ORAL HEALTH-RELATED QUALITY OF LIFE AND SCHOOL PERFORMANCE ASSOCIATED WITH SOCIOECONOMIC STATUS, SOCIAL CAPITAL AND SCHOOL ENVIRONMENTAL FACTORS: A STUDY IN GRADE 6 PRIMARY SCHOOLCHILDREN IN SAKAEO PROVINCE

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ความสัมพันธ์ของคุณภาพชีวิตในมิติสุขภาพช่องปากและผลการเรียน กับสถานะทางเศรษฐกิจและสังคม ทุนทางสังคม และปัจจัยทางสิ่งแวดล้อมของโรงเรียน: การศึกษาในเด็กนักเรียนชั้นประถมศึกษาปีที่ 6 ในจังหวัดสระแก้ว

นายอิสระพงศ์ แก้วกำเหนิดพงษ์

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรดุษฎีบัณฑิต
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Thesis Title	ORAL HEALTH-RELATED QUALITY OF LIFE AND SCHOOL PERFORMANCE ASSOCIATED WITH SOCIOECONOMIC STATUS, SOCIAL CAPITAL AND SCHOOL ENVIRONMENTAL FACTORS: A STUDY IN GRADE 6 PRIMARY SCHOOLCHILDREN IN SAKAEO PROVINCE
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อิสระพงศ์ แก้วกำเหนิดพงษ์ : ความสัมพันธ์ของคุณภาพชีวิตในมิติสุขภาพช่องปากและผลการเรียน กับสถานะทางเศรษฐกิจและสังคม ทุนทางสังคม และปัจจัยทางสิ่งแวดล้อมของโรงเรียน: การศึกษาในเด็กนักเรียนชั้นประถมศึกษาปีที่ 6 ในจังหวัดสระแก้ว (ORAL HEALTH-RELATED QUALITY OF LIFE AND SCHOOL PERFORMANCE ASSOCIATED WITH SOCIOECONOMIC STATUS, SOCIAL CAPITAL AND SCHOOL ENVIRONMENTAL FACTORS: A STUDY IN GRADE 6 PRIMARY SCHOOLCHILDREN IN SAKAEO PROVINCE) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: สุดาดวง กฤษฎาพงษ์, 124 หน้า.

การศึกษานี้มีวัตถุประสงค์เพื่อหาความสัมพันธ์ของสิ่งแวดล้อมในโรงเรียนต่อพฤติกรรมและโรคในช่องปากของเด็ก และหาความสัมพันธ์ตามลำดับชั้นของผลการเรียนต่อคุณภาพชีวิตในมิติสุขภาพช่องปาก การขาดเรียน สภาวะช่องปาก สถานะเศรษฐกิจและสังคม และทุนทางสังคม เก็บข้อมูลจากเด็กนักเรียนในจังหวัดสระแก้ว จำนวน 925 คน โดยการสัมภาษณ์ ตรวจช่องปาก สัมภาษณ์คุณภาพชีวิตในมิติสุขภาพช่องปากโดยดัชนี Child-Oral Impacts on Daily Performance แบบสอบถามผู้ปกครอง และข้อมูลจากโรงเรียน คำนวณหาความสัมพันธ์โดยใช้สถิติไคสแควร์ การวิเคราะห์การถดถอยโลจิสติก และเชิงเส้น พบว่า การจัดผลไม้สดในมื้อกลางวันของโรงเรียนมีความสัมพันธ์กับพฤติกรรมการบริโภคขนมหวานที่น้อย และโรคฟันผุที่น้อย การขายเครื่องดื่มที่หวานในโรงเรียนมีความสัมพันธ์กับฟันผุที่สูง ส่วนการขายของว่างประเภทเนื้อและของกรุบกรอบสัมพันธ์กับฟันผุที่น้อย เด็กในโรงเรียนที่มีการสอนทันตสุขศึกษาในหลักสูตรเรียนมักจะแปรงฟันอย่างน้อยวันละ 2 ครั้ง และแปรงฟันหลังอาหารกลางวันที่โรงเรียน เด็กที่มีฟันผุสูงมักจะเกิดผลกระทบที่มาจากโรคฟันผุ ค่าฟันผุ ถอน อุดที่สูงมีความสัมพันธ์กับผลการเรียนที่ไม่ดี ขณะที่ค่าอนามัยช่องปากที่สูงไม่มีความสัมพันธ์กับผลการเรียน ผลกระทบที่มาจากโรคฟันผุและการขาดเรียน ทำให้ความสัมพันธ์ระหว่างค่าฟันผุ ถอน อุด และผลการเรียนหายไป ดังนั้นสิ่งแวดล้อมด้านอาหารในโรงเรียนมีความสัมพันธ์กับการบริโภคของหวาน และโรคฟันผุ เด็กในโรงเรียนที่มีการสอนทันตสุขศึกษาในหลักสูตรเรียนมักจะมีนิสัยในการแปรงฟันที่ดี แต่ไม่มีความสัมพันธ์กับการบริโภคของหวานที่น้อย และโรคฟันผุที่น้อย โรคฟันผุมีความสัมพันธ์กับผลกระทบที่มาจากโรคฟันผุ และโรคฟันผุส่งผลต่อผลการเรียนโดยผ่านผลกระทบที่มาจากโรคฟันผุ และการขาดเรียน

ภาควิชา ทันตกรรมชุมชน ลายมือชื่อนิสิต .....

สาขาวิชา ทันตสาธารณสุข ลายมือชื่อ อ.ที่ปรึกษาหลัก .....

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KEYWORDS: CHILDREN / DENTAL CARIES / ORAL HYGIENE / QUALITY OF LIFE / SCHOOL ENVIRONMENTS / SCHOOL PERFORMANCE

ISSARAPONG KAEWKAMNERDPONG: ORAL HEALTH-RELATED QUALITY OF LIFE AND SCHOOL PERFORMANCE ASSOCIATED WITH SOCIOECONOMIC STATUS, SOCIAL CAPITAL AND SCHOOL ENVIRONMENTAL FACTORS: A STUDY IN GRADE 6 PRIMARY SCHOOLCHILDREN IN SAKAEO PROVINCE. ADVISOR: PROF. SUDADUANG KRISDAPONG, Ph.D., 124 pp.

The objectives of this study were to assess the associations of school environments with children's oral behaviours and diseases. Second, to assess the hierarchical relationships of children's school performance with Oral Health Related Quality of Life (OHRQoL), school absence, oral status, socioeconomic status and social capital. Data on 925 sixth-grade children in Sakaeo province, Thailand were collected through interview, oral examination, OHRQoL interview using the Child-Oral Impacts on Daily Performance index, parental questionnaire and school records. Chi-square test, logistic and linear regression models were applied. Provision of fruit with meals associated with low sweets consumption and low caries. Selling sweetened beverages associated with high caries, while selling meat and crispy packed snacks associated with low caries. Children in schools with oral education were more likely to brush twice a day and to brush after lunch. Children with high caries were more likely to have Condition-Specific (CS) impacts attributed to caries. High DMFT score was related to lower school performance, whereas high OHI-S score was not. Significant association between DMFT score and school performance became non-significant when CS impacts attributed to caries and school absence were applied. In conclusion, school food environments were associated with sweets consumption and caries. Children in schools with oral education had better brushing habits, but not lower sweets consumption nor caries. Dental caries was associated with CS impacts, and exerted its effect on school performance through CS impacts and school absence.

Department: Community Dentistry Student's Signat re .....
Field of Study: Dental Public Health Advisor's Signature .....
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CHAPTER 1
INTRODUCTION

Dental caries and gingival disease are most common oral diseases in school-age children. Several studies focusing on children and adolescents confirmed that oral diseases strongly impacted on their Oral Health-Related Quality of Life (OHRQoL) including physical, emotional and social well-being (1-4). Although, children with dental pain might be more likely to have problems related to school such as learning at school, doing homework at home and school miss than their counterparts, associations of poor oral status and OHRQoL including school miss of children with school marks were inconclusive.

Previous research showed that individual oral health behaviours clearly affected individual caries experience (5). Direct relationships of individual oral health behaviours and oral health problems with OHRQoL and school performance should be interpreted with cautions, because these relationships could be confounded by other social determinants of children such as sociodemographic and economic status (SDES), social capital and socio-environmental factors particularly in schools.

It was clear that socioeconomic gradients influence to health and oral health outcomes (6-8) and children's school performance as well (9). For example, children from low income households were more likely to have poor OHRQoL (1, 10) and poor educational achievement (11) than those from high income households.

Many previous studies also demonstrated associations of social capital including, parental involvement (12) teacher-parent relationship (13, 14) and relationships to peers (15), with children's academic performances. In addition, socio-environmental determinants in school related to oral health outcomes could be expectedly associated with children's academic performances, because lack of research has examined associations of school environmental characteristics including oral health promoting policies in school with OHRQoL and educational outcomes of children.

No study in Thailand has examined associations of shared underlying social factors such as SDES, social capital and school oral health-related environments with

oral diseases, OHRQoL and school performance in school-age children. Some useful social capital variables or school environmental policies in this study might be easy choices to decrease socioeconomic gradients in oral health and educational outcomes of children.

CHAPTER 2
REVIEW OF LITERATURE

2.1 Oral health of schoolchildren

Oral diseases such as dental caries or gingival disease are prevalent in school-age children. Data from the third National health and nutrition Examination Survey (1999-2002) indicated that 41% of children aged 2-11 years had dental caries in primary teeth and 42% of those ages 6-19 years had dental caries in permanent teeth (16). The sixth National Oral Health Survey in Thai schoolchildren showed that 57% of children aged 12 years had dental caries in permanent teeth and 66% of those ages 15 years had dental caries in permanent teeth (17).

Oral diseases relate to other chronic diseases such as obesity, cardiovascular diseases and cancer in terms of their shared risk factors which are poor dietary habits, smoking and alcohol use (18). Disease consequences not only disrupt physical functions, but also on psychological and social aspects on daily life performances (19). Locker (1988) (20) proposed a theoretical framework of oral consequences as shown in Figure 1. The framework was modified from World Health Organization (WHO)'s Classification of Impairments, Disabilities and Handicaps (21).

