49-2.98)		0.17 (0.07-0.27)
Test of significant		p value=0.09	p value=0.23	-	value=0.64
Smoking					
No	418	1.62 (1.38-1.87)	2,43 (2.00-2.87)	0).18 (0.13-0.24)
Yes	224	1.48 (1.14-1.82)	3.00 (2.40-3.59)	0	.02 (*-0.10)
Test of significant		p value=0.51	p value=0.13	p۷	alue=0.01
Class Smoker					
no	421	1.62 (1.38-1.87)	2.43 (2.00-2.86)	0.	18 (0.13-0.24)
light	50	1.04 (0.32-1.76)	1.82 (0.57-3.07)	0.1	04 (*-0.21)
mod	107	1.52 (1.03-2.02)	3.21 (2.36-4.07)	0.	03 (*-0.14)
heavy	66	1.76 (1.13-2.38)	3.58 (2.48-4.67)	0	00 (*-0.15)
Test of significant		p value=0.45	p value=0.07	pv	ralue=0.02
Systemic disease					
No DM/CV^	450	1,64 (1.40-1.88)	2.88 (2.46-3.29)	-	0.15 (0.09-0.20)
DM	20	1.50 (0.36-2.64)	2.90 (0.91-4.86)		0.00 (*-0.27)
\$	173	1,42 (1.03-1.81)	1.98 (1.31-2.66)	0).09 (*-0.18)
fest of significant		p value=0.63	p value=0.09	p	/alue=0.33

Table 4.36: Crude bivariate ANOVA analysis of participants' caries experience and generalhealth

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	z	Decay	Missing	Filling	Root Carles	DMFT
		Mean (95%CI)				
BMI						
Under wt.	52	2.39 (1.73-3.06)	4.72 (3.62-5.82)	0.07 (*-0.24)	0.49 (0.24-0.75)	7.19 (5.85-8.52)
Normal	420	1.59 (1.36-1.82)	2.63 (2.25-3.01)	0.14 (0.08-0.19)	0.38 (0.29-0.47)	4.36 (3.89-4.82)
Over wt.	144	1.31 (0.91-1.71)	1.98 (1.32-2.63)	0.14 (0.05-0.24)	0.30 (0.14-0.45)	3.43 (2.64-4.23)
Obesity	27	1,12 (0.19-2.05)	1.98 (0.45-3.52)	0.02 (*-0.25)	0.17 (*-0.53)	3.12 (1.26-4.99)
Test of significant		p value=0.04	p value<0.01	p value=0.67	p value=0.39	p value<0.01
Mental health						
poor	142	1.88 (1.48-2.28)	2.97 (2.30-3.64)	0,11 (0.01-0.21)	0.38 (0.22-0.53)	4.96 (4.15-5.77)
mod.	359	1.55 (1.30-1.80)	2.60 (2.18-3.01)	0.12 (0.06-0.18)	0.37 (0.27-0.46)	4.27 (3.76-4.77)
good	142	1.34 (0.94-1.74)	2.36 (1.70-3.03)	0.16 (0.06-0.26)	0.34 (0.19-0.50)	3.86 (3.05-4.67)
Test of significant		p value=0.17	p value=0.44	p value=0,72	p value=0.95	p value=0.16
Smoking						
No	418	1.70 (1.46-1.93)	2.58 (2.20-2.97)	0.18 (0.12-0.24)	0.41 (0.32-0.50)	1.70 (1.46-1.93)
Yes	224	1.34 (1.02-1.66)	2.69 (2.15-3.22)	0.04 (*-0.11)	0.27 (0.15-0.39)	1.34 (1.02-1.66)
Test of significant		p value=0.08	p value=0.76	p value<0.01	p value=0.06	p value=0.34
Class Smoker						
no	421	1.70 (1.46-1.93)	2.58 (2.19-2.97)	0.18 (0.12-0.23)	0.41 (0.32-0.50)	4.46 (3.98-4.93)
light	50	1.19 (0.52-1.86)	2.14 (1.02-3.26)	0.03 (*-0.19)	0.34 (0.08-0.59)	3.36 (1.99-4.73)
mod	107	1.30 (0.84-1.76)	2.73 (1.96-3.50)	0.05 (*-0.16)	0.23 (0.05-0.41)	4.08 (3.14-5.02)
heavy	66	1.54 (0.95-2.13)	3.10 (2.12-4.08)	0.02 (*-0.17)	0.28 (0.06-0.50)	4.66 (3.47-5.85)
Test of significant		p value=0.29	p value=0.63	p value=0.04	p value=0.26	p value=0.43
Systemic disease						
No DM/CV^	450	1.67 (1.45-1.90)	2.94 (2.57-3.31)	0.15 (0.09-0.20)	0.39 (0.31-0.48)	4.76 (4.31-5.21)
DM	20	1.24 (0.18-2.31)	2.33 (0.57-4.09)	0.03 (*-0.29)	0.08 (*-0.48)	3.60 (1.45-5.75)
5	173	1.36 (1.00-1.72)	1.85 (1.25-2.44)	0.09 (0.00-0.18)	0.32 (0.18-0.46)	3.30 (2.57-4.03)
Test of significant		p value=0.29	p value<0.01	p value=0.46	p value=0.24	n value<0.01

Table 4.37: Age adjusted bivariate ANOVA analysis of participants' caries experience andgeneral health

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Crude bivariate analysis found numerous significant associations between caries measures and self-rated oral health, self-rated general health or living conditions and caries experience (Table 4.38). However, after accounting for the influence of age (Table 4.39), only the relationship between self-rated oral health and caries experience still persisted. Participants who rated their oral health as *poor* had twice or more tooth decay, missing teeth, root caries and DMFT compared to those who rated their self-rated oral health as *good*.

	z	Decay	Missing	Filling	Root Caries	DMFT
		Mean (95%CI)				
Self-rated OH		54 89	200	1	3	
Good	284	1.31 (1.01-1.60)	2.01 (1.50-2.53)	0.08 (0.01-0.15)	0.31 (0,19-0.41)	3.41 (2.76-4.04)
Fair	289	1.50 (1.21-1.79)	2.53 (2.02-3.04)	0.16 (0.09-0.23)	0.29 (0.19-0.40)	4.19 (3.56-4.83)
Poor	67	2.83 (2.23-3.43)	5.55 (4.49-6.61)	0.18 (0.03-0.32)	0.88 (0.66-1.09)	8.56 (7.25-9.88)
Test of Significant		p value<0.01	p value <0.01	p value =0,21	p value <0.01	p value <0.01
Self-rated Health						
Good	344	1.44 (1.17-1.71)	2.36 (1.88-2.84)	0.10 (0.04-0.17)	0.42 (0.33-0.52)	3.90 (3.30-4.50)
Fair	286	1.68 (1.38-1.98)	2.87 (2.35-3.40)	0.16 (0.09-0.23)	0.28 (0.18-0.39)	4.72 (4.06-5.38)
Poor	13	3.00 (1.59-4.41)	4.69 (2.23-7.16)	0.00 (*-0.33)	0.62 (0.11-1.12)	7.69 (4.59-10.80
Test of Significant		p value =0.07	p value =0.09	p value=0.32	p value=0.10	p value=0.02
Living condition						
Living well	89	1.97 (1.35-2.59)	4,43 (3,36-5,50)	0.22 (0.08-0.36)	0.57 (0.35-0.79)	6.62 (5.27-7.97)
Coping	546	1.51 (1.29-1.73)	2.39 (2.01-2.77)	0.12 (0.07-0.17)	0.34 (0.26-0.42)	4.02 (3.55-4.50)
Difficult	29	1.90 (0.95-2.84)	3.03 (1.39-4.67)	0.07 (*-0.29)	0.34 (0.01-0.68)	5.00 (2.93-7.07)
Test of Significant		p value=0.31	p value<0.01	p value=0.37	p value=0.15	p value<0.01
Social Standing						
Less than 6	103	1.32 (0.82-1.82)	2.67 (1.79-3.55)	0.12 (0.00-0.23)	0.35 (0.17-0.53)	4.11 (3.00-5.22)
6	228	1.66 (1.32-2.00)	2.92 (2.33-3.51)	0.09 (0.01-0.17)	0.30 (0.18-0.42)	4.67 (3.93-5.42)
More than 6	309	1.61 (1.32-1.91)	2,42 (1.91-2.92)	0.15 (0.08-0.22)	0.42 (0.32-0.52)	4.18 (3.54-4.82)
Test of Significant		p value=0.53	p value=0.45	p value=0.55	p value=0.32	p value=0.56
Longevity						
Disagree	17	0.94 (*-2.18)	1.59 (*-3.75)	0.29 (0.01-0.58)	0.24 (*-0.68)	2.82 (0.10-5.55)
Neutral	115	1.45 (1.04-1.86)	2.34 (1.63-3.06)	0.18 (0.09-0.28)	0.28 (0.13-0.42)	3.97 (3.07-4.88)
Agree	472	1.64 (1.41-1.87)	2.76 (2.36-3.17)	0.10 (0.05-0.16)	0.40 (0.31-0.48)	4.51 (3.99-5.03)
Test of Significant		p value=0.44	p value=0,38	p value=0.20	p value=0.31	p value=0,33

 Table 4.38: Crude bivariate ANOVA analysis of participants' caries experience and self-rated

 variables

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	z	Decay	Missing	Filling	Root Caries	DMFT
		Mean (95%CI)				
Self-rated OH						
Good	284	1.24 (0.96-1.52)	1.86 (1.40-2.31)	0.09 (0.02-0.16)	0.30 (0.19-0.41)	3.18 (2.63-3.73)
Fair	289	1.61 (1.34-1.89)	2.79 (2.34325)	0.15 (0.08-0.22)	0.31 (0.20-0.41)	4.56 (4.01-5.10)
Poor	67	2.63 (2.05-3.20)	5.06 (4.10-6.01)	0.20 (0.06-0.35)	0.85 (0.63-1.07)	7.88 (6,74-9,03)
Test of Significant		p value<0.01	p value<0.01	p value=0.27	p value<0.01	p value<0.01
Self-rated Health						
Good	344	1.51 (1.25-1.77)	2.52 (2.09-2.94)	0.09 (0.03-0.16)	0.43 (0.33-0.53)	4.12 (3.60-4.64)
Fair	286	1,60 (1.32-1.88)	2.69 (2.22-3.15)	0.17 (0.10-0.24)	0.27 (0.16-0.38)	4.46 (3.89-5.03)
Poor	13	2.78 (1.46-4.09)	4.19 (2.00-6.39)	0.02 (*-0.35)	0.59 (0.09-1.10)	6.99 (4.32-9.67)
Test of Significant		p value=0.18	p value=0.32	p value=0.22	p value=0.06	p value=0.10
Living condition						
Living comf.	68	1,43 (0.85-2.02)	3.27 (2.29-4.24)	0.28 (0.14-0.43)	0.53 (0.31-0.75)	4.98 (3.79-6.18)
Coping	546	1.59 (1.38-1.79)	2.55 (2.21-2.89)	0.11 (0.06-0.16)	0.34 (0.27-0.42)	4.24 (3,83-4.66)
Difficult	29	1.69 (0.81-2.58)	2.59 (1.12-4.06)	0.09 (*-0.31)	0.33 (*-0.67)	4.37 (2.58-6.17)
Test of Significant		p value=0.86	p value=0.39	p value=0.09	p value=0.30	p value=0.52
Social Standing						
Less than 6	103	1.57 (1.10-2.04)	3.23 (2.45-4.02)	0.09 (*-0.21)	0.37 (0.19-0.55)	4.89 (3.94-5.85)
6	228	1.64 (1.32-1.95)	2.87 (2.35-3.40)	0.09 (0.02-0.17)	0.30 (0.18-0.42)	4.60 (3.97-5.24)
More than 6	309	1.54 (1.27-1.81)	2.24 (1.79-2.69)	0.16 (0.09-0.22)	0.41 (0.31-0.51)	3.94 (3.39-4.49)
Test of Significant		p value=0.89	p value=0.05	p value=0.41	p value=0.37	p value=0.14
Longevity						
Disagree	17	1.29 (0.14-2.45)	2.37 (0.45-4.30)	0.26 (*-0.55)	0.27 (*-0.71)	3.93 (1.58-6.28)
Neutral	115	1.66 (1.27-2.05)	2.80 (2.16-3.44)	0.16 (0.07-0.26)	0.29 (0.14-0.43)	4.62 (3.84-5.41)
Agree	472	1.56 (1.34-1.78)	2.58 (2.21-2.94)	0.11 (0.06-0.17)	0.39 (0.31-0.47)	4.25 (3.80-4.69)
Test of Significant		p value=0.79	p value=0.82	o value=0.45	p value=0.44	p value=0.68

 Table 4.39: Age adjusted bivariate ANOVA analysis of participants' caries experience and
 self-rated variables

4.3 Summary of the bivariate analysis of caries experiences

This study's bivariate analysis found that variables that were associated with participants' caries experience were gender, age, marital status, occupation, education, health card holding, saving money, debt, last dental visit, BMI, smoking, self-rated oral health, self-rated general health, living conditions, reason for dental visit, brushing frequency, Survival score, Sustainability score, Self-production score and years of being Inpaeng member.

4.4 Multivariate analysis of tooth decay, tooth lass and caries experience (D, M and DMFT)

Three outcome variables were analyzed in the multivariate analysis: tooth decay (D), tooth loss (M) and DMFT. Variables which, in the crude bivariate analysis, associated with D, M and DMFT, were included in this multivariate analysis. According to crude bivariate analysis, 11 variables associated with D, 14 variables with M and 17 variables with DMF. The general linear model was implemented as the analyzing technique. The results are presented in Table 4.40 to Table 4.42.

Age and marriage was the only demographic variables that showed a statistic association in this analysis. Older people were more likely to have more tooth decay, tooth loss and DMFT compared to people in the younger groups.

Financial variables showed no association with tooth decay. However, some associations between M and DMFT and money saving, were observed. Participants with low savings had more tooth loss whereas people with low savings were more likely to have more DMFT.

Underweight participants had more decayed teeth, more tooth loss and more DMFT compared to those who were overweight. No other association with general health variables was found.

Brushing frequency and years since the last dental visit showed no association with any dental caries outcome variables. This study found a weak association between reasons for last dental visit and decayed teeth (p value=0.03) as well as DMFT (p value=0.02). Participants who had check up as the reason for their last dental visit were more likely to have less DMFT compared with those who had their last dental service because of pain.

Survival score showed both positive and negative associations with dental caries variables. Participants who were in the high Survival score group had less tooth decay; however, people in the middle Survival score group had more tooth loss compared to those who were in the lowest Survival score ranking.

Table 4.40: Fully-adjusted estimation for factors associated with participants' tooth decay

Variables		Regression	p value
		coefficient (95% CI)	
	Intercept	2.64(0.15-5.13)	0.03
4.55	25 40 year alda		-0.01
Age	55-49 year olds	-2.05(-3.280.81)	<0.01
	50-59 year olds	-1.39(-2.01 - 0.10)	0.02
	50-69 year olds (ref.)	-0.70(-1.97-0.57)	0.28
Education	70+ year olds (rel.)	0.00	
Education		0.28(-1.74-2.31)	0.78
	4-6 years school	0.59(-1.36-2.55)	0.55
Annual Caving			
Annual Saving	No answer	0.42(-0.22-1.07)	0.19
		0.13(-0.07-0.92)	0.70
	No or low coving (rof)	0.40(-0.28-1.08)	0.25
	high	0.00	
Saving increase	nign	-0.55(-1.20-0.09)	0.09
	low (rof)	-0.60(-1.58-0.17)	0.12
Dobt docroaco	low (rel.)		
Debt decrease	moderate	-0.11(-0.08-0.43)	0.00
	low (rof)	-0.50(-1.00-0.54)	0.51
Poscon for visiting	Chock up		. 0.17
Reason for visiting	Othors	-0.01(-1.30-0.27)	0.17
	Differs Bain(rof)	-0.78(-1.490.00)	0.05
BMI	under weight	2 53/0 86_/ 21)	
DIVI	normal	2.33(0.80 ^{-4.21})	0.01
	over weight	0.12(-1.30-1.54)	0.86
	obesity(ref.)	0.00	0.00
Self-production score	high	0.62(-0.041.29)	0.06
production boord	med	0.14(-0.46-0.75)	0.63
	low(ref.)	0.00	
Inpaeng membership	5yrs or more	-0.07(-0.72-0.58)	0.83
	<5 yrs membership	-0.23(-0.84–0.38)	0.45
	non-Inpaeng(ref.)	0.00	•
Survival	high	-0.79(-1.45-0.12)	0.02
	med	-0.06(-0.65-0.51)	0.81
	low(ref.)	0.00	•
			7

R square=22.62% ref. : group of reference

Variables		Regression coefficient	p value
		(95% CI)	
	Intercept	12.09(7.39–16.80)	<0.01
Δσο	35-49 year olds	-8 38 (-10 326 11)	<0.01
Age	50-59 year olds	-7 3/(-9 26 - 5 1)	<0.01
	60-69 year olds	-5 78(-7 793 76)	<0.01
	70+ year olds (ref)	0.00	<0.01
		0.00	
Marriage	Single	-1.58(-4.97–1.80)	0.35
	married	-1.08(-2.38-0.20)	0.09
	others(ref.)	0.00	
			0.04
Education	>6 years school	0.16(-2.95-3.27)	0.91
	4-6 years school	1.33(-1.67-4.34)	0.38
	No school (ref.)	0.00	
Occupation	Business	-0.84(-4.11-2.41)	0.60
• • • • •	Employee	-0.34(-3.47-2.77)	0.82
	Farmer	-0.82(-3.30-1.64)	0.51
	Public officer	0.49(-2.50–3.48)	0.74
	Retired (ref.)	0.00	
Debt	No answer	0.20(-1.12-1.53)	0.76
	No or low debt	-0.58(-1.89–0.72)	0.38
	Med debt	-0.03(-0.96–0.88)	0.93
	High debt (ref.)	0.00	
Saving increase	High	-1 35(-2 300 41)	<0.01
Saving increase	Moderate	-0 23(-1 40-0 93)	0.69
	low (ref.)	0.00	
Debt decrease	High	-0.10(-1.00-0.79)	0.82
	moderate	-0.64(-1.71–0.43)	0.24
	low (ref.)	0.00	
Last Dental Visit	less than five year	0.98(-0.92–2.89)	0.31
	Five or more year	0.03(-1.92–1.98)	0.97
	Never (ref.)	0.00	
Reason for visiting	Check up	-0.91(-2.25-0.42)	0.17
	Others	-0.49(-1.61–0.62)	0.38
	Pain (ref.)	0.00	
			-
Brushing frequency	more than once a day	-0.51(-1.31–0.28)	0.20
	less than once a day	0.00	<u> </u>

 Table 4.41: Fully-adjusted estimation for factors associated with participants' tooth loss

R square=40.13% ref. : group of reference

Table 4.41: The fully-adjusted estimation for factors associated with participants' tooth loss	
(cont.)	

Variables		Regression coefficient	p value
		(95% CI)	
BMI	under weight	3.46(0.90-6.02)	<0.01
	normal	0.32(-1.76-2.41)	0.76
	over weight	-0.38(-2.56–1.79)	0.72
	obesity(ref.)	0.00	
Living condition	living comfortably	-0.28(-2.44–1.86)	0.79
	coping	-1.49(-3.27–0.28)	0.09
	difficult(ref.)	0.00	
Survival	high	0.47(-0.53-1.48)	0.35
	med	1.22(0.34-2.11)	<0.01
	low(ref.)	0.00	

R square=40.13% ref. : group of reference

Table 4.42: Fully-adjusted estimation for factors associated with participants' cariesexperience: DMFT

Variables		Regression coefficient	p value
		(95% CI)	•
	Intercept	13.26(6.83–19.69)	<0.01
Age	35-49 year olds 50-59 year olds 60-69 year olds 70+ year olds (ref.)	-10.81(-13.248.38) -9.07(-11.476.67) -6.77(-9.284.27) 0.00	<0.01 <0.01 <0.01
Marriage	Single Married Others (ref.)	-1.52(-5.71–2.66) -1.30(-2.92–0.31) 0.00	0.47 0.11
Education	>6 years school 4-6 years school No school (ref.)	0.22(-3.65–4.10) 1.90(-1.83–5.64) 0.00	0.91 0.31
Occupation	Business Employee Farmer Public officer Retired (ref.)	-0.80(-4.92–3.30) 0.11(-3.80–4.02) -0.71(-3.79–2.36) 1.04(-2.69–4.78) 0.00	0.70 0.95 0.64 0.58
Annual Saving	No answer	0.66(-0.60-1.93)	0.30
	High saving	0.13(-1.37-1.6.)	0.86
	Med saving No or low saving (ref.)	0.64(-0.65–1.93) 0.00	0.32
Debt	No answer No or low debt Med debt High debt (ref.)	0.15(-1.59–1.90) -0.64(-2.27–0.97) 0.31(-0.83–1.45) 0.00	0.86 0.43 0.59
Saving increase	High Moderate Iow (ref.)	-1.97(-3.18–-0.76) -0.75(-2.21–0.70) 0.00	<0.01 0.31
Debt decrease	High Moderate Iow (ref.)	-0.29(-1.41–0.82) -1.31(-2.65–0.02) 0.00	0.60 0.05
Last Dental Visit	less than five year	2.05(-0.30-4.42)	0.08
	Five or more year Never (ref.)	1.33(-1.08–3.75) 0.00	0.27
Reason for	Check up Others Pain (ref.)	-1.93(-3.620.24) -1.00(-2.40-0.39) 0.00	0.02 0.15
Brushing	more than once a day less than once a day (ref.)	0.02(-0.96–1.01) 0.00	0.96

R square=44.26% ref. : group of reference

Variables		Regression coefficient	
		(95% CI)	p value
BMI	under weight	5.46(2.27-8.65)	<0.01
	normal	0.52(-2.07–3.12)	0.69
	over weight	-0.39(-3.10–2.32)	0.77
	obesity(ref.)	0.00	
Systemic disease	No CV, DM	1.50(-1.02-4.02)	0.24
	CV	0.33(-2.29–2.95)	0.80
	DM(ref.)	0.00	
Living condition	living comfortably	0.12(-2.57–2.82)	0.92
	coping	-1.37(-3.60–0.86)	0.22
	difficult(ref.)	0.00	
Sustainability	high	-0.06(-1.24–1.10)	0.90
	med	0.11(-1.05–1.28)	0.84
	low(ref.)	0.00	

 Table 4.42 Fully-adjusted estimation for factors associated with participants' caries

 experience: DMFT (cont.)

R square=44.26% ref. : group of reference

4.5 Summary of findings regarding caries experience

Table 4.43 presented the results concluded from three previous tables. It shows the variables with statistically significant outcomes. Older people had more caries experience compared to the younger groups. Survival, a domain in the Thai social capital variable, showed an unclear relationship in determining caries experience. People with higher Survival score had fewer decayed teeth; however, participants who scored Survival in the medium group had the highest missing teeth. People who claimed they had more saving money in the last three years had less missing teeth and lower DMF score. People who answered "pain" as the reason for the latest dental service utilization, were more likely to have more decayed teeth and more DMF score compared to other groups. Participants who were categorised as "underweight", according to their BMI, had significantly more caries experience compared the obese people. The traditional caries determinants such as the use of fluoridated toothpaste, brushing frequency, education and occupation showed no effect in this study.

Variables	D	Μ	DMF
Age			
35-49 y.o.	#	tt	tt.
50-59 y.o.	Ļ	tt	H
60-69 y.o.	~	tt	tt.
Ref:70+ y.o.			
Survival			
high	Ļ	~	~
med	~	f †	~
Ref:low			
Saving Incre.			
High Incre.	~	tt	tt .
Mod. Incre.	~	~	~
Ref:No/Low Incre.	~	~	~
Reasons for Visiting			
Check up	~	~	Ļ
Other	Ļ	~	~
Ref:Pain			
BMI			
Under wt.	11	f †	<u>tt</u>
Normal	~	~	~
Over wt.	~	~	~
Ref:Obesity			

Table 4.43: Summary of caries experience from multivariate analysis

Ref: Reference group; **H**: Markedly lower; **I**: Lower; ~: not sig. different, **1**: Higher; **1**1: Markedly higher

4.6 Periodontal disease

The prevalence of moderate or severe periodontitis among the participants was 75.58% where 55.83% had moderate periodontal disease and 19.75% were diagnosed with severe periodontal disease.

Considering the tooth position, the upper second molars had the worst periodontal condition, measured by clinical attachment loss and periodontal pocket depth. Almost half of them had four millimeters or more CAL (48% of all tooth number 17 and 42% of all tooth number 27). While almost 5% of them had 5mm or more PD. Lower canines had the least periodontal problems, less than fifteen percent of them had 4mm or more CAL (12% of tooth number 33 and 14% of tooth number 43) and less than 2% of them had five millimeters or more PD. The distributions of the periodontal problems by tooth position are reported in Table 4.44 and Table 4.45.

Tooth number	17	16	15	14	13	12	11	21	22	23	24	25	26	27
Percent	48.0	42.2	25.7	25.1	19.2	28.9	21.1	19.4	18.6	20.3	22.3	26.3	38.3	41.8
Percent	27.1	24.3	18.5	15.2	14.6	12.0	12.5	10.3	10.6	12.0	15.1	15.4	20.5	25.2
Tooth number	47	46	45	44	43	42	41	31	32	33	34	35	36	37

Table 4.44: The distribution of CAL≥4mms by tooth position

Table 4.45: The distribution of PD≥5mms by tooth position

Tooth number	17	16	15	14	13	12	11	21	22	23	24	25	26	27
Percent	5.2	3.5	3.1	2.6	2.8	2.5	3.5	2.6	2.3	2.2	2.5	1.5	4.0	4.2
Percent	4.8	2.6	2.6	1.2	1.7	1.1	0.9	0.6	1.1	0.9	1.1	0.9	0.6	3.5
Tooth number	47	46	45	44	43	42	41	31	32	33	34	35	36	37

Apart from the ordinal categories described by CDC definition, this study described the severity of periodontal disease in two continuous variables: 1) the percentage of sites with clinical attachment loss of 4 millimetres or higher, and 2) the percentage of sites with periodontal pocket depth of 5 millimetres or higher.

On average, 16% of the remaining sites of a participant had 4 mm or more Clinical Attachment Loss, while less than 1% of all sites had 5 millimetres or higher periodontal pocket depth. The univariate values of these variables are presented in Table 4.46 and Table 4.47.

Table 4.46: Univariate statistics of CAL

Proportion of Sites with				
Clinical Attachment Loss ≥4 mm				
N of items	643.00	Coeff. Var.	131.82	
Mean	16.04	Skewness	2.01	
Median	7.40	Kurtosis	4.02	
Mode	0.00	Minimum	0.00	
Std. dev.	21.15	Maximum	100.00	

Proportion of Sites with				
Periodontal pocket depth ≥5 mm				
N of items	643.00	Coeff. Var.	209.10	
Mean	0.97	Skewness	6.20	
Median	0.00	Kurtosis	59.84	
Mode	0.00	Minimum	0.00	
Std. dev.	2.83	Maximum	39.28	

Table 4.47: Univariate statistics of PD

The participants' periodontal conditions were also illustrated in boxplot showed below.



Figure 4.5: Boxplot of participants' periodontal condition
4.6.1 Bivariate analysis of periodontal disease

Periodontal disease, as measured by percentage of sites with Clinical Attachment loss of 4 millimetres of more, and percentage of sites with periodontal pocket depth of 5 millimetres or more, was explored for the bivariate relationship with five groups of explanatory variables (and Table 4.49). These groups are demographic, social capital, financial, general and oral health, and self-rated variables. The crude and age adjusted bivariate analysis were calculated and reported.

It can be observed in , that sex, age, occupation and education had an association with the mean proportion of sites with $CAL \ge 4$ mm, and mean proportion of sites with PD ≥ 5 mm. However, after adjusting for age, sex was the only variable that showed significant difference. Compared to females, males had significantly more clinical attachment loss and periodontal pocket depth, measured by proportion of sites with CAL ≥ 4 mm and proportion of sites with PD ≥ 5 mm.

	z	0	rude	Age adj	usted
		Proportion CAL≥4mm	Proportion PD≥5mm	Proportion CAL≥4mm	Proportion PD≥5mm
		Mean (95%CI)	Mean (95%Cl)	Mean (95%CI)	Mean (95%CI)
Sex					
Male	265	20.79 (18.28-23.30)	1.21 (0.87-1.55)	19.99 (17.73-22.25)	1.18 (0.84-1.52)
Female	378	12.75 (10.65-14.85)	0.81 (0.53-1.10)	13.23 (11.34-15.13)	0.83 (0.55-1.12)
Test of significant		p value <0.01	p value =0.08	p value <0.01	p value<0.01
Age					
35-49 y.o.	277	7.69 (5.45-9.93)	0.59 (0.26-0.92)		
50-59 y.o.	205	16.68 (14.27-19.46)	1.28 (0.89-1.66)		
60-69 y.o.	118	24.54 (21.12-27.96)	1.23 (0.72-1.74)		
70+ y.o.	42	42.85 (37.11-48.58)	1.36 (0.51-2.21)		
Test of significant		p value <0.01	p value =0.03		
Marriage					
Single	17	9.06 (*-19.12)	0.39 (*-1.74)	13.41 (4.35-22.47)	0.52 (*-1.87)
Married	558	15.88 (14.12-17.63)	0.95 (0.72-1.19)	16.63 (15.04-18.21)	0.98 (0.74-1.22)
Other	89	19.43(14.36-24.50)	1.31(0.64-1.99)	11.68 (6.97-16.39)	1.08 (0.38-1.78)
Test of significant		p value =0.16	p value =0.42	p value =0.12	p value =0.77
Occupation					
Farmer	552	16.69 (14.93-18.44)	1.05 (0.81-1.28)	16.48 (14.89-18.07)	1.04 (0.81-1.28)
Business	17	8.15 (*-18.15)	0.53 (*-1.88)	11.59 (2.53-20.66)	0.64 (*-1.99)
Employee	22	8.66 (*-17.45)	0.41 (*-1.59)	13.16 (5.17-21.15)	0.56 (*-1.75)

Table 4.48: Crude and age adjusted bivariate ANOVA analysis of participants' demographicsand periodontal status

	Z		rude	Age adj	usted
		Proportion CAL≥4mm	Proportion PD≥5mm	Proportion CAL24mm	Proportion PD≥5mm
		Mean (95%CI)	Mean (95%CI)	Mean (95%CI)	Mean (95%CI)
Public officer	38	10.04 (3.26-16.82)	0.53 (*-1.44)	12.42 (6.27-18.57)	0.61 (*-1.52)
Retired	14	28.90 (17.88-39.92)	0.85 (*-2.34)	17.91 (7.77-28.04)	0.48 (*-1.99)
Test of significant		p value<0.01	p value =0.63	p value 0.54	p value =0.72
Education					
No school	10	18.56 (5.52-31.60)	0.28 (*-2.04)	16.28 (4,49-28.07)	0.21 (*-1.96)
4-6 school years	540	17.21 (15.44-18.98)	1.04 (0.80-1.28)	16.56 (14.95-18.16)	1.02 (0.78-1.26)
>6 school years	93	9.11 (4.81-13.41)	0.71 (0.13-1.29)	12.91 (8.98-16.85)	0.84 (0.25-1.42)
Test of significant		p value<0.01	p value =0,44	p value =0.23	p value =0.58
Health card					
UC card	571	16.27 (14.53-18.01)	1.01 (0.77-1.24)	16.08 (14.52-17.65)	1.00 (0.77-1.24)
Social welfare	10	6.86 (*-20.00)	0.56 (*-2.32)	16.05 (4.14-27.96)	0.86 (*-2.62)
Officer welfare	37	11.29 (4.46-18.12)	0.44 (*-1.35)	11.41 (5.26-17.55)	0.44 (*-1.35)
Private insurance	ω	9.84 (*-33.83)	0.00 (*-3.22)	15.53 (*-37.12)	0.18 (*-3.39)
Other	18	24.55 (14.76-34.34)	1.45 (0.14-2.76)	22.87 (14.06-31.68)	1.40 (0.09-2.71)
Test of significant		p value =0.14	p value =0.65	p value =0.34	p value =0.73

Table 4.48: Crude and age adjusted bivariate ANOVA analysis of participants' demographicsand periodontal status (Cont.)

According to Table 4.49, only Survival score showed a relationship with attachment loss and periodontal pocket after adjusting for age. People in the highest Survival score tertile had the most severe periodontal conditions measured by clinical attachment loss and periodontal pocket depth.

Table 4.49: Crude and age-adjusted bivariate ANOVA analysis of participants' social capitaland their periodontal status

	Ν	Cru	de	Age ad	justed
		Proportion	Proportion	Proportion	Proportion
		CAL≥4mm	PD≥5mm	CAL≥4mm	PD≥5mm
		Mean (95%CI)	Mean (95%Cl)	Mean (95%CI)	Mean (95%CI)
Group membership					
0-3 gr	311	16.27 (13.91–18.63)	0.98 (0.66–1.30)	16.81 (14.69–18.93)	1.00 (0.69–1.32)
4+ gr	330	15.87 (13.58–18.17)	0.97 (0.66–1.28)	15.29 (13.23–17.35)	0.95 (0.65–1.26)
Test of significant		p value = 0.81	p value = 0.97	p value = 0.31	p value = 0.82
Survival					
Jow	221	11 95 (9 19-14 72)	0.68 (0.31_1.05)	13 / 2 / 10 90_15 9/)	0 73 (0 36_1 11)
med	251	16.74 (14.14 - 19.33)	0.00(0.51 1.05) 0.89(0.54-1.24)	16 15 (13 80–18 49)	0.75(0.501.11) 0.87(0.52-1.22)
high	172	20.30(17.16-23.44)	1 47 (1 04-1 89)	19 18 (16 33-22 02)	1 43 (1 01–1 85)
Test of significant	172	n value<0.01	n value = 0.02	n value =0.01	n value =0.04
Sufficiency					
low	270	13.96 (11.44–16.48)	0.75 (0.41–1.09)	15.26 (12.97–17.55)	0.80 (0.46-1.14)
med	195	18.23 (15.26-21.20)	1.07 (0.67-1.47)	16.66 (13.97–19.34)	1.02 (0.62-1.42)
high	179	16.79 (13.69–19.90)	1.20 (0.78–1.64)	16.47 (13.68–19.27)	1.19 (0.77–1.60)
Test of significant		p value = 0.09	p value = 0.22	p value = 0.69	p value = 0.35
Sustainability					
low	195	13.70 (10.73–16.67)	0.87 (0.47–1.26)	15.00 (12.31–17.68)	0.91 (0.51–1.31)
med	209	17.32 (14.45–20.19)	0.80 (0.42–1.19)	16.08 (13.49–18.68)	0.77 (0.38–1.15)
high	240	16.83 (14.15–19.51)	1.20 (0.84–1.56)	16.81 (14.40–19.22)	1.20 (0.84–1.56)
Test of significant		p value = 0.17	p value = 0.27	p value = 0.61	p value = 0.25
Self-production	177		0.00 (0.44, 1.20)	10 01 (12 20 10 02)	0.00 (0.47, 1.21)
WOI	249	15.08 (11.96-18.21)	0.86(0.44 - 1.28)	16.01(13.20-18.82) 16.22(12.02, 18.71)	0.89(0.47 - 1.31)
mea	248	15.22 (12.58-17.87)	0.84 (0.49-1.20)	10.32 (13.93-18.71)	0.88 (0.55-1.24)
nign Test of significant	218	17.82(15.00-20.03)	1.21(0.85-1.58)	15.71(15.15-18.20)	1.14(0.76-1.52)
Test of significant		p value – 0.52	p value – 0.52	p value – 0.94	p value – 0.50
Years of Inpaeng					
membership					
0	368	16.62 (14.46–18.79)	1.02 (0.73–1.30)	15.98 (14.03–17.94)	1.00 (0.71–1.29)
1-3 years	143	14.09 (10.61–17.57)	0.70 (0.23–1.16)	15.66 (12.52–18.79)	0.75 (0.28–1.21)
4-8 years	73	15.80 (10.90-20.70)	1.38 (0.72–2.03)	17.04 (12.63–21.45)	1.42 (0.77–2.07)
8+ years	60	17.40 (12.03–22.77)	0.86 (0.14–1.58)	15.95 (11.12–20.78)	0.81 (0.10–1.53)
Test of significant		p value = 0.63	p value = 0.39	p value = 0.97	p value = 0.40

In crude bivariate analysis, participants with less severed clinical attachment loss had more debt. However, after adjusting for age, no relationship between financial variables and periodontal diseases could be observed. (Table 4.50)

Table 4.50: Crude and age adjusted bivariate ANOVA analysis of participants' financial statusand periodontal status

	Ν	Cru	ıde	Age ac	ljusted
		Proportion	Proportion	Proportion	Proportion
		CAL≥4mm	PD≥5mm	CAL≥4mm	PD≥5mm
		Mean (95%CI)	Mean (95%Cl)	Mean (95%CI)	Mean (95%CI)
Annual Saving					
No/Low	269	16.98 (14.45-19.52)	0.76 (0.42-1.10)	14.89 (12.58-17.19)	0.68 (0.34-1.03)
Mod. Saving	135	15.86 (12.27-19.46)	1.19 (0.71-1.67)	16.79 (13.57-20.02)	1.23 (0.75-1.70)
High Saving	89	14.14 (9.73-18.55)	1.01 (0.42-1.60)	16.56 (12.59-20.54)	1.10 (0.51-1.69)
N/A	150	15.77 (12.37-19.16)	1.16 (0.71-1.62)	17.07 (14.02-20.13)	1.21 (0.76-1.67)
Test of significant		p value=0.73	p value=0.38	p value =0.65	p value =0.17
Properties holding					
Low	20	11.56 (2.28-20.84)	0.26 (*-1.50)	16.93 (8.54-25.33)	0.45 (*-1.69)
Mod.	145	14.18 (10.72-17.64)	1.26 (0.80-1.73)	17.22 (14.07-20.37)	1.37 (0.90-1.84)
High	364	17.53 (15.36-19.71)	1.00 (0.71-1.29)	15.83 (13.85-17.81)	0.94 (0.65-1.23)
N/A	114	14.58 (10.69-18.47)	0.67 (0.15-1.19)	15.00 (11.49-18.51)	0.70 (0.18-1.22)
Test of significant		p value=0.23	p value=0.25	p value =0.81	p value =0.20
Debt					
Low	119	21.87 (18.09-25.66)	1.48 (0.98-1.99)	17.87 (14.39-21.34)	1.36 (0.85-1.88)
Mod.	290	15.52 (13.09-17.95)	0.90 (0.57-1.22)	17.04 (14.83-19.25)	0.95 (0.62-1.28)
High	166	13.63 (10.43-16.83)	0.84 (0.41-1.27)	13.78 (10.89-16.67)	0.84 (0.41-1.27)
N/A	68	14.21 (9.21-19.21)	0.77 (0.10-1.45)	14.00 (9.48-18.51)	0.77 (0.10-1.44)
Test of significant		p value<0.01	p value=0.19	p value =0.17	p value =0.40
Saving Incre.					
No/Low incre.	160	17.40 (14.12-20.69)	0.73 (0.29-1.17)	14.68 (11.69-17.67)	0.64 (0.20-1.08)
Mod. Incre.	116	16.35 (12.49-20.21)	1.01 (0.49-1.52)	16.95 (13.47-20.43)	1.03 (0.52-1.55)
High Incre.	368	15.36 (13.19-17.53)	1.07 (0.78-1.36)	16.33 (14.37-18.28)	1.11 (0.82-1.40)
Test of significant		p value=0.58	p value=0.43	p value =0.57	p value =0.57
Debt Decre.					
No/Low Decre.	252	13.96 (11.37-16.56)	0.91 (0.56-1.26)	15.01 (12.64-17.37)	0.95 (0.60-1.30)
Mod. Decre.	108	11.88 (7.92-15.84)	0.72 (0.19-1.26)	15.13 (11.49-18.78)	0.83 (0.29-1.37)
High Decre.	284	19.47 (17.03-21.91)	1.13 (0.80-1.46)	17.26 (15.02-19.51)	1.06 (0.73-13.9)
Test of significant		p value<0.01	p value=0.39	p value=0.36	p value=0.76

*lower 95% CI less than 0

As reported in Table 4.51, brushing frequency was the strongest variable that was associated with the level of clinical attachment loss and periodontal pocket depth. People who brushed their teeth more than once a day had almost 30% less sites with clinical attachment loss more than 4 mm and almost 35% fewer sites with periodontal pocket depth more than 5 mm. After accounting for the influence of age, there was no association between periodontal variables and dental service variables, the distance to the nearest oral health service and the use of fluoride toothpaste. However the association with brushing frequency remained the same for the severity of clinical attachment loss but not periodontal pocket depth.