Impairment is a loss or abnormality of physical and psychological function including dental cavity, tooth spacing and malocclusion. Functional limitation is the restriction of functional organs or body system such as limitation in jaw mobility. Impairment does not always lead to functional limitation. Its consequence might be caused of discomfort referring to well-being impaction such as difficulty to chewing or tooth cleaning. Disability is defined as the limitation to normally participate in social activities in daily life. Handicap refers to the disadvantage, which makes people cannot adjust themselves to their normal social role.

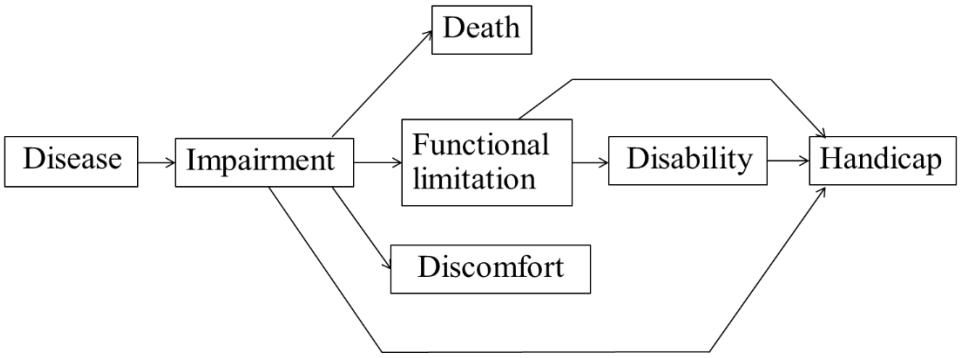

Figure 1: The conceptual model of consequences of oral impacts (Locker, 1988).

Relationships among impairment, disability and handicap are causal relation, but not all direct relationship (22). Impairment may or may not lead to disability and handicap. For example, impairment of tooth cavity in children can cause of disability, such as disturbance of eating or emotional state. Disability can further lead to handicap by making children avoid to participating in their friends and cannot perform well in study at school. In some cases of tooth cavity, impairment may not lead to such disability and handicap.

An ultimate goal of oral heath strategy should be to promote a greater quality of life. Thus, the key actions are not to advocate disease-free dental status, but enable people to enjoy normal physical, psychological and social well-being (19).

2.1.1 Oral Health-Related Quality of Life

Oral Health-Related Quality of Life (OHRQoL) is defined as individual assessment of multidimensional domains including physical function, psychological function and social well-being impacts relating to oral and orofacial concerns (23).

Theoretical concepts and measurements of OHRQoL have been increasingly used in oral health literature as well as in policy implementation (20, 24-26). OHRQoL index have been developed and most widely used for adults and elderly populations (24, 25). Researchers have been developed measurements of OHRQoL appropriating with children. Few indexes were particularly demonstrated to assess OHRQoL in children such as the Child Perceptions Questionnaire (CPQ_{11-14}) (27), the

Child Oral Health Impact Profile (COHIP) (28) and the Child Oral Impacts on Daily Performances (Child-OIDP) (26).

The Child Perceptions Questionnaire (CPQ_{11-14}) is one of the indicators assessing the perception of children on physical limitation and psychosocial impact of oral health (27) that was used in many countries such as United Kingdom (29), New Zealand (30), Australia (2), Saudi Arabia (31), China (32) and Brazil (33). The CPQ_{11-14} self-questionnaire divided to 4 domains such as oral symptoms, functional limitation, emotional well-being and social well-being. Each question of 37 questions asked about the frequency of events in previous 3 months and ranged from 0-4 scores. Higher scores show the more negative impact of oral conditions on children's quality of life.

The Child Oral Health Impact Profile (COHIP) was also developed to assess OHRQoL in school-age children (28). COHIP is a frequently 34-item self-report dividing to 5 different subscales. It consists of oral health, functional well-being, social/emotional well-being, school environment and self-image categories and each question also ranged 0-4 subscales as well. In contrast to CPQ_{11-14}, higher scores demonstrated more positive OHRQoL.

The Child Oral Impacts on Daily Performances (Child-OIDP) index is a valid and reliable measure in Thai schoolchildren aging not over 12 years (26). Child-OIDP index composed of 8 items in 3 dimensions. First, physical aspects include eating, speaking and cleaning mouth. Second aspect represents psychological dimension including sleeping, smiling and emotional maintaining. Third, study and social contact are provided in social aspects. This index has a scoring procedure by using frequency and severity scores to quantify each performance impacts of children and multiplying each performance scores in a sum impact score. Then the sum was divided by the maximum score (72) and multiplied by 100 to derive a percentage score.

The Child-OIDP Index is practical and useful socio-dental index because it was developed to detect the clinical causes of certain impacts, called the Condition-Specific (CS) Child-OIDP (34). For example, the results from a Thai national oral health survey of 12-year-olds showed that having untreated caries was related to

impacts on relaxing, emotion and study. Presence of gingivitis and calculus were associated with impacts on smiling, study and social contact (35).

Subsequently, this index can be adapted for use as an oral health need and outcomes measure for oral health care services planning in schoolchildren who are the important target groups in Thailand (36).

2.1.2 School absence and its relationships to Oral Health-Related Quality of Life

School absence can be considered a societal indicator, as it measures the extent to which children's oral health-related problems and their treatment disrupts normal social role functioning and cause major change in behaviours (37). There are very few studies reporting on school absence and its associations with oral health on school aged level. Previous studies reported by parents or children from questionnaires and telephone survey based on their recall period, one study extrapolated from data for 2 weeks at the national level in United States, and 1-year observation period recorded by teachers (38).

School absence in children seems to be common as studies found that the number of days missed due to any reason of 12-years-olds was as high as 6.2 days per child in 3 months (11). From a longer period of observation, Seirawan et al. (2012) (39) showed that elementary school students from Los Angeles County public schools had averaged 6 absent days in 12 months, while a number of days missed found in older age group; high school students missed school days lower; 2.6 days.

For school absence relating to dental reasons, data from North Carolina Child Health Assessment and Monitoring Program (CHAMP) in 2008 (40) by asking adults who have children aged younger than 18 years residing in their household showed that twenty-two percent of schoolchildren missed any school days for routine dental care such as check-up, filling, orthodontic visiting during 12 months. A total number of 1,049 school days were missed by the 2,120 children for any dental reason, an average of 0.49 day per child during 12 months. Absences as a result of dental pain or infection were relatively infrequent, 3.9%. More school hours missed due to dental visit and dental problems was reported by Gift et al. (1992) (38) that school-age children missed school 1,170 hours / 1000 children in one year. However, method of collecting data differed from other study, that is, the school hours missed for the

whole year were extrapolated from data for only 2 weeks. Similar to a longitudinal study in Thailand, Lampang province, found that 22.5% of grade 5 schoolchildren missed school for any dental reason, a total of 613 hours were missed per 1,000 children. However, school absence was mostly related to waiting time of dental screenings and dental treatment provided by the school dental service (474 hours / 1,000 children) that is due to dental problems only 37 hours / 1000 children in one year (37). Therefore, it seems to be that school miss due to any dental reason was considerable, but the numbers of days missed due to dental problem were less likely than those to dental visit.

This agrees with previous studies focusing on school absence due to dental problem only. They revealed the prevalence of children who missed school because dental problems or dental pains. UCLA Center for Health Policy Research estimated 7% of the 7,240,000 schoolchildren ages 5-17 in California missed at least one day of school due to dental problems in one year (41). Seirawan et al. (2012) (39) also showed that the parents of the disadvantaged children ages 6-16 years old indicating that 5.5 % of the children missed school days because of their children's dental problems, an average of 2.2 day per school year. For the last National data in Thailand, sixth Thailand Oral Health Survey showed 5.1% and 4.4% of 12 and 15 years old children were missed school due to toothache in 3 months (4).

Although school miss due to dental problems was not prevalent, but it reflects the severe level of oral problem perceived by children. Thus, the importance of school miss due to dental problems not only in terms of loss opportunities for learning, but also other aspects of impacts due to severe oral problems might co-exist (41). The problem of school absence due to dental problem is also important, because it can affect children's quality of life in terms of missing academic learning (37). Dental pain experiences and problems of children not only affect difficult eating, chewing and communicating with their friends, but also impact to school absenteeism (1).

Few studies have shown associations between psychological self-perceptions of children or their parents and school absence. Unadjusted models showed that children who were poor self-perceived oral health missed days of school due to any reason more than their counterparts (11). Similar to Pourat and Nicholson (2009)'s study (41) which showed that children who reported fair or poor dental health also

report having missed two or more school days due to dental problem when compared their counterparts. And when asked the parents about school miss due to dental problem of their children, those with poor oral status were nearly 3 times more likely than their counterparts to miss school, but miss school for routine dental care were not significant (40). Moreover, children having toothache nearly 6 times more likely to miss school days due to dental problem when compared their counterparts (39).

Only one study from Thailand showed associations between school absence and Child-OIDP index of 12-year-old children. Twelve years old children who perceived toothache as a cause of oral impacts were more likely to miss more days of school due to toothache than their counterparts. However, associations between toothache and school absence were not significant in adjusted models. For the multivariate analyses, children having moderate or severe intensity of OHRQoL impacts were 3 times significantly more likely to miss school due to toothache compared with those having very little intensity or no impacts (4). It seems that associations between school missed due to dental problems and OHRQoL would be stronger than associations of school miss due to any reasons and other dental reasons with OHRQoL.

2.1.3 Oral health problems associated with Oral Health-Related Quality of Life and school absence

Previous studies examined associations between dental problems and school absence of children, but findings were inconclusive. Some studies reported that difference in school absence because of dental problems between children with and without caries was not statistically significant (39). Krisdapong et al. (2013) (4) reported that both 12- and 15-year-olds with caries did not miss school due to toothache significantly more than their counterparts. However, significant association was found between school absence and DMFT in 12-year-olds. Unadjusted models for both age groups showed that children with severe decay were 3 times more likely to miss school than their counterparts (4). Therefore, different findings regarding associations between school absence and dental caries might depend on criteria used for caries diagnosis. Severe dental caries seem to relate with school absence, while findings on overall dental caries varies.

Poor oral health has been acknowledged as an important cause of children's poor daily performance and quality of life (1, 2). Previous studies showed that higher impacts on OHRQoL were observed in children with untreated decayed teeth after controlling for confounders (1, 3). They also reported that children having dental pain, severe gingival bleeding and incisal crowding were more likely to have higher OIDP scores compared to those without these oral health conditions (3). Similarly in childhood, Espinoza et al. (2013) (42) showed that high number of untreated caries and low number of remaining teeth were associated with decreasing OHRQoL among Chilean adults aged over 17 years.