Table 4.51: Crude and age adjusted bivariate ANOVA analysis of participants' oral healthvariables and periodontal status

	Ν	Cru	ıde	Age ad	justed
		Proportion	Proportion	Proportion	Proportion
		CAL≥4mm	PD≥5mm	CAL≥4mm	PD≥5mm
		Mean (95%CI)	Mean (95%CI)	Mean (95%Cl)	Mean (95%Cl)
Last Dent Visit					
Never	284	16.81 (14.34-19.28)	1.17 (0.84-1.50)	15.88 (13.65-18.10)	1.14 (0.81-1.47)
Five+ years	117	15.87 (12.02-19.72)	0.82 (0.30-1.33)	15.91 (12.44-19.39)	0.83 (0.32-1.35)
Less than 5 years	239	15.17 (12.47-17.87)	0.82 (0.46-1.18)	16.16 (13.72-18.59)	0.85 (0.49-1.21)
Test of significant		p value=0.68	p value=0.31	p value=0.99	p value=0.43
Reasons for Dent Visit					
Pain	279	16.94 (14.60-19.27)	0.89 (0.62-1.16)	15.74 (13.64-17.84)	0.86 (0.59-1.13)
Check up	33	13.86 (7.07-20.65)	1.04 (0.25-1.82)	18.43 (12.30-24.56)	1.19 (0.40-1.97)
Other	54	9.05 (3.69-14.41)	0.33 (*-0.95)	12.02 (7.20-16.84)	0.43 (*-1.05)
Test of significant		p value=0.03	p value=0.23	p value=0.22	p value=0.29
Distance to nearest					
OH service					
≤10 kms	368	14.55 (12.40-16.71)	0.88 (0.59-1.17)	15.22 (13.28-17.17)	0.91 (0.62-1.20)
11-20 kms	195	18.95 (15.99-21.91)	1.03 (0.63-1.43)	17.82 (15.15-20.49)	0.99 (0.59-1.39)
>20 kms	79	15.31 (10.66-19.96)	1.31 (0.68-1.93)	14.85 (10.66-19.04)	1.29 (0.67-1.92)
Test of significant		p value=0.06	p value=0.46	p value=0.26	p value=0.55
Brushing Freq					
<once a="" day<="" th=""><th>262</th><th>21.02 (18.52-23.52)</th><th>1.25 (0.91-1.59)</th><th>18.99 (16.68-21.30)</th><th>1.19 (0.85-1.54)</th></once>	262	21.02 (18.52-23.52)	1.25 (0.91-1.59)	18.99 (16.68-21.30)	1.19 (0.85-1.54)
≥once a day	373	12.31 (10.21-14.41)	0.76 (0.47-1.05)	13.67 (11.73-15.60)	0.80 (0.51-1.09)
Test of significant		p value<0.01	p value=0.03	p value<0.01	p value=0.09
Toothpaste					
Fluoridated	449	15.84 (13.89-17.79)	0.84 (0.58-1.10)	15.63 (13.87-17.39)	0.83 (0.57-1.10)
Others	189	16.14 (13.14-19.15)	1.28 (0.87-1.68)	16.50 (13.80-19.21)	1.29 (0.89-1.69)
Test of significant		p value=0.87	p value=0.07	p value=0.59	p value=0.06

The associations between the severity of periodontal disease and general health variables are cited in Table 4.52. Participants with diabetes mellitus were more likely to have worse periodontal problems compared to their counterparts. Smoking showed a strong linear association with the level of periodontal problems, heavier smokers had more periodontal problems compared to those who did not smoke or to lighter smokers. A non-linear relationship was seen in BMI variables. People who were categorised into the overweight group were more likely to have the least clinical attachment loss, while those who were in the underweight group were more likely to have the least amount of problems concerning periodontal pocket depth. These associations remained the same after age adjusted analysis.

Table 4.52: Crude and age adjusted bivariate ANOVA analysis of participants' general healthand periodontal status

	Ν	Cru	ıde	Age ad	ljusted
		Proportion	Proportion	Proportion	Proportion
		CAL≥4mm	PD≥5mm	CAL≥4mm	PD≥5mm
		Mean (95%CI)	Mean (95%Cl)	Mean (95%Cl)	Mean (95%Cl)
BMI					
Under wt.	52	27.35 (21.69-33.01)	0.65 (*-1.42)	22.20 (16.99-27.41)	0.45 (*-1.22)
Normal	420	16.40 (14.41-18.40)	1.01 (0.74-1.28)	16.17 (14.36-17.98)	1.00 (0.73-1.27)
Over wt.	144	10.57 (7.17-13.97)	0.75 (0.29-1.22)	12.74 (9.63-15.85)	0.84 (0.37-1.30)
Obesity	27	18.53 (10.68-26.39)	2.25 (1.18-3.32)	19.67 (12.39-26.95)	2.41 (1.33-3.50)
Test of significant		p value<0.01	p value=0.07	p value=0.01	p value=0.03
Mental health					
poor	142	18.47 (14.98-21.95)	0.80 (0.33-1.27)	17.70 (14.56-20.84)	0.79 (0.32-1.25)
mod.	359	15.03 (12.84-17.22)	0.99 (0.70-1.29)	15.05 (13.08-17.02)	0.99 (0.70-1.29)
good	142	16.31 (12.81-19.80)	1.11 (0.65-1.58)	16.85 (13.71-19.99)	1.13 (0.67-1.60)
Test of significant		p value=0.26	p value=0.64	p value=0.32	p value=0.58
Smoking					
No	418	13.46 (11.46-15.47)	0.88 (0.61-1.15)	14.12 (12.30-15.94)	0.91 (0.63-1.18)
Yes	224	20.84 (18.10-23.58)	1.14 (0.76-1.51)	19.50 (17.01-21.98)	1.09 (0.72-1.46)
Test of significant		p value<0.01	p value=0.28	p value<0.01	p value=0.43
Class Smoker					
no	421	13.50 (11.50-15.49)	0.89 (0.62-1.16)	14.16 (12.34-15.97)	0.92 (0.65-1.19)
light	50	16.95 (11.16-22.74)	0.52 (*-1.30)	18.38 (13.15-23.62)	0.56 (*-1.35)
mod	107	20.84 (16.88-24.80)	1.21 (0.68-1.75)	18.73 (15.13-22.32)	1.15 (0.61-1.69)
heavy	66	23.81 (18.77-28.85)	1.48 (0.79-2.16)	21.74 (17.18-26.31)	1.41 (0.73-2.09)
Test of significant		p value<0.01	p value=0.21	p value<0.01	p value=0.37
Systemic disease					
	150	16 82 (14 86-18 77)	1 00 (0 83-1 25)	17 11 (15 35-19 96)	1 10 (0 84-1 36)
	20	10.02 (14.00 - 10.77)	2 02 (0 78 2 26)	17.11 (13.33-10.00)	1 04 (0 70 2 17)
	20 173	22.31 (13.04-32.17) 13 33 (10 18-16 49)	2.02 (0.70-3.20) 0.57 (0.15-0.99)	20.30 (12.07-20.09) 12 73 (0 01-15 56)	1.54 (0.70-3.17) 0.55 (0.13_0.07)
CV Test of significant	113	13.33 (10.10-10.40)	0.57 (0.15-0.55)	12.75 (5.91-15.50)	n value=0.03
rest of significant					p value=0.05

*lower 95% CI less than 0, ^DM is the abbreviation for Diabetes Mellitus, CV is the abbreviation for Cardiovascular disorders.

The bivariate relationship of self-rated variables and the participants' periodontal status showed that self-rated oral health was the only variable in this group that was associated with periodontal attachment loss. Although the V shape relationship shown in the crude relationship between the attachment loss and participants' living conditions, this relationship was not significant when adjusted for age (Table 4.53).

Table 4.53: Crude and age-adjusted bivariate ANOVA analysis of self-rated variables and
participants' periodontal status

	Ν	Cru	de	Age ad	justed
		Proportion	Proportion	Proportion	Proportion
		CAL≥4mm	PD≥5mm	CAL≥4mm	PD≥5mm
		Mean (95%Cl)	Mean (95%CI)	Mean (95%CI)	Mean (95%Cl)
Self-rated OH					
Good	284	15.48 (13.03–17.92)	0.96 (0.63–1.29)	14.76 (12.56–16.97)	0.94 (0.61–1.27)
Fair	289	14.42 (11.99–16.58)	0.87 (0.54–1.20)	15.58 (13.38–17.77)	0.91 (0.58–1.23)
Poor	67	25.24 (20.20–30.27)	1.42 (0.74–2.10)	23.00 (18.42–27.58)	1.38 (0.70–2.06)
Test of Significant		p value<0.01	p value = 0.35	p value<0.01	p value = 0.46
Self-rated Health					
Good	344	15.36 (13.12–17.61)	0.87 (0.57–1.17)	16.09 (14.07–18.10)	0.90 (0.60–1.19)
Fair	286	16.79 (14.33–19.25)	1.13 (0.80–1.46)	15.93 (13.71–18.15)	1.11 (0.78–1.44)
Poor	13	18.68 (7.15–30.22)	0.18 (*–1.72)	16.44 (6.08–26.80)	0.10 (*–1.64)
Test of Significant		p value = 0.63	p value = 0.31	p value = 0.99	p value = 0.34
Living condition					
Living comf.	68	22.32 (17.31–27.34)	1.33 (0.65–2.00)	17.06 (12.46–21.67)	1.15 (0.47–1.84)
Coping	546	15.18 (13.41–16.96)	0.94 (0.71–1.18)	15.91 (14.31–17.52)	0.97 (0.73–1.21)
Difficult	29	18.03 (10.21–25.85)	0.66 (*–1.71)	15.69 (8.62–22.75)	0.58 (*–1.63)
Test of Significant		p value = 0.03	p value = 0.48	p value = 0.89	p value = 0.66
Social Standing					
Less than 6	103	14.49 (10.39–18.59)	0.67 (0.12–1.22)	17.01 (13.31–20.71)	0.75 (0.20–1.30)
6	228	17.55 (14.79–20.30)	1.23 (0.86–1.59)	17.35 (14.87–19.82)	1.22 (0.85–1.59)
More than 6	309	15.61 (13.24–17.98)	0.90 (0.58–1.21)	14.83 (12.69–16.96)	0.88 (0.56–1.19)
Test of Significant		p value = 0.40	p value = 0.19	p value = 0.28	p value = 0.25
Longevity					
Disagree	17	11.48 (1.42–21.54)	0.63 (*–1.98)	14.98 (5.91–24.06)	0.74 (*–2.09)
Neutral	115	13.71 (10.38–17.04)	0.88 (0.44–1.33)	15.79 (12.75–18.83)	0.97 (0.52–1.42)
Agree	472	16.97 (15.06–18.88)	1.01 (0.76–1.27)	16.14 (14.41–17.86)	0.98 (0.73–1.24)
Test of Significant		p value = 0.17	p value = 0.78	p value = 0.96	p value = 0.94

*lower 95% CI less than 0

4.6.2 Multivariate analysis of participants' attachment loss

According to the bivariate analysis, there were 14 explanatory variables that may explain variation in participants' clinical attachment loss. These variables were, gender, age, education, occupation, debt, the decreasing of debt, reason for visiting a dental service, brushing frequency, BMI, smoking, class of smoker, systemic disease, living conditions, and Survival score. The variation in participants' periodontal pocket depth may be explained by four variables: age, brushing frequency, systemic disease and Survival score. General linear multivariate models were calculated to report the effect of those 15 variables on clinical attachment loss and those four variables on periodontal pocket depth.

The result in Table 4.54 showed that, after the adjusting of all possible explanatory variables, age was the strongest variable that contributed to the prediction of participants' attachment loss. Older participants were more likely to have more attachment loss compared to their younger counterparts. Education, occupation, financial variables, oral health utilisation, brushing frequency, general health variables and social capital variables showed no association with participants' clinical attachment loss according to this analysis.

In Table 4.55, age was the strongest predictor for periodontal pocket depth; the older participants had more proportion of sites with periodontal pocket depth of five millimeter or more. People who brush their teeth more than once a day were more likely to have less proportion. Participants in the highest Survival score group had more proportion compared to those in the lowest group.

Table 4.54: Fully adjusted estimation for variables associated with participants' clinical attachment loss

Variables		Regression coefficient (95% CI)	p value
	Intercept	71.09 (45.91–96.27)	<0.01
Gender	female	-5.85 (-12.03–0.32)	0.06
	male	0.00	
Age	35-49 year olds	-28.62 (-38.28–-18.96)	<0.01
	50-59 year olds	-21.01 (-30.53–-11.50)	<0.01
	60-69 year olds	-14.01 (-23.924.10)	<0.01
	70+ year olds (ref.)	0.00	
Education	>6 years school	-5.15(-20.47–10.18)	0.50
	4-6 years school	-0.60(-15.43–14.22)	0.93
	No school (ref.)	0.00	
Occupation	Business	-14.79(-30.68–1.09)	0.06
	Employee	-11.23(-26.58–4.11)	0.15
	Farmer	-9.47(-21.60–2.65)	0.12
	Public officer	-10.39(-25.13–4.35)	0.16
	Retired (ref.)	0.00	
Debt	No answer	-2.07(-8.67–4.51)	0.53
	No or low debt	-0.97(-7.40–5.45)	0.76
	Med debt	3.08(-1.56-7.72)	0.19
	High debt (ref.)	0.00	
Debt decrease	high	2.81(-1.63-7.25)	0.21
	moderate	-2.71(-7.86–2.43)	0.30
	low (ref.)	0.00	
Reason for visiting	Check up	3.12(-3.43-9.69)	0.31
	Others	0.49(-4.98–5.97)	0.85
	Pain (ref.)	0.00	
Brushing frequency	more than once a day	-3.74(-7.67–0.18)	0.06
	less than once a day(ref.)	0.00	

R square 33.95%

Table 54: Fully-adjusted estimation for variables associated with participants' clinicalattachment loss (cont.)

Variables		Regression coefficient (95% CI)	p value
BMI	under weight	-1.05(-13.65–11.53)	0.86
	normal	-3.91(-14.20–2.21)	0.45
	over weight	-5.96(-16.72–4.79)	0.27
	obesity(ref.)	0.00	
Smoking	No Yes(ref.)	-6.02(-14.27–2.21) 0.00	0.15
Class smoker	non smoker	0.00	
	moderate smoker	-0.80(-15.90-2.24) -1.58(-9.07-5.90)	0.13
	heavy smoker(ref.)	0.00	
Systemic disease	No CV, DM	-6.13(-16.10–3.83)	0.22
	CV	-7.20(-17.57–3.16)	0.17
	DM(ref.)	0.00	•
Living condition	living comfortably	-1.40(-12.29–9.48)	0.79
	coping	-3.80(-12.84-5.23)	0.40
	difficult(ref.)	0.00	
Survival	high	0.93(-3.90-5.77)	0.70
	med	2.67(-1.64–6.98)	0.22
	low (ref.)	0.00	

R square 33.95%

Table 4.55: Fully-adjusted estimation for variables associated with participants' periodontalpocket depth

Variables		Regression coefficient	n valuo
		(95% CI)	p value
	Intercept	46.71(36.64–56.79)	<0.01
Age	35-49 year olds	-33.53(-39.99–-27.06)	<0.01
	50-59 year olds	-24.72(-31.3018.15)	<0.01
	60-69 year olds	-18.37(-25.24–-11.50)	< 0.01
	70+ year olds (ref.)	0.00	
Brushing frequency	more than once a day	-5.50(-8.49–-2.50)	<0.01
	less than once a day(ref.)	0.00	
Systemic disease	No CV, DM	-3.58(-11.93–4.75)	0.39
	CV	-7.29(-15.91–1.32)	0.09
	DM(ref.)	0.00	
Survival	high	6.44(2.63–10.20)	<0.01
	med	2.65(-0.74–6.06)	0.13
	low (ref.)	0.00	

R square 23.68%

4.6.3 Summary of findings regarding periodontal status

Table 4.56 reported the summary variables that found some associations with participants' periodontal condition. Age is the strongest variable that related to participants' periodontal condition; the elderly had a more severe condition compared to the younger groups. People who brushed their teeth more than once a day had less sites with deep periodontal pockets compared to those who brushed less than that. One of the Thai social capital domains, Survival, showed a negative association in term of PD.

Variables	CAL	PD
Age		
35-49 y.o.	↓↓	H .
50-59 y.o.	↓↓	<u> </u>
60-69 y.o.	11	<u> </u>
Ref=70+ y.o.		
Survival		
high	~	11
med	~	~
Ref=low		
Brushing Freq		
≥once a day	~	H
Ref conce a day		

Table 4.56: Summary of periodontal status from multivariate analysis

Ref: Reference group; **H**: Markedly lower; **J**: Lower; ~: not sig. different, **1**: Higher; **1**1: Markedly higher

4.7 Oral health-related quality of life

Participant's OHIP Severity: the mean of sum OHIP-14 score was 12.22. The value of three OHIP indices is cited in Table 4.57.

Table 4.57: Prevalence, extent and severity of impacts

OHIP-14	Value (95% CI)
OHIP Prevalence: % of people reporting 1+ impacts fairly/very often	60.66 (56.86-64.46)
OHIP Extent: mean no. of items reported fairly/very often	1.48 (1.30-1.66)
OHIP Severity: mean OHIP-14 score	12.22 (11.55-13.09)

The descriptive univariate statistics of OHIP severity is shown in Table 4.58.

OHIP-14 Severity score						
N	631	Std. deviation	9.8			
Missing	13	Skewness	0.87			
N of items	14	Kurtosis	0.33			
Mean	12.22	Minimum	0			
Median	10	Maximum	56			
Mode	4					

Table 4.58: Univariate statistics for OHIP-14 Severity

The distribution of the answer for each item is reported in Table 4.59.

	Response category				
Items	Never	Hardly ever	Occasionally	Fairy often	Very often
			Row percentage	!	
Pronunciation difficulty	72.78	10.42	12.44	3.27	1.09
Taste affected	55.05	17.42	20.53	5.60	1.40
Painful aching	33.18	19.94	34.11	9.97	2.80
Uncomfortable to eat	43.15	14.64	26.64	10.28	5.30
Been self-conscious	48.29	15.58	24.77	7.48	3.89
Felt Tense	51.17	15.76	22.78	7.02	3.28
Diet unsatisfactory	53.82	14.04	22.93	6.71	2.50
Interrupted meals	19.31	10.90	21.50	20.72	27.57
Difficult to relax	60.84	16.07	17.78	3.59	1.72
Been embarrassed	70.67	10.45	14.20	3.59	1.09
Been a bit Irritable	56.61	15.09	20.53	6.07	1.71
Difficulty doing jobs	76.98	9.80	8.71	3.11	1.40
Life less satisfying	66.10	15.24	14.31	2.95	1.40
Unable to function	81.93	7.94	8.26	1.09	0.78

Table 4.59: OHIP-14 response to items

The data collection procedure confirmed the completeness of the questionnaire before the participants left; therefore almost no missing data was presented. More than 70% of participants never or hardly ever experienced the following oral health impacts: pronunciation difficulty, worsening sense of taste, diet unsatisfactory, difficult to relax, irritable with other people, difficulty doing usual job, feeling that life was less satisfying and unable to function. Items that had the most social impact on oral health were interrupted meals and discomfort eating. Box plot of the OHIP severity score was shown in Figure 4.6.



Figure 4.6: Boxplot of participants' OHIP severity score

4.7.1 Bivariate analysis of Oral Health Related Quality of Life

As found in Table 4.60, older people were more likely to have more impact of oral health measured by mean OHIP severity and OHIP extent. No other differences among groups were found in any other demographic variables even after age adjusting. Table 4.60: Crude and age-adjusted bivariate ANOVA analysis of participants' social impact of oral health and their demographics

	Ν	Crude	Age adjusted
		OHIP severity	OHIP severity
		Mean (95%Cl)	Mean (95%CI)
Sex			
Male	265	12.57 (11.37-13.77)	12.44 (11.25-13.64)
Female	378	11.98 (10.97-12.98)	12.06 (11.06-13.06)
Test of significant		p value = 0.45	p value = 0.63
٨٣٩			
Age 35-/19 v o	277	10.96 (9.79-12.13)	
50-59 y.o.	205	10.50(5.75-12.13) 12.61(11.25-13.07)	
50-59 y.o.	110	12.01(11.25-15.57) 12.91(12.01.15.61)	
70+ y o	12	13.81(12.01-13.01) 14.12(11.14.17.10)	
70+ y.u. Test of significant	42	14.12(11.14-17.10)	
Test of significant		p value – 0.05	
Marriage			
Single	17	11.19 (6.33-16.04)	11.73 (6.91-16.56)
Married	558	12.14 (11.31-12.97)	12.26 (11.43-13.08)
Divorced	6	18.60 (9.92-27.28)	19.02 (10.40-27.64)
Other	62	12.68 (10.18-15.19)	11.45 (8.86-14.03)
Test of significant		p value = 0.49	p value = 0.43
Occupation			
Farmer	552	12 39 (11 55-13 22)	12 35 (11 52-13 18)
Rusiness	17	9 18 (4 47-13 86)	9 71 (5 03-14 39)
Employee	22	11 29 (7 05-15 52)	12 07 (7 85-16 29)
Public officer	38	12.76 (9.57-15.95)	13.17 (9.99-16.34)
Retired	14	9.23 (3.85-14.62)	7.52 (2.10-12.94)
Test of significant		p value = 0.52	p value = 0.35
Education			
	10	11 10 (7 60 20 24)	12 77 /7 67 10 97\
	10 E 4 0	14.10(7.09-20.24) 12.25(11.40.12.00)	12.16 (11.22.12.00)
4-0 school years	02	12.23 (11.40 - 13.09)	12.10(11.32-13.00) 12.40(10.27.14.44)
>0 scrioor years	95	11.00(9.05-15.00)	12.40(10.57-14.44)
Test of significant		p value – 0.78	p value – 0.80
Health card			
UC card	571	12.13 (11.30-12.95)	12.10 (11.29-12.92)
Social welfare	10	11.30 (5.14-17.46)	12.64 (6.48-18.80)
Other	58	13.41 (10.86-15.96)	13.39(10.85-15.92)
Test of significant		p value = 0.61	p value <0.01

Considering the financial variables (Table 4.61), participants who had higher annual savings were more likely to have less mean OHIP extent score compared to their less saving counterparts. However, this difference disappeared after adjusting for the influence of age. All other financial variables in this group included, net asset, debt, the increase of money savings and the decrease of debt showed no association with the oral health related quality of life calculated by OHIP severity and OHIP extent.