2.2. Oral health and school marks

Children having poor oral status could be more likely to have poor OHRQoL and poor academic outcomes. There are a number of previous studies regarding oral health factors associated with school marks. Piovesan et al. (2012) (11) revealed that children with dental caries or traumatic dental injuries had lower mean school marks than those without such conditions, although the difference was not significant. Besides, Muirhead and Locker (2006) (43) showed that, after controlling for socioeconomic factors, there were significant associations between children with urgent dental treatment needs and school performance outcomes in English, Mathematics and Science. They suggested that school performances could be used as predictors of children needing urgent dental treatment.

Associations between OHRQoL and school marks have been widely assessed. For the multivariate analyses, children with poor OHRQoL assessed by the CPQ had lower school marks when compared with their counterparts (11). Children with poor oral health rated by parents were significantly related to parent perceptions of poor school marks (40). Children with both poor oral health and general health were 2.3 times more likely to perform poorly in school than those with both good oral health and general health from parents' perceptions, but only children with poor oral health factor do not indicate poor school marks (44). Children with toothaches were almost 4 times more likely to have a low grade point average (39). However, no study applied the Child-OIDP index to the analysis of educational context.

Few studies provided details on reasons of school miss in analyzing relationships with school marks. Blumenshine et al. (2008) (44) indicated that school missed of 2 weeks or more due to any reason were significantly correlated with parent perceptions of poor school marks. However, such significant association was found by bivariate analyses, but not in multivariate analyses. Piovesan et al. (2012) (11) showed that higher school days missed due to any reason had a strong association with lower scores in Brazilian language tests after controlling for confounders. One study reported on association of school days missed for routine dental care and dental problem with school marks (40). They found that, in multivariate analyses, only school miss caused by dental pain or infection was significantly associated with poor school marks.

However, relationships of individual oral health behaviours, oral diseases and OHRQoL with school marks of children should be interpreted with cautions. Findings on associations between school absence and school marks obtained from previous studies have limitations because data were collected from parents in terms of school days missed and children's academic performances. Thus, validity of parental subjective measure might be questioned. Moreover, children experiencing dental pain or infection may not miss school, but discomfort may inhibit their ability to perform well at school (40). This reason might be further impact on their school marks. Moreover, relationships between oral health conditions and school marks could be affected by shared underlying social factors of individual and socio-environmental conditions relating to oral health outcome and school performance as well.

2.3 Social contexts and oral health conditions

2.3.1 Individual's sociodemographic and economic characteristics related to oral health conditions

Socioeconomic status is considered a crucial determinant of well-being and health outcomes. Socioeconomic position can be defined by a number of indicators such as income, education, occupational class and subjective social status (SSS). Influence of such various indicators on health outcomes have been examined (45-47). For example, household income which represents material factors directly influences

health outcomes. Low level of education usually means lack of skill and social advantage (48). Education and occupation can reflect acquired levels of knowledge and skills to control over absolute material resources (49).

Health inequalities result from greater slope of socioeconomic gradient (49). Individuals' health from lower socioeconomic position is obviously worse than those at the upper position (7, 50). Associations were found for various health-related outcomes such as diabetes (51), self-rated health (52), quality of life (53) and mortality (54).

In addition to health gradients, studies demonstrated that socioeconomic factors are underlying determinants of oral health gradients. Socioeconomic status is obviously associated with oral health conditions such as oral health behaviours, oral status, self-perceptions in oral health and OHRQoL. This pattern is closed to the social gradients found in general health (6). That is, those with lower socioeconomic status tended to have more oral health problems including oral health behaviours (55, 56) such as unhealthy food consumption and poor pattern of dental attendances, oral diseases (56), traumatic dental injuries (57), absence from school or work (38), chewing ability (58), toothache (42, 59), poor self-rated oral health and one or more OIDP (60) than those with higher socioeconomic status.

Socioeconomic inequalities and social gradients in oral health have been observed in several countries and various populations (8), using different measures of socioeconomic position and oral health outcomes (61, 62). Sabbah et al. (2007) (63) reported the similarities of socioeconomic gradients in both general and oral health in the same individuals of American adults. People who have less education and poverty-income ratio were significantly more likely to have periodontal diseases, ischemic heart disease and poor perceived oral and general health than who were at higher socioeconomic positions. In addition, associations of sociodemographic factors such as gender, age, race and area of residence with oral health outcomes were also demonstrated in literature as well (11, 38, 41, 64, 65).

2.3.1.1 Relationships to oral health behaviours

Health-related risk behavioural determinants were potential factors leading to several chronic diseases. WHO (2010) (66) indicated tobacco smoking, alcohol

drinking, inadequate or unhealthy diet and physical inactivity as significant risk factors for chronic non-communicable diseases. Previous studies demonstrated that these behaviours were causes of morbidity and mortality (67-70).

Associations of sociodemographic and economic status (SDES) with health behaviours were reported by several studies. For example, sixth-grade girls in Iran reported higher frequency of tooth brushing than boys, after controlling for potential confounders (64). Social background such as parental education and household income are important factors associating with oral health-related lifestyle. Dorri et al. (2011) (64) found that the father's level of education was significantly related to frequency of tooth brushing. A recent study in Brazil showed that men who have black skin, living alone, lower household income and less educational qualifications had two or more risks behaviours for chronic diseases such as smoking, alcohol drinking, less physical activity and unhealthy eating habit (71).

Singh et al. (2013) (72) found educational gradients in adults from England, Wales and Northern Ireland in clustering of behaviours such as smoking habit, frequency of tooth brushing, sugar consumption and dental attendance after controlling for age, gender and self-reported oral health. Adult having lower educational attainment were more likely to have clustering of risk behaviours when compared to adult with higher educational attainment.

In Pennsylvania, USA, Polk et al. (2010) (73) found socioeconomic disparities, measured by both family income and parental education, in oral health behaviours of students. Students with lower socioeconomic status were related to lower frequency of tooth brushing, less dental sealants and less recent dental visiting. Socioeconomic disparities also limit access to dental care needed services. Swedish adult with severe socioeconomic disadvantage, assessed by socioeconomic disadvantage index (SCI), were 5-6 times more likely to avoid required dental treatment compared with those with no SCI after adjusting for confounders (55).

There are few studies have examined the role of oral health-related behaviours in socioeconomic gradient in oral health outcomes. Data on the adults having age over 16 years from National Survey in United States, Sabbah et al. (2009) (56) concluded that improvement in oral health behaviours such as dental attendance, smoking and healthy food consumption can lessen oral diseases inequalities including bleeding

gum, periodontal diseases, tooth loss and perception of oral health, but cannot eliminate them. In addition, a study in Australian adults showed that dental visiting significantly attenuated the socioeconomic disparities in OHIP-14 scores, but dental self-care, measured by adaptation of the Dental Neglect Scale, cannot significantly reduce the slope of the socioeconomic gradient in self-reported missing teeth and OHIP-14 scores (74).

2.3.1.2 Relationships to oral diseases

Incidence and severity of oral disease are different among genders. Male were significantly had root caries, gingival recession and periodontal disease more than female. In contrast, higher coronal caries, temporomandibular disorders and defects in the salivary glands were observed for female (75). For 12- and 15-year-olds Thai children both on a national and regional scale, caries prevalence in girls were higher than boys (65).

It was clear that there are socioeconomic gradients in oral diseases. Guarnizo-Herreno et al. (2013) (76) collected data of adult's self-reported number of teeth from 31 countries in Europe and divided to 5 European welfare-state types. They showed that people who have lower educational and occupational levels highly associated with higher levels of having less than 20 natural teeth and edentulousness in all welfare-state regimes. Evidence from Australia also reported that adults living in low family's income indicated less self-reported number of teeth (54, 58). A similar pattern of association in structural equation modeling was found in adult in the UK. Donaldson et al. (2008) (77) found that higher occupational social class and higher family' income strongly associated with higher number of sound teeth after controlling for dental attendance pattern and personal attitudes to dental treatment.

Similar to adults, high caries prevalence was observed in children whose parent had poor level of education or low family income. Lower educational level of mother and lower household income were associated with higher level of caries among Danish children after adjusting for confounders (78). Polk et al. (2010) (73) also showed a direct relationship between socioeconomic status, assessed by both family income and parental education, and caries prevalence or severe dental caries of students in Pennsylvania, USA. Students who live in families with low socioeconomic status significantly more likely to have high caries prevalence and high levels of

severe caries that is unexplained by oral health behavioural mediators including frequency of tooth brushing, using fluoridated toothpaste, having dental sealants and dental visiting in structural equation modeling.

Longitudinal life course analysis demonstrated that social advantage and social deprivation contributed to the inequalities in health status (79). People with disadvantage social circumstances during childhood such as poverty and lack of educational attainment were associated with poor health status (80). In a life course perspective, circumstances during early life period in which people lived seem to have strong effects to oral status of adolescents or adult (81, 82). Socioeconomic inequalities in oral health emerge in the life course perspective from infancy to older age (83). This theoretical development explained that complex interaction of material, behavioural or cultural and psychological factors can affect oral health throughout the life period (83). Children living in low socioeconomic position may repeatedly produce a negative behavioural health in the future (84). Some authors supported that both critical period's model and accumulation model can explain inequalities in oral health. Nicolau et al. (2003) (81) showed the relationship between socioeconomic and biological risk factors at the early stage of life and dental caries experience at 13-year-olds supporting the critical period's model. Adolescents who live in a non-brick house at birth and those born with low birth weight were significantly more likely to have high levels of caries (81). Thomson et al. (2004) (82) demonstrated that adult oral health can be predicted by childhood socioeconomic status and also by oral status in childhood. In longitudinal cohort study, dental examination and socioeconomic data were examined at age 5 and 26 years. People having low level of socioeconomic status at age 5 years had strongly greater prevalence of dental caries and periodontal disease at age 26 years after controlling for oral status. In similar pattern, after adjusting for socioeconomic status, those who have high dental caries experience at age 5 years were more likely to have high levels of oral disease in adulthood (82).

2.3.1.3 Relationships to Oral Health-Related Quality of Life

Overall findings from previous studies showed that female were more likely to reported higher impacts on quality of life than male, such as oral pain (85), oral

function discomfort (86, 87), psychological problems such as depression (88) and social appearance concern (89).

In children, girls were more likely to have higher negative impacts on quality of life than boys (1, 65, 90-93). For example, a study of 12- and 15-year-olds in Thailand showed that relationships between gender and condition-specific effects from aphthous ulcers were found after control confounding factor. Girls of both age groups were 1.5 times significantly more likely to have aphthous ulcers impacts compared to boys (93). Also, numbers of school hours miss due to dental problems and dental visits were significantly higher in girls than in boys (38).

At the national level, the 1989 National Health Interview Survey (NHIS) included questions on time lost from school because of oral health problems and dental visits over the past 2 weeks. The study found that mean hours missed increased with age (38). In contrast, Krisdapong et al. (2013) (4) showed that 12- year-olds were significantly more likely to miss school due to toothache than 15-year-olds.

It was shown that immigrant groups from different ethnic groups had more problems in quality of life relating to oral health than general population in the countries did (94). Children with parents as immigrants tended to have more problems than children in general did (95). Piovesan et al. (2012) (11) found that children who were black missed days of school due to any reason more than their counterparts. In contrast, Gift et al. (1992) (38) showed that white children missed school because of oral health problems and dental visits significantly more hours than black. If children miss school because of dental problems, children who are Asian-American also report having missed two or more school days when compared their counterparts (41). Children from household containing only one adult in household also had poorer OHRQoL scores than children living with two or more adults (10).

Associations between socioeconomic status and OHRQoL were well established. The effect of oral health on quality of life has been shown (1, 3) and some evidence exist for socioeconomic gradient in oral status (73, 77). That is, subjective perceptions of oral health and OHRQoL are important oral health outcomes as well. Many previous studies also found significant associations between individual socioeconomic factors and perceptions of oral health conditions after adjusting for sociodemographic factors, oral health behavioural risk factors and oral status. Sanders

et al. (2006) (58) investigated the relationship between household income and self-assessed oral health condition in Australian adults. They found that people having low household income were more likely to report fair or poor self-rated oral health, one or more impacts rated often on OHIP-14 categories and low ability to chew than affluent after controlling for sociodemographic factors and oral health-related behaviours including smoking, alcohol assumption, body mass index and frequency of toothbrushing and interproximal aids use. Turrell et al. (2007) (54) also reported that adults from low family's income indicated poorer self-rated oral health and 14-item OHIP scores whether neighborhood level disadvantage was adjusted.

Household income is likely to be one of the most important determinants of oral health of children within the family. After controlling for confounding factors of oral conditions, children living in low family's income were 1.6 times significantly more likely to report children's impact from dental pain than higher family's income (90). Moreover, children living in low family's income were significantly more likely to report poorer OHRQoL (1, 10) and miss school because of dental problems (41) than their counterparts.

Low socioeconomic characteristics may delay treatment until symptoms are more severe; thus they need more time off from school due to complex treatment needs. If children miss school because of dental problems, who cannot afford needed dental care also report having missed two or more school days when compared their counterparts (41). Seirawan et al. (2012) (39) showed that children with inaccessible needed dental care were 3 times more likely to miss school days because of dental problems than were those with access to dental care. Children without insurance appear to have missed due to any reason more hours (38, 40). If children miss school because of dental problems, children who are uninsured appear to have missed more hours (39, 41).

Furthermore, it was clear that educational disparities in OHRQoL exist in several countries. Espinoza et al. (2013) (42) showed a strong relationship between low education level and poor OHRQoL including eating or speaking problem with others and pain after adjusting for gender, area of residence, the number of untreated decay teeth, the number of remaining teeth and self-rated oral health among Chilean adults having age over 17 years. Tsakos et al. (2009) (96) demonstrated strong

associations between educational levels and OHRQoL among older people in London. Elderly with low level of education were significantly more likely to report high impacts on Geriatric Oral Health Assessment Index (GOHAI) scores than those with high educational level after controlling for age, gender, pension status representing different income levels and denture-wearing status. And these associations were also shown among elderly in many countries (97, 98).

Parents' level of education is an important marker of family disadvantage variable affecting oral health in childhood. Low level of education may lead to low income, unemployment and low occupational social class (99). Children whose mothers had low level of education were reported poorer OHRQoL scores than counterparts (1, 3, 92). In Korea's study, Jung et al. (2011) (59) showed that adolescents rating low self-assessed socioeconomic status were associated with higher self-reported oral symptoms such as dental injuries, dental pain and bad breathing after adjusting for confounders such as demographic material, psychological and behavioural factors. Sanders et al. (2006) (58) also supported this finding. They found that Australian adult having lower perception of relative social position, measured by 10-rung ladder (100), associated with poorer self-rated oral health, one or more impacts rated often on OHIP-14 categories and lower chewing ability when compared counterparts after controlling for confounding factors.

2.3.1.4 Psychological processes in socioeconomic oral health gradients

The link between individual's socioeconomic status and oral health outcomes might be explained by psychological stress influenced by social circumstances. Mechanisms of the psychological pathway explaining association between socio-economic inequalities and oral health seems to depend on the type of diseases. Direct associations between psychological stress and dental caries remain inconclusive. Evidence did not show significant relationship between parental stress and caries level of childhood after controlling for confounders (101, 102). Therefore, it seems to be that that dental caries are caused indirectly due to behavioural pathway (83).

Periodontal disease in adults may be partly caused by psychological stress (103, 104). However, some evidence did not support positive associations between psychological factor and periodontal disease (105-107). Some authors suggested that

higher psychological stress level in lower socioeconomic groups could increase smoking and lead to periodontal disease via behavioural pathway (104, 108).

2.3.2 Area level socioeconomic disparities in oral health-related outcomes

Socioeconomic disparities in oral health conditions were related to disadvantaged individuals' characteristics and markedly found in areas with socioeconomic deprivation (62). Measuring social inequalities through individual characteristics such as household income and occupational social class are not enough to explain socioeconomic inequalities in dental health of populations (105). Area-based measures of deprivation can identify wider variations in socioeconomic gradients in oral health outcomes in areas in which people live.

Lakshman et al. (2011) (109) studied area-level socioeconomic disparities in behavioural risk factors in East England. They found that adults living in poorer neighborhood deprivation scores were more likely to smoke and less likely to eat at least 5 portions of fruits and vegetables on 5 or more days per week than those in better neighborhood deprivation after adjusting for individual socioeconomic status.

Levin et al. (2009) (110) examined relationships between prevalence of dental caries in 5-year-old children and level of deprivation of neighborhood in Scotland and found that higher prevalence of caries free was observed for children living in better areas of residence. Pattussi et al. (2001) (111) used the Gini coefficient to measure area level of income inequalities and showed that children living in areas with high level of incomes were strongly correlated with low dental caries experiences and high prevalence of caries free after adjusting for confounders in children from 6 to 12 years of age in Brazil.

After controlling for individual-level socioeconomic status such as age, sex, educational level and household income, people who lived in disadvantaged areas significantly reported more edentulous, rated their oral health as poorer and experienced more negative impacts on OHRQoL than those in more advantaged areas (54).

The WHO (2008) (112) defines social determinants of health (SDH) as "the structural determinants and conditions of daily life responsible for a major part of health inequalities among and within countries". The strategies to tackle social

inequality in health and oral health must include policies to reduce the slope of socioeconomic gradient. To reduce health inequalities, WHO (2008) (112) suggested that healthy policies or interventions should not only limit to intermediary factors such as behavioural factors, but must emphasis actions to tackle structural determinants.

Social determinants approach to reduce the gradient of inequalities in oral health should be linked to population approach tackling the upstream causes of the causes of oral health inequalities (113). Population approach aims to identify the underlying cause of disease and reduce the overall level of risk in the whole population (114). The common risk factor approach focuses on shared risk behaviours of chronic diseases such as cardiovascular diseases, obesity and oral diseases by integrating general and oral health (18). This approach should be used to promote public health interventions for the whole population to reduce social inequalities (8).

The social conditions and environment in which people are born, grow, live and work influence their health behaviours (112). There are underlying causes of the causes which determine clustering of behaviours (115). People from lower socioeconomic position are surrounded in less favorable material conditions than higher socioeconomic groups and also frequently expose more health damaging behaviours (116). Thus, interventions directing oral behaviours cannot decrease differences of caries experience arising from SES disparities (74).

Interventions to change health behaviours should be focused at approving supportive environment to enable the healthier choices to be the easier choices at all ages in a variety of settings including nurseries, school, colleges and workplaces (113). For example, the health promoting school (HPS) approach focuses on improve health and oral health for all children in school by provide supportive physical and social environments. The HPS approach is a strategy for promoting children's oral health in school by healthy public policies such as banning sugary food, providing clean drinking water, vegetables and fruits in school meals and tooth brushing programs (117, 118). In Brazil, Moyses et al. (2003) (119) showed that percentage of caries free children studying in schools with comprehensive HPS activities was significantly higher than in non-supportive schools. Schools with a comprehensive

curriculum were more likely to have less children with dental trauma than non-supportive schools as well.

Tackling oral health inequalities is a major public health challenge that requires changing in macro-environmental and social aspects. The challenge is increasing of opportunities and supportive conditions in order to enable people to sustain good oral health. Thus, enhancing children's social and environmental development has become an increasing determinant of young children's chances and their ability to maintain health and well-being.

2.3.3 Social capital and oral health conditions

2.3.3.1 Concepts and theories of social capital

The concept of social capital has become wildly acknowledged into the mainstream of public health research. In recent years, many researches used the concept of social capital to explain the role of socio-cultural and socio-environmental context affecting to people's life both health and oral health outcomes. The term is used to report a number of phenomena resulting from social relations at the individual and community level. However, social capital literature has been differently constructed by three leading authors Sociologists Pierre Bourdieu, James Coleman and Political scientist Robert Putnam.

Bourdieu (1986) (120) defined three dimensions of capital: economic, cultural and social capital, which are the core factors determining positions of people in to different social class structures. Especially through economic capital and described social capital as a concealed transform of economic capital that powerful people used it to sustain their position in social hierarchy. According to Bourdieu, referred social capital to "the sum of the resources, actual or visual, that increases in an individual or a group by virtue of possessing a durable network of more or less institutionalized relationships of mutual acquaintance and recognition". Thus, the individual's social capital does not only depend on the size of connections, but also the quality of involvement of membership in social relations. These strong networks can improve the social position of the actors in a variety of different social class.