Table 4.61: Crude and age-adjusted bivariate ANOVA analysis of participants' social impact of oral health and their financial status

	Ν	Crude	Age adjusted
		OHIP severity	OHIP severity
		Mean (95%Cl)	Mean (95%CI)
Annual Saving			
No/Low	269	11.88 (10.69-13.07)	11.58 (10.39-12.77)
Mod. Saving	135	13.98 (12.29-15.67)	14.12 (12.44-15.80)
High Saving	89	10.78 (8.69-12.87)	11.14 (9.06-13.22)
N/A	150	12.11 (10.52-13.69)	12.30 (10.73-13.88)
Test of significant		p value=0.09	p value =0.07
Properties holding			
Low	20	14.00 (9.65-18.35)	14.84 (10.51-19.17)
Mod.	145	12.64 (11.00-14.29)	13.12 (11.48-14.77)
High	364	12.04 (11.01-13.07)	11.77 (10.74-12.80)
N/A	114	11.96 (10.14-13.78)	12.05 (10.24-13.86)
Test of significant		p value=0.78	p value =0.36
Debt			
Low	119	12.34 (10.55-14.14)	11.74 (9.92-13.56)
Mod.	290	11.97 (10.81-13.13)	12.21 (11.05-13.37)
High	166	12.06 (10.55-13.57)	12.09 (10.58-13.59)
N/A	68	13.44 (11.09-15.80)	13.41 (11.07-15.75)
Test of significant		p value=0.73	p value =0.73
Saving Incre.	4.60	44.00 (40.05.40.40)	
No/Low incre.	160	11.90 (10.35-13.46)	11.51 (9.95-13.07)
Mod. Incre.	116	12.35 (10.53-14.17)	12.41 (10.61-14.22)
High Incre.	368	12.32 (11.29-13.34)	12.46 (11.45-13.48)
lest of significant		p value=0.89	p value=0.59
Daht Daara			
No/Low Decre.	252	11 79 (10 54 12 01)	11 0/ (10 71 12 10)
Mod Decre	100	11 57 (0 65 12 72)	11 06 (10 07 12 0E)
High Docro	284	12 87 (11 71 14 02)	12 56 (11 20 12 72)
Tost of significant	204	12.0/(11./1-14.03)	12.30 (11.35-13.73)
rest or significant		p value=0.55	p value =0.75

Cited in Table 4.62, participants' frequency of brushing and the use of fluoride toothpaste showed no association with oral health related quality of life. Years since the last dental visit illustrated a strong association even after adjusting for the influence of age. Participants who had a recent dental visit were more likely to have more social impact on oral health as measured by OHIP severity and OHIP extent. People who had pain as their reason for visiting a dental service showed the worst oral health related quality of life in crude analysis; however the p-value increased to 0.05 for mean OHIP severity score after adjusting for age. In the age-adjusted column, a non-linear relationship between OHIP severity and the distance to the nearest oral health service was found. People who lived closer to dental services were more likely to have more impact, while people who were in the middle tertile (11-20 kms to the service) had the lowest impact.

	Ν	Crude	Age adjusted
		OHIP severity	OHIP severity
		Mean (95%Cl)	Mean (95%Cl)
Last Dent Visit			
Never	284	10.39 (9.24-11.55)	10.23 (9.08-11.37)
Five+ years	117	13.36 (11.58-15.14)	13.41 (11.64-15.18)
Less than 5 years	239	13.86 (12.61-15.10)	14.03 (12.79-15.26)
Test of significant		p value<0.01	p value<0.01
Reasons for Dent Visit			
Pain	279	14.43 (13.24-15.63)	14.33 (13.13-15.54)
Check up	33	13.27 (9.82-16.73)	13.70 (10.21-17.19)
Other	54	10.34 (7.61-13.07)	10.62 (7.88-13.37)
Test of significant		p value=0.03	p value=0.05
Distance to nearest			
OH service			
≤10 kms	368	12.89 (11.87-13.91)	13.01 (11.99-14.02)
11-20 kms	195	10.81 (9.42-12.20)	10.65 (9.27-12.03)
>20 kms	79	12.72 (10.50-14.94)	12.61 (10.40-14.81)
Test of significant		p value=0.06	p value=0.03
Brushing Freq			
<once a="" day<="" th=""><th>262</th><th>12.15 (10.94-13.36)</th><th>11.82 (10.61-13.04)</th></once>	262	12.15 (10.94-13.36)	11.82 (10.61-13.04)
≥once a day	373	12.23 (11.21-13.24)	12.45 (11.44-13.47)
Test of significant		p value=0.92	p value=0.44
Toothpaste			
Fluoridated	449	11.73 (10.81-12.66)	11.71 (10.79-12.63)
Others	189	13.32 (11.92-14.73)	13.37 (11.97-14.77)
Test of significant		p value=0.06	p value=0.05

Table 4.62: Crude and age-adjusted bivariate ANOVA analysis of participants' social impact oforal health and their oral health behaviour/ oral health service utilisation

It can be concluded from Table 4.63 that general health variables had no association to oral health related quality of life. In other words, people with a difference in BMIs, mental health scores, smoking experience, and systemic disease, had no difference in the social impact of oral health. Although mean OHIP severity and OHIP extent showed a linear association between groups of different mental health scores, no significant value at p<0.05 were found in this group of general health variables.

Table 4.63: Crude and age-adjusted bivariate ANOVA analysis of participants' social impact of
oral health and their general health

	N	Crude	Age adjusted
		OHIP severity	OHIP severity
		Mean (95%CI)	Mean (95%CI)
BMI			
Under wt.	52	14.50 (11.81-17.19)	13.77 (11.06-16.48)
Normal	420	12.04 (11.08-12.99)	12.00 (11.05-12.95)
Over wt.	144	11.99 (10.35-13.62)	12.30 (10.67-13.94)
Obesity	27	11.84 (7.96-15.72)	12.14 (8.20-16.08)
Test of significant		p value=0.39	p value=0.68
Mental health			
poor	142	13.53 (11.89-15.17)	13.46 (11.83-15.09)
mod.	359	11.95 (10.92-12.99)	11.95 (10.93-12.98)
good	142	11.59 (9.95-13.22)	11.65 (10.02-13.28)
Test of significant		p value=0.19	p value=0.23
Smoking			
No	418	11.78 (10.82-12.74)	11.88 (10.93-12.84)
Yes	224	13.08 (11.77-14.38)	12.88 (11.58-14.18)
Test of significant		p value=0.12	p value=0.23
Class Smoker			
no	421	11.74 (10.79-12.70)	11.84 (10.89-12.79)
light	50	12.50 (9.76-15.24)	12.70 (9.97-15.43)
mod	107	13.77 (11.87-15.67)	13.47 (11.57-15.37)
heavy	66	12.53 (10.14-14.92)	12.24 (9.86-14.62)
Test of significant		p value=0.31	p value=0.49
Systemic disease			
No DM/CV^	450	11.70 (10.78-12.63)	11.75 (10.83-12.67)
DM	20	11.21 (6.77-15.65)	10.81 (6.39-15.22)
CV	173	13.65 (12.18-15.13)	13.57 (12.10-15.04)
Test of significant		p value=0.08	p value=0.09

^DM is the abbreviation for Diabetes Mellitus, CV is the abbreviation for Cardiovascular disorders.

The bivariate analysis result for self-rated variables: self-rated oral health, self-rated health, perceived living condition, the perceived social standing, and perceived longevity, are reported in Table 4.64. Self-rated oral health and Self-rated general health showed a strong association (p-value less than 0.01) with oral health related quality of life. Participants who rated their oral health as poor had more impact of oral health on their daily life, higher by 54% in OHIP severity and 56% higher in OHIP extent, compared to those who rated their oral health as good. The association was the same in self-rated general health. In the age adjusted analysis people in the good self-rated general health group had 60 and 45% less impact as measured by OHIP severity and OHIP extent, compared to association with oral health related quality of life after being adjusted by age.

Table 4.64: Crude and age-adjusted	l bivariate ANOVA	analysis of par	rticipants' socia	al impact of
oral health and their self-rated vari	iables			

	Ν	Crude	Age adjusted
		OHIP Severity	OHIP Severity
		Mean (95%Cl)	Mean (95%Cl)
Self-rated OH			
Good	284	8.23 (7.18-9.29)	8.10 (7.06-9.15)
Fair	289	14.21 (13.16-15.27)	14.42 (13.37-15.47)
Poor	67	20.82 (18.66-22.98)	20.63 (18.47-22.78)
Test of Significant		p value <0.01	p value<0.01
Self-rated Health			
Good	344	10.15 (9.11-11.18)	10.24 (9.21-11.27)
Fair	286	14.48 (13.35-15.60)	14.39 (13.26-15.51)
Poor	13	16.67 (11.20-22.13)	16.48 (11.5-21.92)
Test of Significant		p value <0.01	p value<0.01
Living condition			
Living comf.	68	13.48 (11.12-15.84)	12.76 (10.37-15.15)
Coping	546	11.86 (11.03-12.69)	11.96 (11.13-12.79)
Difficult	29	16.46 (12.67-20.25)	16.18 (12.41-19.95)
Test of Significant		p value=0.04	p value=0.09
Social Standing			
Less than 6	103	11.75 (9.83-13.68)	12.09 (10.17-14.01)
6	228	12.04 (10.74-13.33)	12.02 (10.73-13.31)
More than 6	309	12.57 (11.45-13.69)	12.47 (11.35-13.58)
Test of Significant		p value=0.71	p value=0.86
Longevity	47		
Disagree	1/	12.63 (7.78-14.47)	13.19 (8.38-18.01)
Neutral	115	13.36 (11.78-14.94)	13.70 (12.12-15.28)
Agree	4/2	11.84 (10.94-12.74)	11./1 (10.81-12.60)
Test of Significant		p value=0.26	p value=0.09

Table 4.65 showed the bivariate relationship between social capital variables and oral health related quality of life. Survival, Sufficiency and Sustainability had some associations with oral health related quality of life. The result indicated that, after adjusting for age, people in different Survival, Sufficiency and Sustainability groups had different OHIP severity scores. A linear relationship was shown in Sufficiency score. Participants in the highest tertile had the best oral health related quality of life while the worst were in the lowest tertile. However, inverted U relationships were seen in Survival and Sustainability scores where people in the middle tertile of Survival and Sustainability level had the worst oral health related quality of life and the best oral health related quality of life score belonged to those in the highest tertile group. The pairwise mean comparisons, done by Bonferoni test, found that the distinction was between the highest tertile and the others. The same direction of relationship and the pair wise comparison finding was also observed for Sustainability.

People who belonged to more social groups showed no significant difference of oral health impact compared to people who had no or less than four social group memberships. No significant difference was observed in the relationship between self production score, years of Inpaeng membership and oral health related quality of life. Table 4.65: Crude and age-adjusted bivariate ANOVA analysis of participants' social impact of oral health and their social capital

	Ν	Crude	Age adjusted
		OHIP Severity	OHIP Severity
		Mean (95%Cl)	Mean (95%CI)
Group membership			
0-3 gr	311	12.19 (11.08-13.31)	12.28 (11.18-13.39)
4+ gr	330	12.23 (11.15-13.31)	12.14 (11.07-13.22)
Test of significant		p value=0.96	p value=0.86
Survival			
low	221	12.06 (10.76-13.37)	12.30 (10.99-13.61)
med	251	13.34 (12.10-14.57)	13.24 (12.01-14.47)
high	172	10.79 (9.30-12.28)	10.63 (9.14-12.11)
Test of significant		p value=0.03	p value=0.03
Sufficiency	070		
low	270	13.17 (11.99-14.36)	13.38 (12.19-14.56)
med	195	12.38 (10.98-13.78)	12.14 (10.74-13.54)
nign	179	10.61 (9.16-12.07)	10.57 (9.12-12.01)
lest of significant		p value=0.03	p value=0.01
Sustainability			
Jow	195	12 75 (11 36-14 14)	12 93 (11 55-14 31)
med	209	13 42 (12 06-14 77)	13 24 (11 88-14 59)
high	205	10.76 (9.51-12.02)	10 77 (9 52-12 02)
Test of significant	240	n value=0.01	n value=0.02
Self-production			
low	177	11.91 (10.44-13.38)	12.05 (10.59-13.51)
med	248	12.05 (10.80-13.29)	12.20 (1096-13.45)
high	218	12.67 (11.35-14.00)	12.37 (11.04-13.70)
Test of significant		p value=0.71	p value=0.95
Years of Inpaeng membership			
0	368	11.98 (10.95-13.00)	11.89 (10.87-12.90)
1-3 years	143	11.99 (10.35-13.63)	12.22 (10.58-13.85)
4-8 years	73	12.93 (10.62-15.24)	13.12 (10.83-15.41)
8+ years	60	13.37 (10.86-15.87)	13.16 (10.67-15.65)
Test of significant		p value=0.69	p value=0.67

4.7.2 Bivariate summary of oral health-related quality of life

Age was the only demographic variable that had an association with participants' oral health-related quality of life. For financial variables, an invert U relationship was found between OHIP extent and annual saving. For the oral health behaviour variables, years since last dental visit, reason for the latest dental visit and distance to the nearest oral health service were variables that showed the association with OHIP severity and OHIP extent score. According to this database, people in different categories of BMI, smoking, mental health and systemic disease showed no difference in their oral health-related quality of life as measured by OHIP severity and OHIP extent. Self-rated health and self-rated oral health showed a strong association with OHIP severity and OHIP extent. For the social capital variables, Survival score, Sufficiency score and Sustainability score all influenced participants' oral health-related quality of life.

4.7.3 Multivariate analysis of participants' oral health-related quality of life

A general linear multivariate model was constructed. The following models reported the fully adjusted result of oral health related quality of life and the significant independent variables from bivariate analysis.

The findings from Table 4.66 showed that Sufficiency and the reason for last dental visit were determinants of OHIP severity scores. People in high Sufficiency group were more likely to have less oral health impact to their daily life compared to those in the lowest tertile group.

Table 4.66: Fully-adjusted estimation for variables associated with participants' oral healthrelated quality of life: Survival as the main predictor variable

Variables		Regression coefficient (95% CI)	p value
	Intercept	16.54(7.50–25.59)	<0.01
Age	35-49 year olds	0.04(-5.15-5.24)	0.98
	50-59 year olds	1.69(-3.52-6.90)	0.52
	60-69 year olds	2.77(-2.81-8.35)	0.32
	70+ year olds (ref.)	0.00	
Last Dental Visit	less than five year	0.25(-5.41-5.91)	0.93
	Five or more year	-0.37(-6.18–5.43)	0.89
	Never (ref.)	0.00	
Reason for visiting	Check up	0.24(-3.54-4.04)	0.89
	Others	-3.63(-6.710.54)	0.02
	Pain (ref.)	0.00	
Living condition	living comfortably	-0.78(-7.07–5.51)	0.80
	coping	-2.78(-7.92–2.34)	0.28
	difficult(ref.)	0.00	
Survival	high	-0.61(-3.79–2.57)	0.70
	med	1.63(-0.91-4.17)	0.20
	low (ref.)	0.00	
Sufficiency	high	-3.15(-6.220.08)	0.04
	med	-1.43(-4.01-1.14)	0.27
	low (ref.)	0.00	
Sustainability	high	-0.74(-3.46–1.97)	0.59
	med	0.47(-2.22-3.16)	0.73
	low(ref.)	0.00	

Rsquare 6.99%

4.8 Contextual influence to the outcome variables

In the qualitative phase results, community-level variables were shown to play some roles in determining participants' oral diseases and oral health related quality of life. Quantitative findings from the multilevel models show that 2.5 % of the variation of DMF score among the participants was due to village contextual effect while only 0.9% of the variation was due to Tambon contextual effect (Table 4.67). Contextual effect of the village on periodontal condition of the research participants was 30.8%, while the effect of Tambon on the same condition was only 8.9%. 6.4% of the variation of OHIP severity score was due to the effect of village, while only 3.9% was due to the effect of Tambon.

 Table 4.67: The intra-class correlation of main outcome variables and community level

	Village	Tambon
DMF	2.5%	0.9%
CAL	30.8%	8.9%
OHIP	6.4%	3.9%

Of the three community-level variables investigated with multilevel modeling, village population was the only contextual variable that showed a significant effect in determining oral health-related quality of life of the research participants (Table 4.68).

Outcome/contextual variables	Village population		Distance from village to the nearest dental service		Proportion of Inpaeng member in Tambon	
	Estimate	p-value	Estimate	p-value	Estimate	p-value
DMF	0.00	0.78	0.01	0.62	-0.24	0.35
CAL	0.00	0.87	-0.01	0.84	1.68	0.07
OHIP	0.00	0.03	-0.02	0.61	0.76	0.08

Table 4.68: Crude effects of contextual variables and main outcome variables

In the fully-adjusted analysis (Table 4.69) that included the contextual variable, two variables were associated with OHIP severity score: reasons for the latest dental visit and Sufficiency score were included in this analysis. The model shows that village population was a significant contextual variable associated with the variation of oral health-related quality of life after accounting for person-level variables.

Table 4.69: Fully-adjusted estimation for variables, including contextual variable associatedwith participants' oral health-related quality of life

Variables		Regression coefficient (95% CI)	p value
	Intercept	19.01(15.45–22.75)	<0.01
Reason for visiting	Check up	-0.71(-4.40–2.96)	0.70
	Others	-3.79(-6.76–-0.82)	0.01
	Pain (ref.)	0.00	
Sufficiency	high	-3.74(-6.37–-1.12)	<0.01
	med	-1.33(-3.75–1.08)	0.27
	low (ref.)	0.00	
Village population		-0.00	0.03

4.9 Chapter conclusion

Six hundred and fifty participants living in 73 villages of six Tambons were explored for the association of Thai social capitals and oral health variables: oral health status and oral health-related quality of life. Participants' demographics, financial status, dental health behaviour, dental health service utilisation, general health variables, self-rated health/oral health variables were also investigated as the study's covariates.

Age was the strongest variable that determined every oral health outcome variable (Table 4.70). Weak associations between some financial variables and oral health outcome variables were found. Dental health service utilisation, not including the distance to the nearest dental service, played some role in determining the severity of dental caries, periodontitis and oral health related quality of life. People who brushed their teeth more than once a day were found to have less oral disease. No effect of the use of fluoride toothpaste on any outcome oral health variables was found. Heavy tobacco smoking had a strong association with severe periodontitis, but a weak association with dental caries experience. Compared to other groups, people with diabetes had more severe periodontal disease.

Thai social capital variables were able to predict the variation in participant's oral disease severity and their oral health-related quality of life. Participants in different tertiles of Survival group showed different oral diseased severity. No association was found between levels of Sufficiency as well as Sufficiency and the severity of dental diseases. A stronger association between all three Thai social capital variables and oral health-related quality of life could be observed in the bivariate analysis. After adjusting for all possible predictors (or covariates) the influences of Sufficiency score on OHIP severity still persisted.