Coleman (1988) (13) concluded that three kinds of capital are related to processes directly affecting children's well-being. These include physical capital (money and material resources), human capital (nonmaterial resources embodied in the skills and capabilities acquired by an individual) and social capital. According to Coleman, social capital referred to resources that inhere in the structure of the relations among individuals or groups and that facilitate actor social outcomes. Unlike Bourdieu though, Coleman means social capital as a potential public good benefiting the whole people in communities. For Bourdieu, social capital reproduces social inequality and provides positive outcomes in elites. In addition, Coleman identified 3 forms of social capital by function as well, obligations and expectations, which depend on trustworthiness of the social environment, information channels in social organization and effective norms, which reinforced by social support and promoting safety in communities.

Social cohesion refers to the extent of connectedness and solidarity among groups in society (121). Sampson et al. (1997) (122) showed the concept of collective efficacy which combines social cohesion (the extent to which neighbors trust each other and common values) with informal social control (the extent to which neighbors can count on each other to monitor and supervise youth, and protect public order). They showed that the capacity of adults informally to regulate social behaviours, particularly that of young people (122).

According to Putnam's study of the influence of civic engagement on effective community, Putnam (1993) (123) found that high levels of civic engagement measured by newspaper reading, expressions of trust in survey questionnaire and participation in nonpolitical associations such as soccer clubs or membership in others groups led to more effective policies and political and economic success among Italy's various regions, and also explained the circles of voluntary association, social reciprocity and social trust. Voluntary association is the most important form of reciprocity and interaction between memberships in community that enable trustworthiness causing interpersonal bonding, on the other hand, high level of mutual trust also create association of civic action and strong reciprocity. Thus, Putnam defined social capital as "features of social organization, such as civic participation, norm of reciprocity and trust in others, that facilitate co-operation for mutual benefit".

Putman (1993) (123) classified social capital into vertical hierarchical relationships and horizontal egalitarian relationships. Horizontal social capital refers to social relation in equal memberships interacting for the same purpose or activity. Vertical social capital, on the other hand, involves relation among different organizations such as interaction between members of neighborhood and official government.

Later, Putnam (2000) (124) categorized different forms of social capital by function, bonding, bridging and linking social capital. Bonding social capital is characterized by strong bonds among people with in a particular group that involve information flow and support among memberships and sharing interest in activity, enable people to "get by" in life. Santiago et al. (2013) (125) showed benefit of individual's bonding social capital assessed by social support scale in decreasing dental pain of adolescents, adults and elderly in Brazil. While bridging social capital is formal and informal networks linking with other people that connect across groups of people, which is useful to help them to "get on" by promoting relationships wider but weaker ties. Iwase et al. (2012) (126) reported that high bridging social capital was clearly related to poor self-rated health among women adults in Japan, but bonding social capital did not show the effect and both bonding and bridging social capital were not associated with poor health among men. In addition, linking social capital refer to links between individuals or groups in different social class with larger social organization helping people "get around" (127).

A recent literature review has divided social capital in 2 components, a cognitive component and a structural component (128). Cognitive social capital means that the level of individual' perceptions of trust, sharing and reciprocity in neighborhood including norms, values, attitudes and beliefs, assessing what people feel. Whereas, structural social capital refers to the level of social connections or pattern of civic participation of social institution in community showing what people do (129).

However, there is no consensus of the definition and measurement of social capital (130). In general, social capital refers to collective social perception, social relation or social action of people in community that enable them positively mutual outcomes. Macinko and Starfield (2001) (131) concluded levels of social capital in

conceptualization and measurement in different levels. First, the macro level context, social relations or societal structures in political and economic aspects including political regime type and level of decentralization that produces social capital within societies.

Second, the neighborhood level, measures characteristics of neighborhoods or communities such as patterns of network development, level of social violence and cooperation that may affect social capital production among communities. And these neighborhood level variables can be also aggregated by individual characteristics of social relation (132).

Third, the level of individual action such as participation in social networks and membership in groups and individual level of perceptions that are basically psychological constructs such as individual's collective efficacy of reciprocity, social trust, social support or social control in community. Both level of individual actions and individual attitudes could be collected to the community, state or national levels in health and oral health literatures.

2.3.3.2 Relationships among social capital, health and oral health

The processes underlying relationships between social capital and health have not completely understood yet. However social capital can influence on various health outcomes through health-related behaviours (130) such as dietary habits (133), physical activities (134), tobacco smoking (135) and psychological pathway (136). Moreover, there are possible pathways linking income inequalities with social capital and health outcomes. Income inequalities could reduce social capital, while social capital is related to health outcomes (136). Aida et al. (2011) (132) examined the effects of social capital on relationships between income inequalities and health. They found that associations between income inequalities and self-rated health decreased by community-level structural social capital, aggregated from individual-level data.

Similarly, social capital can take complex pathways to impact oral health outcomes. High level of social capital improved oral status through positive oral health-related behaviour and pattern of attending dental services (137, 138). Because individual with high social capital can get more channels of oral health information

between individuals or groups and share positively oral health behaviours through the communities.

People with high level of social capital may have more psychosocial health protections. Phongsavan et al. (2006) (139) studied relationships between social capital and psychological distress in adults and concluded that individual's perceptions of trust, safety and reciprocity in community associated with lower risk of mental health distress. Psychological distress can increase poor oral health-related behaviours such as smoking and unhealthy food consumptions (83) and lead to increased risks of periodontal diseases (140) as well as dental caries (141).

Social capital also affects individual oral health behaviours. The 2007 National Survey of Children's Health in the US (137) found that perceived social capital of mothers having children younger than 18 years, measured as social capital index capturing reciprocal help, support and trust in neighborhood, was related to maternal report on children's unmet dental care needs and the use of preventive dental visit, but was not associated with perception on child's teeth. Report on the 2003 National Survey of Children's Health found significant associations between high perceived social capital of parents and oral health of children aged 1-5 years (142), children's oral status in the survey were rated by parents.

Furuta et al. (2012) (143) found significant relationships between social capital and self-rated oral health of first year students at the university in Japan. Lower level of neighborhood trust and lower level of vertical school trust, measuring teachers and students' relation, were significantly associated with poor self-rated oral health. In contrast, low informal social control was associated with better oral health. Authors discussed that this findings might be explained by Japanese cultural characteristics of having strong social control which could results in over stress (144).

In Thailand, Suksudaj (2010) (145) explored specific social capital variables from qualitative study, consequently, defined 3 domains of social capital: survival, sufficiency and sustainability. He found that only adults with high sufficiency characteristics such as lifestyle of living in moderation and collective financial management were more likely to have less oral impacts on quality of life compared to their counterparts. However, no statistically significant association was found between social capital and caries prevalence in this group of Thai adults.

In addition to individual's perceptions, social capital can be measured at a community level. This is because individual's risk of illness cannot be considered as isolated from the risk of their community (115). Thus, influences of surrounding community contexts and individual characteristics on caries experiences cannot be separately examined. Multilevel analysis was used to estimate the influences of individuals and community separately. Previous multilevel research revealed the significant relationships between community level social capital and oral status in children. In Brazil, Pattussi et al. (146) referred empowerment to social capital and found that 14- to 15- year-old students living in area with higher level of empowerment had significantly lower DMFT rates than counterparts. In addition, they reported on significant associations of areas with high levels of social capital, defined as norms and networks, with low prevalence of dental injury among boys (147). Results obtained by multilevel analysis on 3-year-old Japanese children showed that community contexts were associated with caries prevalence in young children (148). Higher social cohesion and neighborhood trust in communities, measured by number of community centers (per 100,000 residents), were related to lower dmft scores (148).

In addition to child age groups, associations between social capital and oral health were examined in different ages in other studies. Santiago et al. (2013) (125) concluded that there were significant relationships between neighborhood social capital, individual social capital and dental pain in adolescents, adults as well as elderly. They revealed that people living in high areas with neighborhood social capital and those having high bonding social capital were less likely to have dental pain. Particularly, the effects of neighborhood social capital on dental pain were more important than bonding social capital at an individual level.

Olutola et al. (2012) (149) conducted a multilevel study in South African adults, and found significantly positive associations of area-level, individual-level social capital with self-rated oral health. The effects of social capital on oral health differed between genders. Males who trust other people in their communities were more likely to report self-rated good oral health than their counterparts. No significant relationships were found between area-level social capital and self-rated oral health.

In contrast, females living in high area-level social networks measured by household cell-phone were more likely to have better self-rated oral health.

Aida et al. (2009) (141) examined different associations between vertical and horizontal networks, measured by number of participation groups, and number of remaining teeth of elderly Japanese. They found that individual-level and community-level horizontal social capital had beneficial effects on number of remaining teeth, while individual-level and community-level vertical social capital did not. However, some variables of vertical and horizontal social capital used in this study were unclear.

Evidence from many studies suggested that various patterns and levels of social capital determined oral health outcomes. Effective social capital would therefore, reduce socioeconomic gradients in oral health outcomes.

2.4 Social contexts and school marks

Although there are several methods that schools can promote educational outcomes of children, most approaches focused on institutional attainment for individuals (150). Social disadvantage, although being outside of school's control, undoubtedly leads to low school performance of children (151). Associations between poverty and educational achievement were well established and frequently related to disempowerment and lack of confidence in children (152). Thus, involvement of schools, families and communities can promote children's educational achievement (150).

2.4.1 Individual's sociodemographic and economic characteristics associated with school marks of children

Many previous studies have demonstrated relationships of socioeconomic status and race/ethnicity with academic achievement. Children who were African American and Hispanic/Latino (153), whose parents had low level of educations (154) and those who were in a poverty (9, 155) were more likely to have low educational performances. Poor children were 2 times more likely to drop out of school before graduation and 1.4 times more likely to experience learning disability (9).

Studies reported on various indicators of poor academic outcomes such as household income, parental education, parental occupational status and family structure (9). Those indicators have different impacts on educational achievements. White (1982) (156) showed independent effects of various components of socioeconomic status. Financial impoverishment generates deficits in all sorts of physical, emotional, educational and health-related resources needed to support children in schools. Low-income children begin school with a lower level of readiness than their middle class counterparts. Their parents may not be able to buy them educational toys and provide access to enriching activities (12). Previous studies showed that children with lower family income associated with low school marks after adjusting for confounding factors (11, 44). And uninsured children also associated with low school marks (11, 44).

Household income has large effects on children's ability and achievement. Students living in poor family were more likely to miss school, to be labeled as problem students, to earn lower scores in standardized test and to drop out of school (9). Because low income may produce socioeconomic pressures leading to conflict between parents in financial matters (157) and undermining the children's self-confidence, social relationships and school achievement (158). Moreover, gambling was a cause of problems in family relating academic performance of children as well. Student living in family with gambling problems were 1.8 times more likely to be rated at poor educational performance than counterparts after controlling for confounders (159).

Pocket money seems to be typical economic resource allocated to children. Qualitative research revealed that children gradually develop the idea of ownership when age increases (160) and change their view of pocket money from parents' to their own money (161). Huan He et al. (2012) (161) showed the result of poverty indicators that child self-esteem was more strongly related to child's reports of family poverty, including weekly pocket money and the perceived economic stress, than parents' reports of family poverty. Thus, amount of pocket money children received for school can be used as an indicator of socioeconomic status of children.

Parents' level of education could be used as another marker of family disadvantage. Low levels of parental education will generate educational disadvantage

because those parents are less able to help their children with schoolwork and less able to be challenging goals or standards of success in academic achievement. Children whose mothers had low education were reported low school marks (11, 40, 44). Moreover, lone parenthood often associated with socio-economic disadvantage within the household (162). In addition, parents with low status jobs might not have social connections with teachers or school staff because their work is usually on fixed schedules.

2.4.2 Area level characteristics associated with school marks of children

Most studies focus on individual level of poverty significantly affecting to educational outcomes, while some studies indicated that the effects of aggregated circumstances such as neighborhood or community, school and city were stronger than individual effects (163, 164). Other theories about educational failures of poor children have tried to shift the blame from children to their parents and communities (165). Some authors stressed that impoverished children, family and communities may not have enough basic resources needed to support their children such as books, computers and other supports for education (166). In contrast, other supports are usually prepared in middle class or affluent household.

People in high-income communities have access to better services for children such as parks, quality schools and community centers. Lower-income families may have fewer resources to care for children and may miss out on many opportunities because of living in poor socioeconomic circumstances of neighborhoods (12). Moreover, children living in low family income may be made them worse by their poor neighborhoods such as many unemployed adults, serious crime, drug problems and few resources for child development such as playgrounds, health care facilities and after school programs (9). Children from low-income families living in unsafe neighborhoods are at risk behaviour problems, because they usually spend out-of-school time with their peers such as hanging out with friends without adult supervision (167, 168). For example, thirty months longitudinal study found that adolescent boys whose families got money from experiments for moving to better neighborhoods showed significantly higher school marks than control groups (169), although positive effects were not sustained at 60 months (170).

Furthermore, poor communities and working-class community schools had fewer resources such as funding of education and teachers than the ones in upper-middle class communities (171). Teachers in these schools not only more limit their student's growth by having low expectations (172), and they also had less skills to support their children than teachers in higher income schools (173).

Study showed that children studying in schools with lower income populations had lower collective efficacy (174). Collective school efficacy occurs when all students are expected to reach high standards, which positively related to student achievement (174). The result of relationship between school characteristic and literacy achievement in 3- and 5- grade students showed that percent of low income students in school indicated the negative growth in literacy skills. Rather than, family income did not predict change in student's literacy skills (175).

2.4.3 Relationships between social capital and school marks of children

Bourdieu (1984) (176) explained that the poor are handicapped because they lack appropriate cultural capital such as satisfactory habits, skills and information. For example, Black children in America were disadvantaged in education because of traditions within the African-American community which did not support education (165).

Coleman viewed family social capital as tools supporting children's educational achievement. Disadvantaged children lack social capital and do not have the norms, the social networks and the relationships between adults and children (13). Parental involvement has been defined and measured in different ways in previous studies such as parental involvement at home or at school and combined both of them in the single measure of parental involvement (177-179). Parental involvement at home includes helping with homework, supporting educational resources and controlling for behaviour expectations and educational importance (13). Parental involvement at school may include participating parent-teacher meetings and attending in volunteer activities of school. Parents can get access to useful information, parenting skills or available resources in the socially parental networks (13).

Relationships between parental involvement and children's academic achievement have been explored. High level of parental involvement significantly associated with high children's academic performance (12, 177, 180). Parental involvement mediated the effects of poverty, parental education and race/ethnicity on children's academic performance (155). In addition, home learning environment including read to the children, access to library, provide learning activities and provision developmental experiences were accounted for the effects of family's income on cognitive outcomes in young children (181). Smith et al. (1997) (182) revealed the influence of quality of home environment on the effects of income on cognitive development of children. Differences in home environments status of higher and lower-income children explained nearly half of the effects of income on cognitive development of preschoolchildren and close to one-third of the effects of income on elementary children (182). Thus, increasing parental-child relationship can help parents promote their children's academic performance and may decrease the inequalities in educational achievement (155).

Coleman (1988) (13) stressed the importance of building close relationship with schools. For example, if students attending in Catholic schools received the formation of social capital through social intergenerational closure between family and school and did not change schools often, they had significantly lower dropout rates (13). Direct connection between community and school improvement showed positive outcomes both community-school relationship and academic outcomes (183).

Education is commonly accepted as a great weapon against poverty and social inequality (184). Public institution such as school settings not only become a major learning environment and secondary caregiving, but also play a role as a protective factor in children's lives (185). School provides the basic skills necessary to participate in society. School-based programs encourage students for civic engagement of young people from all socioeconomic backgrounds. Most young people spend more amount of their times with friends and teacher than with parent, and these relationships are important in children's development. Schools may provide with some of social capital that is missing from low incomes children's home environments and will increase their chances to succeed in educational performances (13). That is, schools where there are strong teacher collaboration and parent-teacher

communication, students are more likely to excel in academic performances (14). Briefly, schools could be inevitably important community of children.

The organizational structure and norms of the classroom had significant roles on student's relationship with peers and teachers (186). Teachers who emphasize the importance of achievable goals for their children were also positively related to student achievement (187). Furthermore, the influence of peers on the motivation of other students on learning and social behaviour of all students may affect student academic performance (15).

Students particularly from low-income families participating in extracurricular activities in school were more likely to have informally supportive relationships. These social networks of students may buffer the worst effects from their low social positions through informal relationships with teachers (188). Thus, the influence of social capital on educational achievement of children undeniably exists. Promoting social capital especially for disadvantaged children could help decreasing educational gradients.

2.5 Summary

Associations between OHRQoL including school absence and school performance have been widely assessed in many countries. However, findings on the associations between school absence and school performance obtained from previous studies have limitations and no study applied the Child-OIDP index to the analysis of educational context. Relationships of individual oral health behaviours, oral status and OHRQoL with school marks of children should be interpreted with cautions, because these relationships could be affected by shared underlying social factors of individual and socio-environmental conditions relating to oral health outcome and school performance as well.

It was clear that socioeconomic gradients influence to health and oral health outcomes and children's school performance as well. Moreover, evidence from many studies suggested that various patterns and levels of social capital determined oral health outcomes. Many previous studies also demonstrated associations of social capital including parental involvement, teacher-parent relationship and relationships to peers with children's academic performances. Effective social capital would reduce

socioeconomic gradients in oral health outcomes. Thus, promoting social capital especially for disadvantaged children could help decreasing educational gradients.

In addition, socio-environmental determinants in school relate to oral health outcomes could be expectedly associated with children's academic performances, health promoting school approach focuses on improve health and oral health for all children in school by healthy public policies. Some useful social capital variables or school environmental policies in this study might be easy choices to decrease socioeconomic gradients in oral health and educational outcomes of children.

No study in Thailand has examined associations of shared underlying social factors such as sociodemographic and economic status, social capital and socio-environmental school factors with oral diseases, OHRQoL and school performance in school-age children.

2.6 Research Objectives

The purposes of this study are:

1. To examine the associations of sociodemographic and economic status and school oral health-related environments with oral behaviours and oral status in children.
2. To examine the associations of sociodemographic and economic status, social capital and oral status with OHRQoL in children.
3. To examine associations of sociodemographic and economic status, social capital, oral status, OHRQoL and school absence with school performance in children.

2.7 Research Conceptual Framework

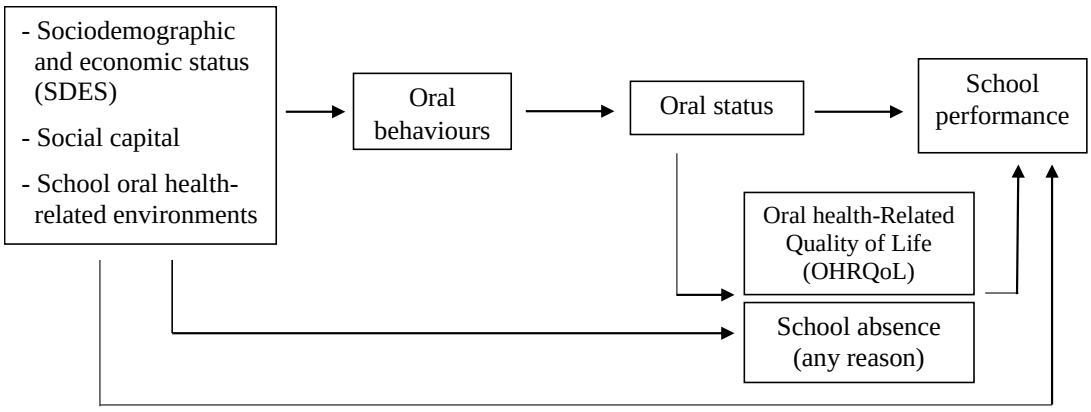

Figure 2: Conceptual Framework of study.

CHAPTER 3
RESEARCH METHODOLOGY

A cross-sectional study were carried out to collect data of sociodemographic and economic status (SDES), social capital, school oral health-related environment, oral health behaviours, oral status ,Oral Health-Related Quality of Life (OHRQoL) and school performance of children. This chapter will explain all research methodological procedures including sampling design, data collection, study implementation and data analysis.

3.1 Sample

3.1.1 Study area

A cross-sectional survey were conducted in Sakaeo province, Thailand for convenient propose. Sakaeo province located approximately 250 Kilometers east of Bangkok. It was divided into nine districts. Most of the populations lived in local areas.