Variables	D	М	DMF	CAL	PD	OHIP
Age						
35-49 y.o.	#	<u> </u>	H	#	#	~
50-59 y.o.	Ļ	#	₩	Ц.	₩	~
60-69 y.o.	~	Ħ	Ħ	Ħ	Ħ	~
Ref=70+ y.o.						
Survival						
high	Ļ	~	~	~	TT	~
med	~	11	~	~	~	~
Ref=low						
Sufficiency						
high	~	~	~	~	~	₩
med	~	~	~	~	~	~
Ref=low						
Saving Incre.						
High Incre.	~	↓↓	Ц.	~	~	~
Mod. Incre.	~	~	~	~	~	~
Ref=No/Low	~	~	~	~	~	~
Reasons for visit						
Check up	~	~	Ļ	~	~	~
Other	Ļ	~	~	~	~	Ļ
Ref=Pain						
Brushing Freq						
≥once a day	~	~	~	~	#	~
Ref <once a="" day<="" td=""><td></td><td></td><td></td><td></td><td></td><td></td></once>						
BMI						
Under wt.	Ħ	††	<u>t</u> t	~	~	~
Normal	~	~	~	~	~	~
Over wt.	~	~	~	~	~	~
Ref=Obesity						
Village population	-	-	-	-	-	Ļ

Table 4.70: Summary of findings from multivariate analysis

Ref: Reference group; **H**: Markedly lower; **I**: Lower; ~: not sig. different, **1**: Higher; **11**: Markedly higher

Chapter 5 : Discussion

5.1 The research objectives and findings discussion

This research proposed a role of social determinants in oral health, recognizing the social determinants in rural Thai communities may not be the same as those in the industrialised societies. According to the findings of this research, traditional social determinants of oral health such as education, occupation, network, and trust showed non-linear and inconsistent associations with oral health of Thai rural people. In contrast, Sufficiency score was associated with lower OHIP scores, signifying better oral health related quality of life. Studies in non-western societies have been concerned about this issue. Those studies developed the culturally and locally appropriate indicators to explore social capital and its relationship to health/oral health ^{89-90, 142}.

Network, the main feature of the social capital concept was recognised in developing the Thai social capital. However, despite counting participants' network membership, this research explored the favorable characteristics, suggested by an active network in the study area: the Inpaeng network, and transformed those entities into variables called Thai social capital. The ethnographic study found that social capital in rural communities of north-east Thailand comprised both tangible and intangible assets. The assets contribute to people's Survival from financial constrains, their lifestyle of living in moderation (Sufficiency) and the presence of a Sustainable community environment. Thai social capital was categorised in these three domains: Survival, Sufficiency and Sustainability. The Survival domain included the land holding, food security, community welfare, and farm chemical usage. Sufficiency concerned people's lifestyle of mindful, moderate and sensible consumption and their involvement in religious practices and religious ceremonies. Traditional social capital characteristics such as trust, reciprocity and network were categorised in the domain of Sustainability. The Sustainability domain also included ecological concern and community groups' competencies

When the three domains were quantified using a newly developed questionnaire, Thai social capital variables showed an association with participant's oral disease severity, such as Sufficiency domains with oral health-related quality of life. The village population size was the contextual variables that influenced the association between Thai social capital and oral health-related quality of life.

The research found that Thai social capital is a useful indicator for exploring a social gradient in Thai rural communities compared to the traditional variables, used in other social gradients social capital studies, such as social class⁷², educational level, occupation⁹⁴, income⁹⁶ and health insurance¹⁴³.

The research findings showed some associations between well-known risk factors and oral health status. Age was the strongest factor associated with people's caries experience. However, some well known risk variables found in other studies showed no relationship to oral health status in this study. This issue will be investigated in detail under the following heading: Findings discussion (5.4).



5.2 Final conceptual framework

Figure 5.1: Adjusted conceptual framework after the research findings

The findings from this study suggest a new conceptual framework to describe the relationships between social capital along with individuals' characteristics, and oral health (Figure 5.1). The forms of social capital have been regrouped into the domains of Survival, Sufficiency and Sustainability. Inpaeng membership was found in the qualitative study as a variable that signified capital utilisation and hence a potential mediator variable. The bivariate analysis found that the longer a participant had been an Inpaeng member, the higher their Thai social capital score.

A weak association between Survival as well as Sufficiency and oral health status was observed. There were associations between traditional predictors of oral health status such as age, brushing frequency, oral health utilisation as well as financial status and oral health status. However, four major oral health predictors: educational level, health care card holding, fluoride use and smoking showed no association with oral health status, according to the multivariate analysis. No association was found between expected mediators (networks and Inpaeng membership) and oral health status. This suggested that there were some mediators and other ways of capital utilisation that may determine participants' oral health status.

It should be noted that this study presented the association between Thai social variables and the participants' oral health. The pathway does not propose causality as the study was cross sectional. However, pathways proposed by some scholars may help explain how Thai social capital could influence oral health. Newton stated the individual risk factors as the link between one's oral health and their social context¹⁴⁴. Likewise, Holst proposed the social level variables affected oral health via psychological reactions, health behaviour and material factors¹⁴⁵. Social context and social structure support material factors (such as the availability of oral health service and fluoride), contribute to an individual's healthy behaviours and psychological stress. A more complex pattern applying structural equation modeling done by Aleksejuniene et al. supported this idea. They found oral hygiene behaviours and dental visit pattern as the linkages between social variables and adults' oral health¹⁴⁶.

According to this literature, the relationship between Thai social capital and oral health-related quality of life, found in this research, may be explained by the psychological pathway. People in the higher Thai social capital group may have a better

psychological state compared to those who were in the lower Thai social capital group. This may shape their perception of oral diseases in a more positive direction as well as lessen their psychological stress.

A different point of view is also possible. Several variables in Thai social capital could be considered as prerequisite for health. In regard to the Ottawa charter for health promotion¹⁰⁹ those prerequisites are peace, shelter, education, food, income, a stable eco-system, sustainable resources as well as social justice and equity. The charter stated *"Improvement in health requires a secure foundation in these basic prerequisites."* Thai social capital covered several aspects of food security, income, stable eco-system and sustainable resources. According to Ottawa charter, it can be assumed that people with high Thai social capital have more secure foundations to improve their health. Overall, instead of explaining the association between Thai social capital and oral health in a more elaborate explanatory pathway, it could be assumed that people with higher social capital have more secure foundation to improve and maintain their health.

5.3 Method discussion: Research's strength and weakness

5.3.1 The research strength

The research applied locally and culturally specific variables to describe the characteristics of the participants. Because these variables were gained from a systematic study in communities with the same context as the study communities, it could be claimed that the variables exploring Thai social characteristics were more valid compared to other Thai studies that used traditional approaches^{38, 147}.

This research applied a statistically-sound sampling technique; the number of the participants was 62% more than the calculated sample size. It could be claimed that this research produced a statistically credible results.

Apart from the Thai National Oral Health Survey, few studies have systematically explored clinical oral health in adult group in rural communities. This research reported adult and elders' oral health and its predictors which have not been studied for more than 10 years. The most recent study with inferential statistical analysis in north-east Thailand, conducted by Supaporn Chatrchaiwiwatana, collected the data in 1994³⁸.

Thai rural adults and the elderly population are difficult groups to recruit for studies of this type. Rural adults in agriculture communities worked on their farms and can be hard to contact. The elderly may find it easier to make appointments but they usually cannot travel beyond their village according to the lack of adequate transportation. Traditionally, researchers set up their data collecting bases, for clinical oral health examinations, at Tambon health centres. According to the results, the distance from village to Tambon health centre ranged from 0 to 15 kilometres. It can be seen that traditional method of fixing data collection units at Tambon level may be the barrier to some participants. This research was designed to set data collecting unit at the village level. Six Tambons were selected as the research area. Instead of setting the data unit at only 6 health centres of each Tambon, this research data collection took place in more than 40 sites covering 72 villages, the sites included health centres, village meeting areas, school halls, temple halls. It can be seen that this method improved accessibility for the research participants in order to participate in this study.

Two routes of appointing research participants: via Tambon health centre route and via the route of Inpaeng network, were implemented. The same lists of all expected participants were given to Tambon health centre public health workers and to Inpaeng area coordinators for making the research data collection appointments. Apart from this study, no previous Thai oral health study has collaborated with any NGOs (Non-Governmental Organisation). Working with the Inpaeng network, the well-known NGO of the area, provided the addition channel to access more people who may have never been (or do not want to be approached) by the governmental organisations. However, others who would normally participate in the Thai oral health study still participated in this collection because of the involvement in recruitment of public health workers.

5.3.2 The research weakness

5.3.2.1 Examiner

Due to the time and money limitations, only one oral examiner and an assistant could be recruited to collect the data of more than 600 participants in this study. The

physical fatigue and stress may compromise the reliability of the data. The inter-class correlation coefficient indicated the intra-examiner reliability as "almost perfect" for the DMFT examination (weighted Kappa 0.96), but as "moderate agreement" for the PPD and CAL examination (weighted Kappa 0.50 and 0.57). This level of reliability is consistent with other oral health surveys. However, the intra-examiner reliability for periodontal pocket depth ranged from 0.44 to 0.78, for the Thai National Oral Health Survey³¹ and from 0.55 to 0.87 for the Australian National Oral Health Survey¹⁴⁸.

5.3.2.2 Missing data

The researcher had access to only 6 out of 9 Tambons for collecting the research data. Three Tambons, one in each stratum, or 320 possible participants were missing. This was due to two reasons. Firstly, the Inpaeng leaders and/or the public health authorities in the Tambon(s) could not be contacted and secondly, the time and resources were limited. According to the unpredicted increase in petrol prices, the research budget could not provide the full scale plan implementation. The data collection was done in the period of the crude oil crisis (January–June 2008). The petrol price which was the main expense of this research increased by 70% in the data collection period compared to the time of budget planning. Therefore, instead of having 9 sample Tambons from 70 Tambons of the Inpaeng population, this research had 6 Tambons from 56 Tambons located in Sakonnakhon province. More power of statistical analysis was expected if all data could have been collected as planned.

5.3.2.3 Questionnaire design

Because some problematic issues emerged when questionnaires were applied among the research participants but not in the pilot test, more consideration should have been given to the selection criteria for participants in the pilot test. The criteria indicating that people in the pilot study should share the same demographic and social condition as the research participants may not have been sufficient. It was clear that the working experience of Inpaeng administrative staff, who were the research pilot participants, played a significant role in determining their literacy skill. Wordings in the questions that could be understood by the pilot group were problems to many research participants.
There were five options for answering self-rated health/oral health: Excellent, Very good, Good, Fair and Poor. In this sense, the "Good" option implies the middle/neutral status in the same sense as answering "Good" for the greeting "How are you?" However, after translating into Thai "Good" conveys a very positive sense while "Fair" is neutral. Thus, it could be expected that these research findings in self-rated health and oral health were underestimated.

The question exploring the participants' systemic diseases was based on their perception, not their medical records. Participants may have had undiagnosed systemic diseases, and have chosen "no" as the answer.

The reliability of the data on smoking should be questioned. Almost all of the smokers smoked hand-rolled cigarettes (as known as RYO: Roll-your-own smoke) rather than packet cigarettes. This is supported by a study by Young et al.¹⁴⁹ which found the majority of Thai smokers smoked RYO. The amount of tobacco in a hand-rolled cigarette is heavily dependent on the smoker who rolls that cigarette. An uneven amount of tobacco for each type of cigarette produced 9.9-21 mg tar and 0.9-1.8 mg nicotine¹⁵⁰, compared to 11 mg tar and 0.9 mg nicotine produced by a Marlboro with filter. According to this reason, the reliability of pack-year smoking, as a predictor variable of clinical attachment loss, was questionable. A practical and feasible index of measuring tobacco consumption is needed for the north-east Thai rural population and other populations which use hand-rolled cigarettes.

The data on socioeconomic status is another issue that needs to be addressed. According to the research findings, people with different educational levels and occupations show no statistical difference in oral health status. Moreover, the directions of the relationship between financial variables and severity of oral diseases are unclear. These findings differ from studies in industrialised countries where income inequality, education inequality and social class (categorised by occupations) play a very critical role in determining health and oral health ^{95-96, 151}. Two reasons could explain these different findings. Firstly, the majority (more than 80%) of participants were categorised into one occupational group: small scale farmers and also one educational level: 6 years or fewer school education, which means it is less likely to find the statistic difference between

groups with heavily uneven distributions like in this study. Secondly, categorising people by socioeconomic status may not compatible with the north-east Thai rural community context of primary agricultural communities. The concept of socioeconomic status was developed in the industrialised societies where most of people's income is from their salary and social class is well-defined¹⁵². The income and occupation level of Thai rural people may not reflect their well-being because they live in rich environmental resource areas and primary social and family bonds still exists.

Small scale farmers have no routine monthly income; most of the income is from product sold after harvesting each year. Moreover the product price always varies every year. Therefore, it is more likely that an unreliable financial status would have resulted if this research had asked about the monthly/annual income from the participants. Instead of income, this research explored financial variables in terms of household annual saving, household property and household debt. However, these questions seemed to be a sensitive issue for many participants. The number of people who didn't want to answer those three financial questions ranged from 10% to 23%. This could be one of the reasons that the associations between financial variables and oral health outcome variables were weak. In order to gain more understanding of financial status in Thai rural people, a more accurate and less intrusive financial status measurement is needed.

5.4 Findings discussion

Although Thai social capital variables, found in the qualitative study, covered a wider range of characteristics compared to the traditional social capital, some intersection between them could be observed. Trust in community leaders, trust in younger generations, characteristics of community groups, the peacefulness of the community and community networks could be considered as the social capital variables, in the traditional definition, used in this study. Considering only these questions, no variation of the answers were found. For example, more than 80% of the participants responded "agree" or "strongly agree" for the questions "I trust my community leaders", "My community is peaceful" and "Most of my community groups or organisations are effective". It can be claimed that, according to the traditional social capital definitions, almost all of the participants were in the high social capital group. Similar findings could be found in Gray et al. study of Thai elderly happiness. They found small proportion of

respondent concerning negative trust and relationship with their neighbours¹¹⁸. The Thai social capital, found in this study, revealed more social characteristics of the participants. The high proportion of the responses "neutral" or "disagree" could be in several questions such as "I always record my financial expense", "I have secure natural resources", and "I have a reliable welfare when I'm getting older". It can be claimed that the findings of these characteristics contributed to a more understanding of social determinants of oral health for Thai north-east rural communities.

Considering each item of Thai social capital questions, presented in Table 4.15 to Table 4.17, several concerns should be discussed. Firstly, the heavy farm chemical contamination in food is of concern. Even the majority of farmers themselves could not avoid having chemical contaminated food. Secondly, the national campaign to promote household financial records (mentioned in the qualitative findings) could claim their initial achievement. More than 15% of the participants answered "agree" or "strongly agree" to the question "I always record my financial expense". Thirdly, the micro-finance or community bank in the research area was widely accepted by the people. And lastly, as mentioned in previous paragraph, the issue of trust in authorities, leaders and neighbours were not a major problem reported by most of these participants. However, a minor concern for the young generation and environmental depletion could be observed. Comparing to other social capital study findings from industrialised countries, the issue of trust and reciprocity or the interaction between people are the major concerns¹⁵³⁻¹⁵⁶. In conclusion, the issue of trust, or the interaction between people, were not the major concerns in north-east Thai rural communities. Rather, the interaction between people and their environment were showed to be the issues that need to be addressed.

This research provided insightful perspectives of Thai local community. According to the results, it stated the importance of locally-specific community characteristics. This study confirmed the existence of locally specific social determinants of oral health. By ignoring the locally and culturally specific variables and focusing only on the wellestablished social determinants a researcher could miss the chance to address oral health problems from various perspectives according to the communities' contexts.

This research design selected participants according to their Inpaeng membership, they were categorised, in the randomization stage, into Inpaeng and Non-Inpaeng participants. Because the Thai social capital variables were based on the desirable characteristics of Thai villagers suggested by Inpaeng network, Inpaeng participants were expected to have higher Thai social capital score compared to Non-Inpaeng participants. However, the result showed that non-Inpaeng participants had same Sufficiency and Sustainability group distribution as Inpaeng participants. It can be inferred that the influence of Inpaeng membership showed in the domain of Survival. The characteristics in Sufficiency and Sustainability domains could be considered as the general desirable characteristics for Thai rural villagers that can be promoted not only via Inpaeng's activities but also via several social norms and social movements. Apart from the food security which is the main characteristic in the Survival domain, several Thai social capital characteristics could be influenced by general social norms and national social campaigns. For example, the practicing of Buddhist five precepts and the attending in the religious ceremonies were perceived as the rural social norms while the household financial recording has been promoted by the Thai government hosted by Bank for Agriculture and Agricultural Co-operatives (BAAC) commencing in 2006¹⁵⁷.

Females outnumbered male participants by 20%. The gender response difference could be expected in the north-east communities as males are more likely to move to work in city areas.

The oral disease prevalence and severity were consistent with other research studies. Compared to the latest Thai National Oral Health Survey, this survey found that people in a similar age group showed the same severity of dental caries experience but research participants had slightly more periodontal problems³¹. Compared to studies from industrialised countries, the research participants showed much greater social impact of oral health^{54, 140, 148}. However, the high mean OHIP severity score finding from this study was also consistent with the study that was conducted in Malaysia⁶⁸.

The bivariate findings confirm that self-rated oral health is strongly related to oral diseases and oral health related quality of life. This finding is supported by several studies such as Sanders et al.¹⁵⁸, Wamala¹⁵⁹ and Peek¹⁶⁰. It can be proposed that the self-rated oral health can be used as an outcome variable in Thai rural communities. The self-rated oral health mirrored not only people's perceptions of their oral health, but also the severity of their oral diseases. Because the self-rated oral health data collection is

feasible, it can be easily fit in the studies are unable to collect the clinical oral health examination data.

The association between Thai social capital and oral disease severity was not statistically significant. However, the association between Thai social capital and people's oral health related quality of life persisted even after adjusting for the effect of several covariates. It can be concluded from these findings that Thai social capital influences how people feel about the diseases rather than the disease itself. In other words, Thai social capital works through psychological pathway rather than physiological and behavioural pathway of promoting health.

According to the bivariate analysis, several inverted-U relationships can be observed as the relationship between Thai social capital and oral health outcomes. The effect of Thai social capital was unclear for the people with low and moderate Thai social capital. However, people in the highest group of Thai social capital always had the best oral health condition. Unlike financial capital, social capital may affect the health/oral health outcome in a non-linear direction. This may be due to the negative effects of social capital. One of its negative consequences, as suggested by Portes⁸ was the restrictions on individual freedom. According to this idea, strong social bonds could constrain rather than facilitate people to health pathways.

Some variables found in other studies that play an important role in determining oral health showed no effect in this study. The use of Fluoride toothpaste was not associated with the severity of dental caries. As shown in several studies by Do et al.¹⁶¹⁻¹⁶³, two important missing variables need to be explored for evaluating the effect of fluoride toothpaste and the prevalence of dental caries. Those variables are the concentration of fluoride in drinking water and exposure period to fluoride toothpaste.

According to OHIP items, two items explained most of the impact of oral health problems on eating: had to interrupt meals because of problems with teeth, mouth or dentures and uncomfortable to eat any foods. These items were found as the most frequent social impact of oral health. These findings were could be easily understand if one knows the characteristic of Isaan dishes. Most of the time Isaan (North-east) people have glutinous rice as the main source of carbohydrate. They hand-roll the glutinous rice and dip it in chilli paste accompanied with fish and fresh vegetables. Therefore, it is very easy for these kinds of foods to get stuck in the tooth spaces. An OHIP domain, measuring handicap as the impact of oral health, had the lowest frequency. These findings also is similar to that found in Australian, British¹⁴⁰ and Japanese¹⁶⁴ studies.

The use of herbs, in self-health care and as the alternative to health services, shown in Table 4.8, Table 4.9 and Table 4.20, were widely accepted. This could be claimed to be an achievement of the Inpaeng program. The training courses of Thai traditional medicine that have been implemented continuously for several years accompanied with the free support of herb seedlings from Inpaeng network could be the major factors that contribute to the herbal medicine use. Moreover, the Ministry of Public Health's policy of registering herbal medicine masters (or herbalists) and the quality control of herbal medicine products could also be a factor that promotes the safe use of herbal medicine and herbal medicine practice.

The village population and proportion of Inpaeng members in the Tambon played some roles of influencing the association between Thai social capital and participants' oral health related quality of life. This finding highlighted the role of community-level variables in Thai rural communities. Four contextual variables were collected. There are several other contextual variables that are always collected by health centre and Tambon Administrative Organisations. The community-level data such as percent of political voting, crime rate and land holding could be very useful in explaining social capital of the community. It is recommended for the future exploration of Thai social capital to include these variables and analyse them as an oral health contextual effect.

5.5 Contribution of this research to the field of community oral health

Four issues could be considered as research contribution to the field of oral public health. These issues are:

1) Thai social capital could be a determinant of oral health in contemporary Thai rural communities.

An association between people's oral health-related quality of life and Thai social capital was found. This indicated the role of locally specific social variables that could determine oral health. Generally, socioeconomic status is the most commonly used social variable. However, for communities where people shared the same socioeconomic status like north-eastern Thai rural communities, the study of socioeconomic status may not be enough in understanding people's health gradient. Findings from this research suggested that locally and culturally specific variables played an important role in determining oral health. It also suggested that the knowledge gained from studies conducted in the industrialised countries may not be fully compatible with non-industrialised communities.

Rather than unrealistically suggesting the promotion of Thai social capital to benefit people's oral health, this research should be regarded as additional evidence to support the concept of social determinants of oral health. Because the general approach of social determinants of oral health that focus mainly on socioeconomic variables was not compatible with Thai rural communities, this study proposed locally and culturally compatible social variables that might act as social determinants of oral health.

More than thirty percent of the Thai dentist labour force work for people living in rural communities³⁰. The findings from this research may introduce the idea of locally specific social determinants of oral health to them.

2) This research is the very first community dentistry research done in Thailand that used the qualitative-quantitative integrated approach.

Some qualitative studies exploring oral health issues have been done in Thailand. The qualitative studies address the problems of illegal dental practitioners¹⁶⁵, the sociocultural context of hill tribes¹⁶⁶, or even the orthodontic treatment as a fashion trend¹⁶⁷. Several cross-sectional oral health survey studies, exploring the association between general variables and oral health status could also be found^{33, 35-36, 44}. However, no published studies applied the qualitative and quantitative integration approach as the method of study. This study could be the first study in the Thai community that found Thai specific variables and linked them to oral health.

Every community hospital has its own oral health promotion program. Community oral health care workers may use the method of qualitative-quantitative approach proposed in this study to gain more understanding of their own communities. More practical and culturally appropriate oral health promotion programs could be initiated based on knowledge gained by the qualitative-quantitative approach.

3) This research confirmed the influences of major risk factors of oral diseases in Thai rural population.

The research findings confirmed the associations between well-known variables and oral health status in Thai rural communities.

This study recognised the oral health checkups for its positive associations to dental caries experience. It also confirmed the brushing frequency (once a day or more) as a major variable associated to periodontitis. It can be concluded that these major variables play their roles in determining oral health regardless of Thai local and cultural issues. The findings also suggested the influence of cultural and locally specific characteristics that weaken or eliminate the effects of some well-known oral health variables, such as occupation, self-perceived social standing and health-oral health insurance (types of health care cards) in Thai rural communities.

4) This research is the first study ever use of the OHIP-14 Thai version to explore oral health-related quality of life in the Thai population.

The OHIP-14 Thai version gave the option of measuring oral health-related quality of life in the Thai population. Before 2008, all Thai studies measuring OHRQOL were done by the Oral Impact on Daily Performances (OIDP)^{42, 44, 48, 50}. While OIDP extensively measures a domain: disability in terms of physical, psychological and social aspects of daily performances, OHIP measures seven domains that cover functional limitation, physical discomfort, psychological discomfort, physical disability, psychological disability,

social disability and handicap. Applying the OHIP-14 Thai version, researchers are able to explore several domains that have not been studied in Thai population¹⁶⁸.

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Appendices

Appendix I





The Thai social capital as a social

determinant of oral health

Protocol for Oral Epidemiological Examinations

ARCPOH 2007

Thai social determinants of oral health

Protocol for Oral Epidemiological Examinations

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Introduction

Aims of the Survey

The aim of this survey is to describe levels of tooth loss, dental decay and gum disease in the research participants. It also collects the data acquired from questionnaire.

Methods and sampling of study participants

"Thai social determinants of oral health" is a cross-sectional study of a random sample of Thai residents aged 35 years or older. This is a research project of Sutee Suksudaj, supervised by Prof. Gary D Slade, Assc. Prof. Kaye Roberts-Thomson and Dr James Taylor, the University of Adelaide's Australian Research Centre for Population Oral Health (ARCPOH) and school of Anthropology.

Households in 70 Tambons (Thai sub-district) in northeast Thailand are subjects for a random selection. Within each Tambon, households were labelled in two groups, the test group and the control group. The test group are households that registered as members of INPAENG network (a network that promote a self-sufficient lifestyle). The control group are households that are not registered.

All 70 Tambons are categorized into three strata according to the time period of being registered as INPAENG members. Randomly generated numbers are used to select four Tambons from each stratum, three as targeted Tambons and one as reserved Tambon. Totally, this study will focus on nine targeted and four reserved Tambons.

Within each targeted Tambon, every household from test group is selected and same amount of households from control group are randomly selected. Within each household, every illegible resident will be examined.

The reserved Tambons are targeted Tambons additions or replacements in case of any unexpected circumstances.

For those residents providing consent, they will be asked to complete a self completed questionnaire about their oral health, dental care, and socio-economic circumstances and social determinants.

Study participants (SP) who complete the questionnaire will be asked to have an oral epidemiological examination in which levels of tooth loss, dental decay and periodontal (gum) status will be recorded by a dental clinician using standardized epidemiological criteria.

Data collection methods

Self-completed questionnaire

Sampled study participants will be invited to fill in an eleven pages questionnaire survey and those who agree will be asked about oral health status, oral health behaviour, oral health-related quality of life, general health status and behaviour, psychological health, social capital, and socio-economic characteristics. Subjects' agreement to participate in both data collecting methods (questionnaire and oral epidemiological examination) will be obtained by signing in a consent form.

Oral epidemiological examinations, including biological samples

Interviewed study participants will be asked to undergo an oral epidemiological examination that will be conducted by a qualified and registered dental clinician who will be trained and calibrated in survey procedures. Examinations will take approximately 20 minutes and will record tooth loss, dental decay history and periodontal (gum) status using standardized criteria defined for oral epidemiological studies. Dental mirrors, explorers and periodontal (gum) probes will be used to record oral epidemiological indices. Infection control guidelines published by the relevant State/Territory public dental services will be used. Prior to periodontal assessments, subjects will be questioned by examiners to determine if the subject has any medical contra-indications to periodontal probing (eg. to exclude subjects susceptible to subacute bacterial endocarditis). SP who reports any such contra-indications will be excluded from periodontal probing. Examinations will be conducted at Tambon health centre facilities. No x-rays will be taken and no treatment will be provided. SPs will be informed of any conditions that, in the examiner's opinion, require a dentist's diagnosis and/or treatment, and advised of its urgency.

Purpose of this Manual

This Manual provides you a general description of the study. It also provides an overview of the tasks that the staff involved will be expected to perform during the survey. The main part of the Manual consists of oral examination procedures, diagnostic coding systems and diagnostic criteria to be used in this survey.

Conventions used in this Manual

Study participant – not patients: In this Manual and during the survey we use the term Study Participant (SP) to refer to people who participate in the study.

Each section is described in three sub-sections:

- Clinical procedures
- Diagnostic codes
- Diagnostic criteria

Hierarchy of diagnostic codes

For many observations being recorded in this epidemiological examination, two diagnostic codes may co-exist but there is space to record only one condition.

If it is certain that two diagnoses co-exist, record the code that is listed higher in the hierarchy of listed codes.

For example, an occlusal surface may have a fissure sealant and decay.

• In this example, decay is listed above fissure sealant in the diagnostic codes, so the examiner would call **D** for decay. What to do if the examiner is uncertain about the diagnosis

For example, there may be some signs of early coronal decay, but examiner is not certain that cavitation has occurred.

If it is uncertain whether a condition meets the criteria for one diagnosis or another, select the diagnosis that is listed lower in the hierarchy of listed codes.

What to do if the examiner can't determine the appropriate code

If, after consulting this protocol, one cannot determine how to correctly code a condition, you record a call of X for that part of the examination, and type a description of the condition into the computer. Space is provided for each page of the examination for the examiner to record any such findings or to make additional comments if you believe they are necessary.

Protection of human subjects and ethical conduct of research

This section is an excerpt from "National Statement on Ethical Conduct in Research Involving Humans" published by the National Health and Medical Research Council (Commonwealth of Australia 1999)

The primary purpose of this Statement of ethical principles and associated guidelines for research involving humans is the protection of the welfare and rights of participants in research. The ethical and legal responsibilities which researchers have towards participants in research reflect basic ethical values of integrity, respect for persons, beneficence and justice.

INTEGRITY, RESPECT FOR PERSONS, BENEFICENCE AND JUSTICE

1.1 The guiding value for researchers is integrity, which is expressed in a commitment to the search for knowledge, to recognised principles of research conduct and in the honest and ethical conduct of research and dissemination and communication of results.

1.2 When conducting research involving humans, the guiding ethical principle for researchers is respect for persons which is expressed as regard for the welfare, rights, beliefs, perceptions, customs and cultural heritage, both individual and collective, of persons involved in research.

1.3 In research involving humans, the ethical principle of beneficence is expressed in researchers' responsibility to minimise risks of harm or discomfort to participants in research projects.

1.4 Each research protocol must be designed to ensure that respect for the dignity and well being of the participants takes precedence over the expected benefits to knowledge.

1.5 The ethical value of justice requires that, within a population, there is a fair distribution of the benefits and burdens of participation in research and, for any research participant, a balance of burdens and benefits. Accordingly, a researcher must:

(a) avoid imposing on particular groups, who are likely to be subject to over researching, an unfair burden of participation in research;

(b) design research so that the selection, recruitment, exclusion and inclusion of research participants is fair; and

(c) not discriminate in the selection and recruitment of actual and future participants by including or excluding them on the grounds of race, age, sex, disability or religious or spiritual beliefs except where the exclusion or inclusion of particular groups is essential to the purpose of the research.

1.6 The proportion of burdens to benefits for any research participant will vary. In clinical research, where patient care is combined with intent to contribute to knowledge, the risks of participation must be balanced by the possibility of intended benefits for the participants. In other research involving humans that is undertaken solely to contribute to knowledge, the absence of intended benefits to a participant should justly be balanced by the absence of all but minimal risk.

CONSENT

1.7 Before research is undertaken, the consent of the participants must be obtained.

The ethical and legal requirements of consent have two aspects: the provision of information and the capacity to make a voluntary choice. So as to conform with ethical and legal requirements, obtaining consent should involve:

(a) provision to participants, at their level of comprehension, of information about the purpose, methods, demands, risks, inconveniences, discomforts, and possible outcomes of the research (including the likelihood and form of publication of research results); and

(b) the exercise of a voluntary choice to participate.

Where a participant lacks competence to consent, a person with lawful authority to decide for that participant must be provided with that information and exercise that choice.

1.8 A person may refuse to participate in a research project and need give neither reasons nor justification for that decision.

1.9 Where consent to participate is required, research must be so designed that each participant's consent is clearly established, whether by a signed form, return of a survey, recorded agreement for interview or other sufficient means.

In some circumstances and some communities, consent is not only a matter of individual agreement, but involves other properly interested parties, such as formally constituted bodies of various kinds, collectivises or community elders. In such cases the researcher needs to obtain the consent of all properly interested parties before beginning the research.

1.10 The consent of a person to participate in research must not be subject to any coercion, or to any inducement or influence which could impair its voluntary character.

1.11 It is ethically acceptable to conduct certain types of research without obtaining consent from participants in some circumstances, for example, the use of de-identified data in epidemiological research, observational research in public places, or the use of anonymous surveys.

1.12 A participant must be free at any time to withdraw consent to further involvement in the research. If any consequences may arise from such withdrawal, advice must be given to participants about these before consent to involvement in the research is obtained.

Armamentarium and infection control

The dental team is responsible for having all necessary armamentarium ready for examinations.

Paperwork and office supplies

This Examination Protocol, including laminated "cheat sheet" of codes

Laptop Manual and "cheat sheet" of keyboard shortcuts

Street Directories and Maps

Pens, indelible marker pen, scissors

Blank A4 paper for printer

Extra information sheets (for those who did not receive them)

Large-print information sheets (for those who cannot read normal font)

Consent forms

Medical history forms

Dental Inspection report form

Paper forms for data entry (emergency use only)

Folders for completed documents

Equipment

Laptop computer

Printer

Extension cord and power board

Examination instruments

Protective glasses for study participants

Mouth Mirror

Michigan William periodontal probe

Tweezers

Examination supplies

Examiner's mask, gloves, eye protection

Gauze, cotton rolls

Infection control supplies (containers, trays, bags, Roar, detergent etc)

Headlamp

Gift packs

Gift packs for SP who finished the research data collection procedure

Infection control guidelines

The Infection Control procedures must conform to "Infection control guidelines for the prevention of transmission of infectious diseases in the health care setting" amended 19 September 2002 accessible at

http://www.health.gov.au/pubhlth/strateg/communic/review/icg_pdf/icg_guide.pdf

Generally, the Infection Control procedures must follow the State/Territory Infection Control Guidelines in every jurisdiction. This section provides general guidelines and guidelines which are specifically for particular equipment used in this survey. Standard precautions for infection control apply.

Table 71: Standard precautions for infection control in health care settings

- Aseptic technique, including appropriate use of skin disinfectants
- Personal hygiene practices, particularly hand washing before and after patient contacts
- Use of personal protective equipment, which include gloves, masks and eye protection
- o Appropriate handling and disposal of sharps and other clinical waste
- Appropriate reprocessing of reusable equipment and instruments, including appropriate use of disinfectants
- Environmental controls, including design and maintenance of premises, cleaning and spills management

Sterilisation of reusable instruments

Sterilisation of examination instruments (periodontal probes, tweezers, and mouth mirrors) should follow guidelines for instrument sterilisation. Used instruments must be sterilised after the oral examination when and where applicable.

If the oral examination session is in a clinic with sterilisation equipment, cleaning and sterilisation of instruments can be performed on site. If no sterilisation facility available on site, the coordinator and the dental team must nominate the most convenient facility for sterilisation. Time and transport for returning and picking up instruments must be included in planning the working day.

Transport of instruments

The probes, tweezers and mouth mirrors are to be bagged and sterilized together in the sterilisation facility. The best option is to bag together one probe, tweezers and mouth mirror. They will be transferred to the clinical examination site in a lidded plastic container marked as "CLEAN". Dirty instruments will be returned to the defined sterilisation site in a lidded plastic container marked "DIRTY".

Separate storage containers are to be used for consumables and non-consumables. Consumables will be stored in large covered crates for transfer to the clinical examination site.

On site

The tables for instruments and consumables are wiped clean with detergent.

Instruments will be left unopened until SP arrives. Instruments are picked up by gloved examiner as needed.

Infection control procedures

The dental examiner and recorder are responsible for the infection control procedures described in this section and/or State/Territory infection control guidelines.

Prior to the examination

The following must be completed prior to the start of each session:

- All contact areas (chair; syringe and syringe holder; light; mounted bracket tray; chair control unit) must be wiped with paper towel with disinfectant.
- $\circ~$ The tray must be disinfected with a disinfectant solution before arranging the instruments and supplies for the session use.
- Cover the bracket table with paper tray and place clean instruments on that.
- The examiner must wear a facemask, safety glasses, and a new pair of examination gloves for each SP examination.
- Only properly sterilised instruments are to be used for dental examination.

After each examination

The sequence of procedures for maintaining infection control between SP examinations is as follows:

- \circ $\;$ Used instruments will be deposited in the used instrument container.
- Used consumables are disposed in clinic wastage bag.
- $\circ~$ Reusable instruments are put into plastic container marked as DIRTY for later cleaning and sterilisation
- All contact areas (chair; syringe and syringe holder; light; mounted bracket tray; chair control unit) must be wiped with paper towel with disinfectant.
- SP protective glasses must be wiped with disinfectant.

Procedures before the examination

Scheduling of appointments

Examination team will identify health centre locations and schedule examination sessions. It will be the researcher's responsibility to make appointments for study participants to attend those scheduled sessions.

Duties of examination teams

Prior to commencement of each session, the dental team is responsible for:

- Transporting equipment, instruments and supplies to the examination facility
- Setting up the examination area
- Check all equipment, instruments and supplies
- Making sure enough supplies are available for the session. A full session is quite busy and there may be no time to resupply

Sequence of procedures for each examination

- 1. Welcoming SP and asking them to complete consent form and medical history
- 2. Finding and opening the SP's examination form on the laptop computer
- 3. Reviewing completed medical history and recording selected items on laptop computer
- 4. Conducting the nine components of the examination (subject to SP's age and consent):
 - Removable Denture Assessment (Section Chapter 5066944)
 - Oral Mucosal Tissues Assessment (Section 0)
 - Tooth presence (Section 0)
 - Plaque, calculus and gingivitis (Section 0)
 - Periodontal destruction (Section 0)
 - Coronal and root caries/restorations
- 5. Informing study participants of the findings from the survey and discharging the SP (Section 0)

Items 1-3 are described in the remainder of this section.

Welcoming study participants

When subjects arrive at the clinic, introduce the examiner, verify with the SP that he/she is attending for this study, and establish their name. Check their name against the appointment schedule. Enquire whether or not the SP received the mailed survey information sheet and hand them the following forms:

- survey information sheet if required by SP
- consent form

Consent form

Confirm that the consent form has been completed. The dentist or recorder should complete the declaration at the bottom of the form and sign as witness.

Reviewing medical history to determine medical contraindications to periodontal probing

A positive response to any of the following questions should be queried and confirmed with SP by the dentist. Subjects who confirm any of the following medical conditions queried on the front page of the questionnaire <u>must not</u> undergo gingival or periodontal assessments:

Q1: SP must ALWAYS take antibiotics before routine dental care

Q2a Congenital heart murmur

Q2b Heart valve problems

Q2c Congenital heart disease

Q2d Bacterial endocarditis

Q3 Rheumatic fever

Q4 Kidney disease requiring renal dialysis

Q5 Hemophilia

Q6 Pacemaker or automatic defibrillator

Q7 Other artificial material in your heart, veins or arteries

Q8 Joint replacement in last three months

Q9 Transplanted organs

Note that subjects are <u>not precluded</u> from periodontal probing if they respond positively to angina or heart attack in the absence of any of the other conditions listed above.
After reviewing these questions on the front page of the questionnaire, the examiner must mark and initial one of the two check-boxes on the back of the form to indicate whether or not periodontal assessment is contraindicated.

Equipment and bracket table setup

For each study participant, set up the following equipment, instruments and supplies:

- Protective glasses for study participant
- Michigan William periodontal probe
- Tweezers
- Examiner's mask, gloves, eye protection
- Gauze and cotton rolls
- Two Cotton swabs
- Plastic container for dentures (if SP wears dentures)

Positioning of SP and examiner

The subject should be in a supine position for the examination with the examiner at the 12 o'clock position.

Rule for recording

Do not leave any blanks: any dentures, all teeth, all surfaces of both crown and root, all sites for periodontal assessment, fluorosis, tooth wear should be recorded. If that is not possible, record reason in the Comment box.

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Removable Denture Assessment

Clinical procedures

- Ask SP "Are you wearing any dentures today?"
- If SP is wearing denture(s) ask that he/she remove them
- Identify whether each denture is a full or partial denture, then ask SP to place denture(s) in plastic container.
- Place the container on the bracket table may need to refer to partial dentures when coding tooth presence.

Diagnostic codes

Call one code for each arch:

- **F** SP is wearing a full denture
- **P** SP is wearing a partial denture
- **X** None of the above (eg. no dentures, or dentures not worn to examination)

Diagnostic criteria

The denture assessment is limited to removable prostheses.

A full denture is defined as one that replaces all teeth in the arch, whether or not it has 16 teeth.

A denture with full coverage is still coded as a full denture, even if it overlays one or more prepared root abutments, tooth roots, implants, or partially erupted teeth.

A partial denture is defined as one that does not replace all teeth in the arch, and which therefore has gaps to accommodate natural teeth, whether or not those partial teeth are still present. For example, if a partial denture was originally constructed to replace all but the canine teeth, and both canine teeth had since been extracted without any addition to the denture, it would still be coded as P.

Do not attempt to evaluate the quality of the dentures.

Oral Mucosal Tissues Assessment

Clinical procedures

Using the mouth mirror and gauze to help retract tissues, visually examine the lips and intra-oral mucosa:

- **Lips** should be examined with the mouth both closed and open. Note the colour, texture and any surface abnormalities of the vermilion border.
- Labial mucosa and sulcus. Examine visually the mandibular and maxillary vestibule and frenum with the mouth partially open. Observe the colour and any swelling of vestibular mucosa and gingiva.
- **Commissures, buccal mucosa and sulcus (upper and lower).** Using mouth mirror as retractor and with the mouth wide open, examine the entire buccal mucosa extending from the commissures and back to the anterior tonsillar pillar. Note any change in pigmentation, colour, texture and mobility of the mucosa, make sure that the commissures are examined carefully and are not covered by the mouth mirror during retraction of the checks.

Alveolar ridges. Check from all sides (buccally, palatally, lingually).

Tongue. With the tongue at rest and mouth partially open inspect the dorsum of the tongue for any swelling, ulceration, coating or variation in size, colour or texture. Also, note any change in the pattern of the papillae covering the surface of the tongue. The SP should then protrude the tongue and the examiner should note any abnormality of mobility. With the aid of mouth mirror, inspect the margins of the tongue. Then observe the ventral surface.