3.1.2 Study sample

The sample population was sixth grade students studying in public and private schools in nine districts in Sakaeo province.

3.1.3 Sampling design and sample size calculation

In terms of sample size calculation, the main objective of study was to address socioeconomic characteristics associated with OHRQoL and school performance. Estimated proportions of children missing schools due to toothache in public and private schools were used to calculate sample size in this study. Proportion of children missing schools due to toothache in public schools was 5.4% and the estimated proportion of children missing schools due to toothache in private schools was 1.9% (4). The sample size was calculated by using 80% power and 95% confidence interval level. The calculated sample size was 900 children. Design effects referred to the ratio

of the variance of the estimator of complex sampling design to the variance of the estimator based on simple random sampling design. Design effects as 1.5 was calculated. The calculated sample size was 1,350 children. Moreover, although high response rates were expected in this study because of school time examinations, absence of subjects or loss of data might be occurred during process of data collection. Over sample size by 10% were required. In total, 1,485 grade 6 schoolchildren were required for this study.

A stratified random sampling design were implemented. The target population was selected by systematic probability proportional to size (PPS) sampling method. PPS sampling was advantageous because it ensured that higher probability of larger schools were selected (189). According to the main aim of study, the sample needed to cover schoolchildren across different socioeconomic characteristics. Therefore, strata were defined by urbanicity and types of school which represented socioeconomic status of children. At the first stage, all of schools in 9 districts in Sakaeo were classified into three strata, namely, public schools in rural areas, public schools in urban areas and private schools. It is noted that there was no any private school located in rural areas. At the second stage, schools in each stratum were divided according to their size, namely, small, medium and large schools. At the third stage, within each size of school, all classrooms were ranged by alphabet and systematic selected according to proportional number of grade 6 schoolchildren in strata and size of school. Due to the practicality, all children in selected classrooms were invited to participate in this study.

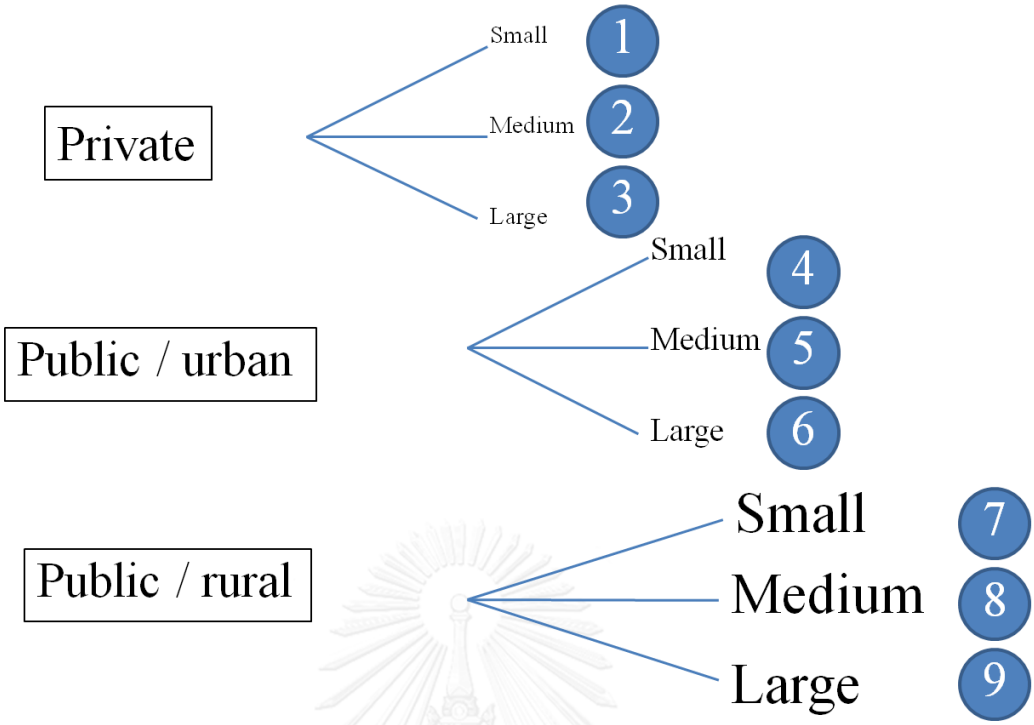

Figure 3: A stratified random sampling design.

3.2 Data collection

Data collected consisted of seven parts: SDES, social capital, school oral health-related environments, oral behaviours, oral status, OHRQoL/school absence and school performance. Data were collected through oral examination, interviewed questionnaire on children's OHRQoL, oral behaviours and social capital, parental self-administered questionnaire on social capital and socioeconomic backgrounds, school data for school oral health-related environments and school records for school absence and performance.

3.2.1 Sociodemographic and economic status

SDES, including age, sex, school type with urbanicity (public rural; public urban; private), school size (small to medium; large), monthly family income (up to 15,000 THB (Thailand minimum wage) (low); more than 15,000 THB (high)) and father's education level (less than 12 years (low); 12 years or more(high)) were recorded.

3.2.2 Social capital

Social capital characteristics perceived by children included number of close friends, trust in close friends (never to moderate (low)/ high), parental support in school work (never to moderate (low)/ high), engagement in school activities (such as head/assistant head of classroom, school board committee, school representative). Number of students per teacher were also calculated to represent teacher-children relationship. Social capital data obtained from parents were participation in school meetings representing teacher-parent relationship (never to often (infrequent)/ always (frequent)) and parental expectation in children's graduation (less than bachelor degree (low)/at least bachelor degree (high)).

3.2.3 School oral health-related environments

School oral health-related environments were collected through observation and interviewing school staff by one observer/interviewer. These included ever received oral health promoting school (OHPS) award, provided free toothbrushing and toothpaste, simple oral examination by teachers, integrated oral education into school curriculum, availability of fresh fruit in free-of-charge school meals and eight items on snacks/drinks sales in school. The eight items were (i) fresh starchy snacks such as sandwiches, stuffed bread and steamed stuffed bun; (ii) meat snacks such as fried chicken, barbecued pork, hotdog, meat burger; (iii) crispy packed snacks such as potato chips, fried crispy wheat flour; (iv) ice-cream; (v) candies; (vi) sweetened milk such as chocolate flavored milk, yogurt drinks; (vii) sweetened drinks such as sugar-added herbal drinks and fruit juice; (viii) soft drinks. The five school environments were recorded as 'never or present for less than 2 years' (no) and 'present for 2 years or longer' (yes), whereas eight item sales in schools were recorded as 'never or sometimes' (no) and 'usually' (yes).

3.2.4 Oral behaviours

Behavioural questionnaire was composed of questions on 1) brushing practice after lunch (never or hardly ever or sometimes (no); usually(yes)); 2) frequency of brushing per day (less than twice (no); twice or more (yes)); 3) frequency of

consuming six types of unhealthy snacks/drinks (crispy packed snacks, ice-cream, candies, sweetened milk, sweetened drinks and soft drinks) within a week (not every day (no); every day (yes)), recorded separately for each type. 4) daily sweets consumption, defined as whether or not any of the five types of sweets (ice-cream, candies, sweetened milk, sweetened drinks and soft drinks) were consumed every day during a week (no; yes).

3.2.5 Oral status

Children were examined for dental caries and oral hygiene at schools by seven local trained and calibrated dentists. The World Health Organization DMFT index was used for dental caries (190). Number of untreated decayed teeth (DT) and number of decayed, missing and filled teeth (DMFT) were calculated. DT score of less than 2 and DMFT score of less than 3 were categorized as low level of dental caries according to the mean score. The Simplified Oral Hygiene Index (OHI-S) (191) was used to assess oral hygiene. The OHI-S scores (maximum score of 6) of up to 1.2 were categorized as good oral hygiene, while those higher than 1.2 were considered as fair/poor (192).

3.2.6 Oral Health-Related Quality of Life and school absence

For OHRQoL measure, children were interviewed by well trained and calibrated three interviewers using the Thai version of Child-Oral Impacts on Daily Performances (Child-OIDP) index (26). Oral impacts during the past 3 months, through difficulties on 8 daily performances: a) eating; b) speaking; c) cleaning teeth; d) emotional state; e) relaxing/sleeping; f) smiling without feeling embarrassment; g) studying; and h) social contact were assessed. The OIDP system includes a question on oral conditions perceived as important causes of experienced impacts. Answers on perceived clinical causes were used to calculate Condition-Specific (CS) impacts. CS impacts attributed to dental caries were the impacts of which perceived causes were toothache, sensitive tooth, hole in tooth or broken filling, while CS impacts attributed to periodontal disease were the impacts of which perceived causes were inflamed gums, pain in gums, calculus or bad breath. The OIDP system includes a question on

oral conditions perceived as important causes of experienced impacts. CS OHRQoL measures had better discriminative ability than the other generic measures (193).

School absence referred to the absence due to any reason (never to 1 day during the past semester/ 2 or more days). Data were collected at the end of 4 month semester.

3.2.7 School performance

School performance was measured by the total National Standard Examination score. The examination was arranged annually by the National Institute of Educational Testing Service (State Organization) to evaluate school performance of 6^{th} grade schoolchildren across the country in 8 subjects: a) Thai language, b) Socio-cultural education, c) English language, d) Mathematics, e) Sciences, f) Hygiene and physical education, g) Arts and h) Work and technology. Possible maximum score of each subject was 100 and that of total score was 800.

3.3 Study implementation

3.3.1 Permission

After obtaining approval of human research by the Chulalongkorn University Ethics Committee (HREC-DCU 2014-033), the programme was implemented. Primary education authorities, local health authorities, seven community hospitals and all schools of the study areas were contacted to gain their permission and co-operation. Letters informing about purposes of the study and positive consent forms were sent to parents of sampled children. The children returning the consent forms signed by their parents were counted in study participations. After oral examination, every participant received a sheet informing them on their oral status, suggestion in necessary dental treatment and oral health instruction. Schools received summary results of grade 6 children oral status and treatment needs as well as a letter thanking them.