If adequate precautions can be taken by the examiner, the tongue can be examined more efficiently by grasping the tip with a piece of gauze to assist full protrusion and to aid examination of the margins.

- **Floor of the mouth.** With the tongue still elevated, inspect the floor of the mouth for swelling or other abnormalities.
- **Hard and soft palate.** With the mouth wide open and the SP's head tilted backward, gently depress the base of the tongue with a mouth mirror. First inspect the hard then the soft palate.

Diagnostic codes

Call up to two codes for each subject. If a subject has no oral mucosal conditions, record "X" in both boxes on the computer.

- 1 Suspected malignant tumour (oral cancer)
- 2 Ulcerated lesions (aphthous, herpetic, traumatic)
- **3** Any other oral mucosal lesions
- X None of the above (eg. healthy oral mucosa)

Diagnostic criteria

Code 1: Suspected malignant tumour (carcinoma)

This is only a provisional diagnosis. The carcinoma may develop in a white patch (an area of leukoplakia) or in a red area (an erythroplakia) but many carcinomas arise in an area of mucosa that previously appeared normal.

Except in some early and small lesions, there is usually induration – the tissue feels firm and thickened – either throughout the lesion, or at the margins if there is ulceration. Where the tumour occurs on a mobile part of the mucosa, there may be fixation and loss of mobility because the tumour has involved the deeper tissues.

The appearance of the surface of the tumour is very variable: it may be relatively smooth and white or red, but commonly the surface is nodular or ulcerated and the ulcer may have a raised rolled margin. In the later stages there may be a soft fungating mass that bleeds readily.

If this provisional diagnosis is made, refer SP for urgent dental care

Code 2: Ulceration (aphthous, herpetic, traumatic)

Ulceration is defined as a break of the oral mucosa. The clinical appearance of ulcerations shows great variation. The most common form is minor aphthae. There are typically 1–4 ulcers in each attack. These are usually confined to the non-keratinised parts of the mucosa. The ulcers are shallow, but painful. Herpetic ulcers are characterised by a large number of small shallow ulcers occurring in any part of the mucosa. Although each individual ulcer may not exceed 2 mm in diameter, groups of ulcers may coalesce to form compound ulcers with irregular outlines.

Code 3: Any other oral mucosal conditions

This would include any white-coloured lesions (eg. Candida, lichen planus white or red patches that are not ulcerated, angular cheilitis that is not ulcerated, denture hyperplasia)

Plaque, calculus and gingivitis

Clinical procedures

Up to six index teeth are assessed:

- The most anterior molar in each quadrant (up to four teeth);
- Tooth 11
- Tooth 31

Hence, the first molar is used or, in its absence, the second molar, or in the absence of both, the third molar. However there is no substitution for either of the incisors. When an index tooth is not available (eg. it is missing) mark the appropriate sextant as "X" for each index.

Each tooth is assessed for three indices: calculus is assessed first, then plaque, and then gingivitis. Assess all three indices for one tooth before moving onto the next tooth.

Attention: Check the medical history to make sure the SP is suitable for periodontal probing. If the SP is NOT medically fit for periodontal probing, assess calculus and plaque but do not assess the gingival index. In this case, the gingival index score is called as **X**.

First gently dry the index tooth and visually inspect the dried buccal surface <u>and</u> lingual surface of the crown and the root (if exposed) and call the calculus index.

Next, examine only buccal surfaces of the tooth (and root, if exposed).

- If no plaque is visible, hold the periodontal probe parallel to the buccal surface, and scrape it from mesial to distal of the tooth's buccal surface.
- If there is curvature on the buccal surface, examiner may need to reorient the probe and make a second scrape across the curved part of the buccal surface, making sure that the probe does not contact the gingival tissues.

Then call the plaque index.

Finally, hold the periodontal probe at approximately 90 degrees to the long axis of the tooth, with the tip resting on the neck of the tooth and the side of probe applying gentle pressure on the free gingival margin. Swipe the probe from the mesial to the distal of the buccal surface, applying gentle pressure to the gingival margin. <u>Do not probe to the bottom of the socket.</u>

Wait for up to 10 seconds to observe any bleeding. (Use the waiting time to dry the next index tooth prior to its assessment) Call the gingival index.

Diagnostic codes (call one code for each index tooth in the following hierarchy)

Calculus: buccal and lingual surfaces

- Y Calculus is visible
- N No calculus visible
- X Cannot be assessed (eg. no index tooth)

Plaque index: buccal surface (Loe, 1967)

Call the highest score for the tooth:

- **3** Abundance of soft matter easily visible within the gingival pocket and/or on the dried tooth and gingival margin.
- 2 Moderate accumulation of soft deposits within the gingival pocket, or on the dried tooth and gingival margin which can be seen with the naked eye.
- 1 A film of plaque adhering to the free gingival margin and adjacent area of the tooth. The plaque may be seen *in situ* only after scraping the periodontal probe on the dried tooth surface.
- 0 None of the above
- X Cannot be assessed (eg. no index tooth)

Gingival index: buccal surface (modified from Loe and Silness, 1963).

Call the highest score for the tooth:

- **3** Severe inflammation: marked redness and oedema, ulceration or tendency to spontaneous bleeding.
- **2** Moderate inflammation: redness, oedema, glazing or bleeding after applying pressure with the probe.
- 1 Mild inflammation: slight change in colour or slight oedema but <u>no</u> bleeding after applying pressure with the probe.
- **0** None of the above.
- **X** Cannot be assessed (eg. no index tooth) or SP excluded from periodontal probing.

Tooth Status

Clinical procedures

Start from the SP's upper right quadrant at the position of tooth 18; pass through maxilla to the position of tooth 28. Then continue onto the lower left quadrant at the position of tooth 38 continuing around the mandible to the position of tooth 48. Make one call for the status of each tooth position.

Diagnostic codes (call one code for a tooth and its root surface in the following hierarchy)

Μ	Missing due to any reason.
R	Root fragment includes both not decayed and decayed
D	D ecay: cavitation of enamel <u>or</u> dentinal involvement <u>or</u> both are present.
F	Filling placed to treat caries
0	Other restoration placed for reasons other than caries
S	Sound is recorded when none of the above conditions are found.
Х	Excluded

Diagnostic criteria for coronal surfaces

Decay is called if there is cavitation of enamel or dentinal involvement or both

<u>Cavitation</u> is defined as a discontinuity of the enamel surface caused by the loss of tooth substance, due to caries.

- It must be distinguished from fractures, erosion and abrasion.
- Lesions with dentinal involvement are coded D even if the lesion has hardened and appears to have "arrested".

<u>Dentinal involvement</u> is judged separately for three categories of surfaces:

- For pits and fissures, the surface is coded as decayed when opacity or discolouration indicate caries of dentine that is undermining adjacent enamel.
- For smooth surfaces on buccal and lingual surfaces: the surface is coded as decayed if the surface is etched or there is a white spot **and** if dentine seems to be involved as indicated by discolouration of dentine.
- Proximal surfaces use the same criteria as smooth surfaces. In addition, any of the following conditions can be sufficient to call proximal decay:
 - If the marginal ridge shows darkening/shadowing as evidence of caries of dentine, the surface is decayed.

Transillumination (for anterior teeth): caries in dentine may be visualised as a loss of translucency producing a shadow in a calculus free and stain-free proximal surface.

When diagnosing decay on any surface

- Staining and pigmentation are not, by themselves, sufficient evidence of caries.
- Erosion, abrasion, hypoplasia, attrition, fractures, mottled enamel and enamel opacities on exposed hard surfaces are not classified as carious.
- Suspected or apparent carious LESIONS IN ENAMEL ARE NOT TO BE PROBED TO DETERMINE THE "FEEL" OF THE ENAMEL.

Filled due to decay **(F)** is recorded when the surface contains one or more permanent restorations placed to treat caries.

Filled for other **(O)** reasons such as restorations placed to treat wear, hypoplasia and trauma, or for aesthetic reasons.

The ${\bf F}$ and ${\bf O}$ categories include restorations which have the following $\underline{acceptable}$ deficiencies

- Surface which is irregular, rough or discoloured
- Under-contouring, or faulty occlusal contact
- Mal-contouring of embrasures which can be corrected
- Minor marginal discrepancy
- Overhang which can be corrected
- Joined or repaired restorations.

Sound includes surfaces with hypoplasia, fracture, erosion and surfaces restored for aesthetic reasons.

Only one entry can be made for each tooth surface. In the event that a tooth has two or more conditions, call the condition listed highest on the list.

Nonvital teeth are scored in the same manner as vital teeth.

• If a restoration on a nonvital tooth was placed solely to seal a root canal that restoration is scored as **O**.

On molars and premolars with full coronal restorations, including abutment teeth for fixed or removable prostheses, all surfaces should be coded as **F**.

On incisors and canines with full coronal restorations, the examiner should make the determination of the reason for crown placement.

 If it can be determined that the crown was placed solely for a reason other than caries (such as fracture, malformation or bridge abutment), all surfaces should be coded as F.

Coronal surfaces which are not visible should be regarded as sound, e.g. surfaces that are covered by calculus, orthodontic bands or brackets.

Use the dental anatomical landmarks to define surfaces when a tooth is rotated.

• For example, if the mesial surface of a rotated tooth faces the palate, it is nevertheless recorded as mesial.

Diagnostic criteria for tooth loss

Do not try to determine the reasons for tooth loss. Use only the M codes for all participants.

• If a tooth has been extracted, and drifting of adjacent teeth has closed the gap, the extracted tooth must be coded as **M**

M codes can be called only for anatomical tooth positions: if a gap has opened up due to a tooth drifting from its neighbour, do not call any codes for the gap that is left, even if the gap has a prosthetic replacement.

A "root fragment" is defined as a fragment where the natural and/or restored coronal tissues comprise less than one quarter of the original coronal structure (see Figure 2).

34 has a large restoration but together the natural and restored structure replaces the entire crown	33 has a root fragment that has been capped for an overlying denture, but the capping represents less than one quarter of the original coronal structure	34 has caries that has left less than one quarter of the crown intact
Call 34 = O	Call 33 = R	Call 34 = R

Figure 2: Examples of calls for root fragments

Fused or geminated teeth should be recorded as a single tooth position.

Supernumerary teeth should be omitted.

If both a deciduous and its associated permanent tooth are present, ignore the deciduous tooth and record the permanent tooth only.

When code M or R is recorded as tooth status, the code X is needed to fill in every remaining box for that tooth.

Diagnostic criteria for root caries

Clinical procedures

Diagnosis of root decay is different from that for coronal decay and requires the use of the periodontal probe, because textural changes are used in the diagnosis.

Examiner will get some indication of the texture by dragging the probe across the root surface and gently feeling for any softness.

Do <u>not</u> try to push the tip hard into the dentine.

Start at the Mesial surface and then move on to Buccal, Distal, Lingual surfaces.

Diagnostic codes (call one code for a root surface in the following hierarchy)

- D Decay: a discrete, well-defined or discoloured lesion on the root surface that is soft to exploration using the periodontal probe.
- F Filled root surface that contains one or more permanent restorations placed for any reason.
- **S** Sound root surface that is visible and has none of the above conditions.
- Nv No visible root surface.

Diagnostic criteria

Decay is called if there is a lesion that is soft to exploration using the periodontal probe

Normal cementum is softer than enamel, and frequently will yield to pressure from the tip of a probe. Areas of root caries, however, are softer than surrounding cementum; therefore, it is possible to differentiate sound cementum from carious cementum based on tactile sense. In some incipient lesions the carious area of the root surface may merely be discolored without cavitation, but the area will be soft to probing. Carious lesions in root surfaces may be yellow/orange, tan, light brown, or black.

Cavitation with jagged margins and a roughened, but soft floor or base usually occurs in advanced lesions.

Arrested lesions that are hardened on probing are coded as **S**ound, even if the lesion is cavitated.

Additional notes assessment of coronal and root surface lesions:

If both the coronal and root surfaces are affected by the same carious lesion or restoration, use the ONE MILLIMETER RULE to determine the coding.

- If at least one millimetre of the lesion or restoration is coronal to the CEJ, it is coded for the coronal surface.
- If at least one millimetre of the lesion or restoration is apical to the CEJ, it is coded for the root surface.
- If the lesion or restoration extends at least one millimetre onto both coronal and root surfaces, code both surfaces

If there is recurrent caries at the margin of a filling extending at last one millimeter onto coronal and root surfaces, code **R** for the surface with recurrent caries and **Fr** for the other surface.

Periodontal destruction

Attention: Check the medical history to make sure the SP is suitable for periodontal probing. If the SP is NOT medically fit for periodontal probing, skip this section of the examination

Clinical procedures

Teeth that are charted as **P**resent, other than third molars, are to be assessed for periodontal destruction. Other teeth will automatically be blanked out in the Periodontal screen by the computer and must not be assessed.

Take particular care not to probe periodontal tissues around implants.

Assess periodontal status beginning in the upper right quadrant (i.e. tooth 17, if present) and progress through the maxillary arch to tooth 27. Proceed onto the lower left quadrant at tooth 37 and continue around the mandibular arch to tooth 47.

Three sites are to be measured for each tooth:

- Mesio-buccal (M): (referred to as Mesial) adjacent to the actual or imaginary contact point of the tooth's mesial surface
- Mid-buccal (B): (referred to as Buccal) the mid point of buccal surface in single-rooted teeth and mid point of the mesio-buccal root in multi-rooted teeth.
- **Disto-buccal (D)**: (referred to as Distal) adjacent to the actual or imaginary contact point of the tooth's distal surface

Start at the mesio-buccal site, then go to the mid-buccal and finally the disto-buccal site.

For each tooth, dry the buccal surface with air and then make measurements with the periodontal probe.

For the <u>interproximal sites</u>, (M) and (D), the probe should be placed parallel to the long axis of the tooth and facially adjacent to the dental contact area. Angulating the probe into the interproximal area under the dental contact is not permitted.

For all sites, the periodontal probe is to be held with a light grasp and pointed toward the apex of the tooth.

The periodontal probe has alternating color bands, each 2mm in width. All fractional millimeter measurements are <u>rounded down</u> to the lowest whole millimeter before calling the number.

<u>Clinical Attachment Loss (CAL)</u> is measured first, and is defined as the distance from the Cemento-Enamel Junction (CEJ) to the bottom of the pocket.

First identify or estimate the location of the Cemento-Enamel Junction (CEJ) at the site.

- If the CEJ is coronal-to or equal-to the free gingival margin, identify it visually and/or using tactile sense with the tip of periodontal probe.
- If the CEJ is subgingival, identify it using tactile sense with the tip of periodontal probe. If in doubt, try to estimate position of the CEJ using adjacent or contra-lateral teeth.

Measure and call CAL in millimeters.

Probing Pocket Depth (PPD) is defined as the distance from the free gingival margin to the bottom of the periodontal crevice/pocket.

Measure and call probing depth in millimeters.

<u>Bleeding</u> is defined as the presence of blood at the gingival margin at the moment the probe is removed.

Diagnostic codes

CAL recorded in whole millimetres.

When the bottom of pockte is less than one millimetre vertically from the CEJ.

- **1 to 12** Distance in millimetres from the cemento-enamel junction (CEJ) to the bottom of the pocket.
- X When CEJ cannot be identified or base of pocket cannot be reach due to calculus

PPD recorded in whole millimetres

- **0 12** Distance from the FGM to the bottom of the periodontal crevice/pocket.
- **N** When CAL code in that point of measurement is less than 4 mm.
- X When probing depth cannot be determined (e.g. base of pocket/crevice cannot be reached due to calculus)

Bleeding recorded in Yes/No

Diagnostic criteria

The probing pressure is very light and is not to exceed 20 grams.

The tip of the probe is pointed towards the apex along the axis of the tooth. It must not be angled.

If the adjacent tooth is missing, approach the mesial and distal sites from the buccal aspect, keeping the probe in the direction of the long axis of the tooth and adjacent to the position that would have been the interproximal contact area.

If a tooth has rotated, use the original coronal anatomy to determine landmarks: e.g. if the tooth has rotated so that the crown's mesial surface faces 45° towards the palatal, measurement should still be made adjacent to what would have been the contact point on the mesial coronal surface.

If a full coronal restoration is in place use the gingival margin of the crown as the CEJ.

If a restoration covers the CEJ, estimate the location of the original CEJ.

If a measurement is more than 12 mm, record it down to 12 mm.

- If the CEJ is not visible because it is subgingival, examiner will need to estimate the position of the CEJ using tactile sense with the tip of the periodontal and/or other anatomical landmarks (eg. the estimation of coronal dimensions based on the visible portion of the crown). In these instances, estimate the distance from the FGM to the CEJ using the periodontal probe, rounding any fractional millimetres down to the lower whole millimetre. Call recession as zero or any negative number.
- If the measurement rounds down to zero, call "zero".

When measuring <u>probing depth</u> round down any fractional millimetres to the lower

whole millimetre.

• If CEJ cannot be seen or estimated, do not records CAL (coded as X) and do not record PPD (coded as X).

Additional notes:

- The sequences of recording CAL and PPD are as follow.
- First, find CEJ use criteria mentioned previously in the protocol
- Second, record CAL.
- If CAL<4mm, record code N in PPD box.
- If CAL≥4mm, record PPD in millimetres.

Completing the examination and discharging the study participant

Following the examination, the dentist must

- inform study participants of the findings from the survey
- offer and provide the study participant with a Colgate Gift pack
- review and print a paper copy of the examination recorded on the laptop computer

Informing study participants of the findings from the survey

After completing the survey examination, examiner must advise each study participant verbally and in writing of the findings.

Subjects requiring urgent diagnosis or treatment

Subjects must be referred immediately for care if they have any of the following potentially life-threatening conditions:

- A suspected malignant or pre-cancerous lesion
- Signs of systemic infection or a spreading local infection
- Other life threatening conditions, based on the clinical judgement of the examiner

In these situations, advise the subject that examiner recommend they obtain immediate attention, contact the provincial health service to arrange an appropriate referral

Subjects not requiring urgent diagnosis or treatment

For all other subjects, examiner's advice should take three forms:

- Completion and explanation of the "Dental Inspection" report form (see Appendix E). Tick at least one box in the upper part of the form, and one of the two boxes regarding suggested timing of care. Note that examiner can advise subjects to seek care immediately, even if they do not have a life threatening condition – for example, if examiner finds a tooth likely to develop pulpitis. In addition to ticking relevant boxes, provide additional explanation to the subject (eg. explain that "dental caries" means decay/cavity).
- 2. Discussion of any additional findings that examiner believe are relevant to the subject, but that are not contained on the "Dental Inspection" report form. For example, if the subject asks about prosthodontic replacement of missing teeth, examiner should endeavour to discuss their query. This does <u>not</u> mean that examiner needs to make any additional diagnoses, or even provide a specific recommendation if examiner does not have sufficient information. For example, examiner's discussion may explain that a decision about treatment needs would need to be made after undergoing a more detailed dental assessment and discussing treatment options with a dentist.

- 3. Explanation of the limitations inherent in the survey examination. It is very important to emphasize to subjects the limitations of a survey examination, including:
 - the possibility that examiner has not detected disease that is present (eg. interproximal caries, periodontitis at lingual sites), and conversely
 - the possibility that a condition that examiner has noted does not require treatment (eg. caries that a dentist may choose to control by prevention rather than fill)

This is explained briefly in the paragraph above the space for the name and

signature of the examining dentist, and should be reiterated verbally.

Additional discussions regarding treatment needs or other findings from the examination

Examiners are at liberty to discuss general aspects of oral health care and prevention of oral disease with survey participants. However, study participants are not patients of the examining dentist, and therefore survey dentists do not have the same "duty of care" that applies in a dentist-patient relationship. Consequently, there are several areas of discussion that survey dentists must specifically avoid:

- In general, avoid making specific treatment recommendations eg. advise subjects to seek care for decay rather than telling them to get a crown on a specific tooth.
- Do not give the impression that examiner has made a definitive diagnosis.
- Do not tell subjects that they should forego treatment that reportedly has been recommended by another dentist.
- Do not advise subjects to change dentists or to seek care from a specifically-named dentist.

Recording recommendations on the laptop computer

After filling in the Dental Inspection report form, record the recommendations that examiner has made on the final page of the data entry program.

Providing the study participant with a Gift pack

Subjects who complete an examination are eligible to receive an oral health care giftpack Each giftpack has an approximate retail value of \$2 and consists of:

- A toothbrush
- A toothpaste, 40g tube

Recording final outcome of examination

Record on the appointment schedule the outcome of the examination. If examiner do not complete all sections of the examination for which the SP has provided signed consent and is eligible, record this as "Partly completed" (code 2) and record the reasons in the "comments" section of the final page of the data entry program. Reasons for partial completion could include "ran out of time", "SP became uncooperative", "equipment failure" etc. If an SP does not consent to part of the examination, or is not eligible for part of the examination (eg. due to medical contraindications) but completes all other parts of the examination, record this as "Exam completed" (code 1) on the appointment schedule.

Reviewing data on the laptop computer and printing a paper copy of the examination

After dismissing the SP, review the data on the laptop computer scan for any omissions or errors. Focus particularly on any calls that were changed, or any points in the examination where the recorder and examiner had to stop because they had become unsynchronised.

Glossary of terms

ARCPOH	Australian Research Centre for Population Oral Health
CEJ	Cemento-Enamel Junction
Coronal surfaces	The surfaces of the crown of the tooth
Crown	The part of the tooth which, on a natural sound tooth, is covered in dental enamel
Dental caries/decay	A disease process that results in the demineralisation of the hard tissues of the tooth by microbial activity. The terms dental caries/dental decay or decay are used interchangeably
Dentate	Having one or more natural teeth
Dentine	The calcified tissue which form the major part of the tooth. In encloses the dental pulp, but is covered by enamel on the coronal surface
DMFT	Abbreviation of Decayed Missing and Filled Teeth. this is the sum of all natural permanent teeth in an individual mouth which are either decayed, missing or filled
Edentulous	Not having a natural tooth
Enamel	The hard mineralised outer covering the coronal surfaces of the natural tooth
Examiner	A dentist who undergoes special training and calibration to perform oral examination in the study
FGM	Free Gingival Margin
Periodontal disease	A disease of the tissue which invest and support the teeth (gum disease)
Recorder	A dental nurse who undergoes special training to assist the examiner during oral examination and to record collected data
Root	The part of the tooth not covered by enamel and which in health, is below the level of the gum. It may become exposed due to recession of the gums
SP	Study participant

Summary of codes

Removable Denture Assessment

- F SP is wearing a full denture
- P SP is wearing a partial denture
- X None of the above (eg. no dentures, or dentures not worn to examination)

Oral Mucosal Tissues Assessment

- 1 Suspected malignant tumour (oral cancer)
- 2 Ulcerated lesions (aphthous, herpetic, traumatic)
- **3** Any other oral mucosal lesions
- X None of the above (eg. healthy oral mucosa)

Tooth status

- Μ Missing due to caries/periodontal disease Absent for reasons other than Α caries/periodontal disease Root fragment R D Decayed F Filling placed to treat caries Other restoration placed for 0 reasons other than caries S Sound Х Excluded (eg. deciduous tooth) Calculus Υ Calculus is visible
- N No calculus visible
- X Cannot be assessed

Plaque index

3	Abundance of soft matter.							
2	Visible soft deposits.							
1	A film of plaque found after scraping surface.							
0	None of the above.							
х	Cannot be assessed (eg. no index tooth)							
Gingiva	ll index							
3	Marked inflammation; spontaneous bleeding.							
2	Inflammation with bleeding after pressure with periodontal probe.							
1	Slight change but <u>no</u> bleeding after pressure with periodontal probe.							
0	None of the above.							
х	Cannot be assessed.							
Bleedir	ng following periodontal probing							

(all teeth except 3rd Molars)

- Y Yes
- N No

Oral Epidemiology examination form



None of the above conditions

References

- Fejerskov O, Manji F, Baelum V (1988). <u>Dental fluorosis: a handbook for health workers</u>. Copenhagen, Munksgaard.
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- Loe H, Silness J (1963). Periodontal disease in Pregnancy: 1. Prevalence and Severity. Acta Odontol Scand **21**: 533-551.
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Appendix II: Information sheet and consent form for study participants

Information Sheet

for research participants

This research is carried out by Mr Sutee Suksudaj. He is a Master degree student of the University of Adelaide. The research data that will be collected is for his Master (and Ph D) degree completion.

The participation of this research is completely voluntary; you can withdraw at any stage and any time.

This research study aims to explore the relationship between Thai village social capital and oral health.

Researcher will give you a questionnaire that contains questions about your lifestyle, neighbours, general health and oral health. After the questions, your oral health status will be examined by a clinical oral health specialist. This aim of this examination is for data collection only; not for the purpose of dental treatment.

The data collecting process consists of a questionnaire and an oral health examination, will take 30-45 minutes.

Trained public oral health personnel will examine your oral health status.

If you have valvular heart disorders, please inform the researcher immediately.

During the oral health examination, your gums may feel as though they have been pricked with a toothpick. This may cause minor gum irritation.

Your data will be kept in secure storage and will be analysed with others. Your name and identity will be kept private. It will not be exposed to any publications of the results.

After the examination, the researcher will inform you of your oral health status, but will not be providing you with any dental treatment. You will be given a toothbrush and toothpaste as recognition for participating in this research.

For more information, please contact

Researcher: Mr Sutee Suksudaj

Faculty of Dentistry Thammasat University

Patumthani Thailand

+61 2 9869213 ext 1050

THE UNIVERSITY OF ADELAIDE HUMAN RESEARCH ETHICS COMMITTEE

CONSENT FORM FOR PEOPLE WHO ARE PARTICIPANTS IN A RESEARCH PROJECT

1.	I, (please print name)
	consent to take part in the research project entitled:
	Thai social determinants of oral health.
2.	I acknowledge that I have read the attached Information Sheet entitled:
	Information sheet for research participants
3.	I have had the project, so far as it affects me, fully explained to my satisfaction by the research worker. My consent is given freely.
4.	Although I understand that the purpose of this research project is to improve the quality of medical care, it has also been explained that my involvement may not be of any benefit to me.
5.	I have been given the opportunity to have a member of my family or a friend present while the project was explained to me.
6.	I have been informed that, while information gained during the study may be published, I will not be identified and my personal results will not be divulged.
7.	I understand that I am free to withdraw from the project at any time and that this will not affect medical advice in the management of my health, now or in the future.
8.	I am aware that I should retain a copy of this Consent Form, when completed, and the attached Information Sheet.
	(signature) (date)
WIT	NESS
	I have described to
	the nature of the research to be carried out. In my opinion she/he understood the explanation. Status in Project: Research officer
	Name:

(signature)

(date)

Appendix C: Research questionnaire

Determinants of Oral health	ıl	Austra POPU	RCP lian Researc LATION OR	POH h Centre for AL HEALTH
THE UNIVERSITY OF ADELAIDE AUSTRALIA		. (J.		
How to answer Most items are answered by ticking one box that	at best describes you	ur answer (E	xample 1).	Strongly
I was satisfied with the dental care I received.	disagree	e Neutral	Agree	agree
Others are answered by writing a number in the EXAMPLE 2	e box (Example 2).			
	No. of Concession, Name			

Part I Oral health						
A1 When did you have your last visit for	Never	More than 5 years	2-5 years	1-2 years	Less that 1 year	
dental care?	1	2	3	4	5	
A2 What was the reason for your last	Pair	1	Check up		Other	
visit?		1	2		3	
A3 Which program of health care are	Gold card	sw	Official welfare	Private health	Other	
you covered by?	1	2	3	4	5	
A4 In the last week, how many times did you brush your teeth?						
	Fluoride	Herbal toothpaste	Salted toothpaste	Salt, Homemade	None	
A5 What kind of toothpaste do you use?	1	2	د	4	5	
6 How often do you use toothpaste	Most of the time Sor		Sometimes	umetimes M		
when brushing your teeth?	r		2		З	
A7 Did you use a toothbrush to clean	Yes			No		
your tooth? If yes, go to A9	1 Go to A9				2	
A8 What kind of material do you use for	Fingers	Wood	stick To	oth pick	Other	
tooth cleaning?	1]2	3	4	
A9 In the last week, how many times did you use a mouth rinse or mouth wash? (if not go to A11)						
A10 What kind of mouth rinse you use?	Salt	Herbal	rinse Ar	ti septic	Fluoride	
Alle finde kind of model finde you user			2	3	4	
A11 How would you rate your oral health	Excellent	Very good	Good	Fair	Poor	
today?	T	2	э	4		

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Part II Oral health-related quality of life					
HOW OFTEN during the last year	Please tic	k ONE box	that best desc	ribes your e	xperience
B1 have you had trouble pronouncing any words because of problems with your teeth.	Very Often	Fairly Often	Occasion ally	Hardly Ever	Never
mouth or dentures?		2	3	4	5
B2 have you felt that your sense of taste has worsened because of problems with	Very Often	Fairly Often	Occasion ally	Hardly Ever	Never
your teeth, mouth or dentures?		2	□3	4	5
B3 have you had painful aching in your	Very Often	Fairly Often	Occasion ally	Hardly Ever	Never
mouth 2		2	3	4	□5
B4 have you found it uncomfortable to eat any foods because of problems	Very Often	Fairly Often	Occasion ally	Hardly Ever	Never
with your teeth, mouth or dentures?		2	3	4	5
B5 have you been self conscious because of problems with your teeth, mouth or	Very Often	Fairly Often	Occasion ally	Hardly Ever	Never
dentures?	1	2	3	4	5
B6 have you felt tense because of problems with your teeth, mouth or	Very Often	Fairly Often	Occasion ally	Hardly Ever	Never
dentures?		2	3	4	5
B7 has your diet been unsatisfactory because of problems with your teeth,	Very Often	Fairly Often	Occasion ally	Hardly Ever	Never
mouth or dentures?	1	2	3	4	5
B8 have you had to interrupt meals because of problems with your teeth.	Very Often	Fairly Often	Occasion ally	Hardly Ever	Never
mouth or dentures?	1	2	3	4	5
B9 have you found it difficult to relax because of problems with your teeth.	Very Often	Fairly Often	Occasion ally	Hardly Ever	Never
mouth or dentures?		2	3	4	5
B10 have you been a bit embarrassed because of problems with your teeth.	Very Often	Fairly Often	Occasion ally	Hardly Ever	Never
mouth or dentures?	1	2	3	4	5
B11 have you been a bit irritable with other people because of problems with	Very Often	Fairly Often	Occasion ally	Hardly Ever	Never
your teeth, mouth or dentures?	1	2	3	4	5
B12 have you had difficulty doing your usual jobs because of problems with your	Very Often	Fairly Often	Occasion ally	Hardly Ever	Never
teeth, mouth or dentures?	1	2	3	4	5
B13 have you felt that life in general was less satisfying because of problems with	Very Often	Fairly Often	Occasion ally	Hardly Ever	Never
your teeth, mouth or dentures?		2	3	4	5
B14 have you been totally unable to function because of problems with your	Very Often	Fairly Often	Occasion ally	Hardly Ever	Never
teeth, mouth or dentures?		2		4	15

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Part III General Health and Health behavio	ur				
	No	Yes, please indicate			
C1. Have you had systemic disease eg.		Diabetes	Cardiovascular	Hypertension	Other
Diabetes? (confirmed by your doctors)	1				
	We	eight (Kg)		Height (Cm)
C2. Your height and your weight					
C3. What are public health care	Health centre	Community hospital	Provincial hospital	University Hospital	None
services that you can access?	1	2	э	4	5
C4. What are other health services that you can access?	Private Clinic	Chemist	Herb	Thai traditional	Spiritual healing
	1	2	э	4	5
	Never or less Than once a week	1-2 days a week	3-4 days a week	5-6 days a week	Everyday
C5. How often do you eat fresh fruit?	1	2	3	4	5
00 Have des de veu delak aleskal2	Never or less than once a week	1-2 days a week	3-4 days a week	5-6 days a week	Everyday
Co. How often do you drink alconol?	1	2	د	4	5
67 Herride very meetly get about?	Walk	Bike	Public bus	Motorcycle	Car
(select only one box)	1	2	J	4	5
C9. Where are most of your foods	Ready c	ooked	Fresh food from Market	n Fresh f	ood from own n, orchard
from?]1	2		3
C9. How would you rate your physical	Excellent	Good	Fare	Fair	Poor
health today?	1	2	з	4	5

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Part IV Smoking History		
D1 Have you smoked more than 100	Yes	No, go to E1
cigarettes in your lifetime?	1	2

If you currently smoke cigare answer D2-D3	ettes please	If you are a FORMER cigaret	te smoker 6
D2. For how long have you smoked cigarettes	Year	D4. How long ago did you stop smoking cigarettes	Year
3. On a usual day, how man cigarettes do you smoke?	у1	D5. How long did you smoke before you stopped	Year
		D6. On a usual day, how man cigarettes did you smoke?	y1

			1999 B	a sea of the sea of the	and the second se	
Please check one box for each question						-
E1. I have a secure job.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Don't know
	1	2	3	4	5	6
F2 have sufficient land for agriculture	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
Le. There sumiciant and for agriculture.	1	2	s	4	5	6
E3. Since last year, I've had sufficient food	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
to eat.	1	2	3	4	5	6
E4. Production from my farm, orchard	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
my family.	1	2	3	4	5	6
E5. Lalways eat various kinds of food	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
	1	2	3	4	5	6
E6. Foods that I eat are not contaminated	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
with chemicals.	1	2	3	4	5	6
E7. Lalways eat in moderation	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
	1	2	3	4	5	6
E8. I hardly use chemical in my farming	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
	1	2	3	4	5	6
E9. My lifestyle will promote longevity	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
historie un biennote tengenis.	1	2	3	4	5	6
F10 Lalways use herbal medicine	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
E rost always use nerval medicine	1	2	Э	4	5	6

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Part V Social capital: 3Ss questions (continu	ie)					
Please check one box for each question						
E11. I have skill in Thai traditional massage	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Don't know
	1	2	3	4	5	6
E12. I am of receiving full and adequate	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
public modern health care.	1	2	3	4	5	6
E13. I always practice the five precepts.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
(Buddhist morality practice)	1	2	3	4	5	6
E14. I frequently attend religious	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
ceremonies.	1	2	3	4	5	6
E15. I am an aware person	Strongly disagree	Disagree	Neutral	Agree	Strongly agree,	Don't know
	1	2	3	4	5	6
E16. I am satisfied with my public facilities	Strongly disagree	Disagnee	Neutral	Agree	Strongly agree.	Don't know
eg. road, electricity	1	2	3	4	5	6
E17. I have no problem accessing information	Strongly disagree	Disagree	Neutral	Agree	Strongly agree,	Don't know
from media or people	1	2	3	4	5	6
F18 Jam a life time learner	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
Lio. Tana ne interestion.	1	2	3	4	5	6
E19. Compared to the last 3 years, I have	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
greater saving resources.	1	2	3	4	5	6
E20. Compared to last 3 years, I have less	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
financial debt.	1	2	3	4	5	6
E21. Most of my money is spent for the	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Don't know
necessities rather than 'what I want'.	1	Z	3	4	5	6

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Part V Social capital: 3Ss questions (contin	ue)			ALC: NO	1	
Please select one box for each question						
E22 Laluana second mu financial average	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Don't know
LZZ, Taiways record my mancial expense	1	2	3	4	5	6
E23. Most of my household commodities	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
are produced locally.	1	2	3	4	6	6
E24. My community has an excellent	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
community bank.	1	2	З	4	5	6
E25. Most of my community groups or	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
organizations are effective.	1	2	3	4	5	6
E26. I have a reliable welfare when I'm	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
getting older.	1	2	3	4	5	6
E27. My community has a community	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
master plan.	1	2	З	4	5	6
E28. My community acts according to the	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
community master plan.	1	2	с	4	5	6
E20 Library and and an and	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
E29. Thave secure natural resources	1	2	3	4	5	6
E30. I believe that, in the future, natural	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
resources would not be used up.	1	2	3	4	5	6
E31 I trust mu community loaders	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
Lor. Trusting community leaders.	1	2	3	4	5	6
E32. I can rely on the young generation in	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Don't know
my community	1	2	3	4	5	6
E33 My community is nearesful	Strongly disagree	Disagree	Neutral	Agree	Strongly agree.	Don't know
E33. My community is peaceful.	1	2	3	4	5	6

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Part VI Self sufficiency		
E1 Are you camping out self-	Yes	No
sufficiency agriculture?	1	2
F2. How many social groups or local group do you belong to?		1

Tick the m	nost fit of your buy	ing and prodi	ucing		
F3. Rice	Buy 100%	Buy 75% Produce 25%	Buy 50% Produce 50%	Buy 25% Produce 75%	Produce 100%
	1	2	[]3	4	5
F4 Food	Buy 100%	Buy 75% Produce 25%	Buy 50% Produce 50%	Buy 25% Produce 75%	Produce 100%
14.1000	1	2	د	4	5
E5 Household Items	Buy 100%	Buy 75% Produce 25%	Buy 50% Produce 50%	Buy 25% Produce 75%	Produce 100%
ro. nousenoid itemo	1	2	Б	4	5
F6 Herbs	Buy 100%	Buy 75% Produce 25%	Buy 50% Produce 50%	Buy 25% Produce 75%	Produce 100%
10.110100		2	7	4	5
F7. Fertilizer	Buy 100%	Buy 75% Produce 25%	Buy 50% Produce 50%	Buy 25% Produce 75%	Produce 100%
	1	2	3	4	5

Tick the most fit of your buying and producing

	Page 10 of	12			
Part VII Financial status					
G1. How much do you save each year?	<1000	1000-10000	10000-100000	100000 up	NA
(Baht)	1	2	3	4	5
G2. How many properties do you have?	<1000	1000-10000	10000-100000	100000 up	NA
(Baht)	1	2	3	 4	5
G3. How much debt do you have? (Baht)	<1000	1000-10000	10000-100000	100000 up	NA
	1	2	3	4	5
	Peasant	Private Business	Private Employee	Public Officer	Retired
G4. What do you do for living?	1	2	_з	4	5
G5. How do you feel about your	Living comfor	tably Co	ping	Difficult	Very Difficul
household income nowadays			2	3	4

Think of this ladder as representing where people stand in community.

At the top of the ladder are the people who are best off – those who have the best of everything. At the bottom are the people who are worst off – with the worst of everything.

The higher up you are on this ladder, the closer you are to people at the very top of community.

The lower down you are on the ladder, the closer you are to the bottom of community.



rt VIII Mental health				
ase select one box for each question				
M I	Strongly disagree	Disagree	Agree	Strongly agree
11.1 am satisfied with my life	1	2	3	4
	Strongly disagree	Disagree	Agree	Strongly agree
12.1 feel relaxed and comfortable	1	2	З	4
12 Lans state of mu daily life	Strongly disagree	Disagree	Agree	Strongly agree
I3.1 am sick of my daily life	1	2	3	4
	Strongly disagree	Disagree	Agree	Strongly agre
I4.I can cope with life's serious problems	1	2	3	4
	Strongly disagree	Disagree	Agree	Strongly agre
I5. My life is full of suffering	1	2	3	4
I6.1 accepted life's problems that can't be	Strongly disagree	Disagree	Agree	Strongly agre
solved.	1	2	3	4
17.1 can control myself in an emergency	Strongly disagree	Disagree	Agree	Strongly agre
situation.	1	2	3	4
18.1 am confident in facing a life crisis	Strongly disagree	Disagree	Agree	Strongly agre
should it happen	_ 1	2	3	4
	Strongly disagree	Disagree	Agree	Strongly agre
I9.I feel empathy for suffering people	1	2	3	4
	Strongly disagree	Disagree	Agree	Strongly agre
I10. I am happy to help other people.	1	2	3	4
	Strongly disagree	Disagree	Agree	Strongly agre
111. I help people, whenever I can	1	2	3	4
	Strongly disagree	Disagree	Agree	Strongly agre
112.1 am proud of myself	1	2	3	4
113. I feel secure and safe when I'm with	Strongly disagree	Disagree	Agree	Strongly agre
my family.	□¹	2	3	4
114. I believe that my family will take a	Strongly disagree	Disagree	Agree	Strongly agre
good care of me, if I suffer a serious	1	2	3	4
115. My family members love and care for	Strongly disagree	Disagree	Agree	Strongly agre
each other.		2	3	4

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J1. Gender		M	ale	Fe	male	
			1	2		
			Age	(year)		
J2.	Age			1		
			Ma	arried	Divorce	
J3. Marital status		1		2	з	
J4.	How many children do you					
	have? (if not, write 0)					
J5.	Educational status	None	Primary	High school	Higher that High schoo	
		1	2	3	4	
16	University of the second se	Yes		No		
J0.	J6. Have you been a member of INPAENG network	2 finish the questionnaire				
lf you cu	rrently are an INPAENG network'	s Ify	ou are FORM	MER INPAENG	network's	
	members answer J5		mem	ber answer J6		

Ye	ar	Year
J7. How long have you been a member?	J8. How long were you a 1 member before you quit?	1

Thank you for completing this questionnaire.

Your assistance is greatly appreciated and will make a valuable contribution to understanding the

role that behavioural and social factors make in explaining differences in oral health status

between different groups in the population.