3.3.2 Preparation of documents and validating questionnaires

All documents were prepared using standard forms, if available, otherwise, the appropriateness and completion of information of all instruments were considered.

a) Most questions contained in questionnaires on oral behaviours of children and school oral health-related environments were used in oral health survey in Thai primary school. Some specific questions were added. Social capital and school oral health-related environmental questionnaires have never been used in Thailand. Face and content validity were consulted with experts in the field of dental public health and edited all questionnaires according to experts. Language and format of the questionnaires were modified several times, after consultation with school staffs until the questionnaires were comprehensible. Later, questionnaires were tested on a group of children, parents and school staffs for adjusting appropriated form. Some questions and choices were adjusted if those were similar. Some questions were excluded if those cannot reach the real answers, for example, brushing time and rinsing habit. In a pilot test, one-third of children answers do not know.

b) The standard forms and criterias used for clinical oral examinations (190, 194, 195) were used in study. Ten percent of children were re-examined for testing intra-examiner reliability.

c) The Child-OIDP (26), OHRQoL index that was developed and validated in Thai schoolchildren and previously used in the sixth and seventh National Oral Health Survey in Thai schoolchildren in 2005 and 2012 were used. Intra-examiner reliability were also tested by re-interviewing children as were done in clinical oral examination.

3.3.3 Training and calibration exercises

Training and calibration exercises were conducted after all instruments were prepared, which were.

a) Oral behaviours, social capital and school oral health-related environments

Interviewers were trained before collecting all questionnaires including oral behaviours and social capital of children and school oral health-related environments.

b) Clinical oral examination

Reliability tests were done through the evaluation of correlation among items according to the criteria for each condition. The calibration procedure for all examiners was carried out at the Sakaeo Public Health Office. Methods were based on World Health Organization's guidelines (190). Extensive training of oral examinations including DMFT and OHI-S indices. The main examiner tested inter-examiner reliability against others examiners.

c) Oral Health-Related Quality of Life

Validation process of Child-OIDP in Thai schoolchildren was described in previous research (26). Interviewers were trained and calibrated before collecting subjective socio-dental questionnaires including Child-OIDP and overall perception of oral problems. Inter examiner-reliability of all examiners were tested against the main examiner, considered as gold standard. Intra-examiner reliability were also tested by re-interviewing children as were done in clinical oral examination.

3.3.4 Implementation steps

a) Parental questionnaires were sent and collected by schools. All required data except parental questionnaires and school performance were carried out together in first visit for the convenience of school staffs. Completed parental questionnaires and school records (school absence and school performance) were collected by public health officers in each district and were sent to Sakaeo provincial public health office.

b) The implementation of oral examinations based on the World Health Organization's guidelines (190), in terms of infection control and the provision of instruments and supplies. Assessing of the oral status were done using plane mouth mirror and periodontal ball-pointed probe. Each examiner worked with a trained recorder arranging duplicate examinations. Each subject lied down on a portable chair facing natural light. Examiners examined behind a child's head. Recorders sat close to examiner for hearing corrected data.

c) The processes of OHRQoL data collection were described in previous study (26).

3.4 Data analysis

SPSS Version 22.0 (SPSS, Inc.,Chicago, IL, USA) was used for data analysis. Data entry was done twice in order to ensure the reliability. Any difference detected was checked against the original completed questionnaires. The level of significant were set at 5%. Statistical analyses included the followings:

3.4.1 Descriptive statistics

Descriptive data were presented as frequencies, mean (standard deviation (SD)) and median (interquartile range (IQR)), which were:

a) SDES, social capital, school oral health-related environments, oral behaviours, oral status, school absence and school performance were categorized into two or more groups. Some continuous data also were shown. In addition, cronbach's alpha coefficient was used for the analysis on internal reliability. Ten percent of the children were re-examined at the end of the day for the intra-examiner reliability test using Intraclass Correlation Coefficient (ICC).

b) OHRQoL data

The Child-OIDP scores were presented in continuous data. The oral impact scores of each performance were obtained by multiplying severity and frequency ranging from 0-3 scores per performance. Therefore scores could range from 0 to 9 in each performance. The overall oral impact scores was the sum of all 8 performances divided by 72 and multiplied by 100. Answers on perceived clinical causes were used to calculate CS impacts attributed to dental caries and to periodontal disease. In addition, statistics used for the analysis on internal reliability of the Child-OIDP was Cronbach's alpha coefficient. External (test-retest) reliability was examined using ICC.

3.4.2 Bivariate analysis

Independent variables were discrete and continuous data, and were tested for relationships with dependent outcomes. Dependent variables obtaining P-value of <0.2 for their associations with independent variables in univariate analyses were further entered into regression models.

The high/low of DMFT and DT scores and good/fair or poor of OHI-S score were associated with SDES, school oral health-related environments and oral behaviours and using Chi-square test.

The presence/absence of CS impacts attributed to dental caries and those of periodontal disease were associated with SDES, social capital and oral status and using Chi-square and Spearman correlation tests.

School performance was associated with SDES, social capital, oral status and CS OHRQoL/school absence using Mann-Whitney U, Kruskal-Wallis and Spearman correlation tests.

3.4.3 Multivariable regression models

Multiple regression were used to evaluate independent effects of several covariates after adjusting for confounders on the following dependent outcomes. The continuous dependent variable, total school performance scores, used the linear regression model, while presence/absence of CS impacts, high/low of dental caries and good/fair or poor oral hygiene used logistic regression. Statistical significance was indicated when p-values was less than 0.05. Multi-colinearity among all independent variables was checked and if found, variables were excluded.

Regarding the associations of school oral health-related environments with oral behaviours and oral status in chapter 5, model 1 was SDES-adjusted. Model 2 was to further adjust for other school environments. Model 3 was further adjusted for oral behaviours significantly associated with each outcome, thus, representing the effects of certain school environments on oral behaviours and oral status after adjusting for potential confounders.

The hierarchical relationships of school performance with CS OHRQOL/school absence and oral status were shown in chapter 6. A conceptual framework was developed (Figure 4) to assess the associations between various parameters in a hierarchical manner. For CS OHRQoL as the outcome, SDES and social capital factors had direct effects (pathway b) and exerted the effects (pathway a) through proximate oral status (pathway c). For school performance as the outcome, SDES and social capital factors were distal determinants directly affecting school performance (pathway f) and exerted their effects through proximate oral status

(pathway a) and other proximate determinants (pathways b), Oral status exerted their effect on school performance directly (pathway d) and through OHRQoL/school absence (pathways c, e), while OHRQoL/school absence affected school performance directly (e).

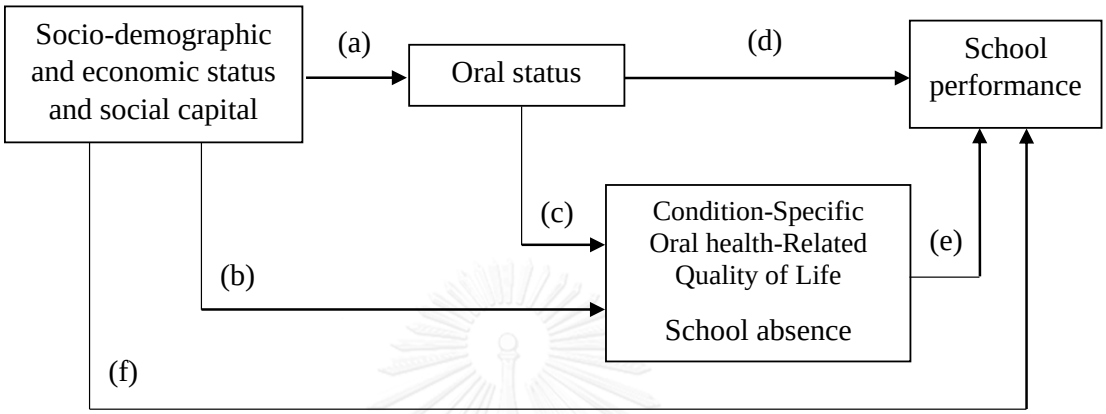

Figure 4: Conceptual hierarchical framework for the associations of sociodemographic and economic status, social capital, oral status, condition-specific oral health-related quality of life (CS OHRQoL), school absence and school performance outcomes.

Note: Pathways a, b, c are for the analyses of CS OHRQoL as the outcome.
Pathways a, b, d, e, f are for the analyses of school performance as the outcome.

Independent variables obtaining *p*-values <0.2 for the univariate analysis were hierarchically entered into the multiple logistic and linear regression models performed in two and three steps respectively. For CS OHRQoL as the outcomes, model 1 included all SDES and social capital factors to represent the effect of each factor on CS impacts attributed to dental caries and periodontal disease. Model 2 further included oral status, which was significantly associated with the related CS impacts in univariate analyses, to represent the effect of oral status on CS impact adjusted for SDES and social capital confounders. For school performance as the outcome, model 1 included all SDES and social capital factors. Model 2 further included oral status, which was significantly associated with school performance, to represent the effect of oral status on school performance adjusted for SDES and social capital confounders. Model 3 measured the effects of OHRQoL/school absence on

school performance adjusted for all confounders. School absence and CS OHRQoL variables related to certain oral status were included in the model, only if relating oral status was associated with school performance.

3.4.4 Research Hypothesis

Hypotheses of this study were to compare children's oral behaviours and oral status, between groups with different school environments, as well as to compare children's OHRQoL and school performance between groups with different social factors and oral status, which were:

3.4.4.1 Null hypothesis: Proportions of children having good oral behaviours or good oral status in groups with high socioeconomic status and highly supportive school oral health-related environments would equal to those in groups with low socioeconomic status and poorly supportive school oral health-related environments.

Ho: $\pi a = \pi o$

πa = Proportions of children having good oral behaviours or good oral status in groups with high socioeconomic status and highly supportive school oral health-related environments.

πo = Proportions of children having good oral behaviours or good oral status in groups with low socioeconomic status and poorly supportive school oral health-related environments.

Alternative hypothesis: Proportions of children having good oral behaviours or good oral status in groups with high socioeconomic status and highly supportive school oral health-related environments would not equal to those in groups with low socioeconomic status and poorly supportive school oral health-related environments.

Ha: $\pi a \neq \pi o$

3.4.4.2 Null hypothesis: Proportions of children having good OHRQoL in groups with high socioeconomic status, high social capital and good oral status would equal to those in groups with low socioeconomic status, low social capital and poor oral status.

Ho: $\pi a = \pi o$

πa = Proportions of children having good OHRQoL in groups with high socioeconomic status, high social capital and good oral status

πo = Proportions of children having good OHRQoL in groups with low socioeconomic status, low social capital and poor oral status

Alternative hypothesis: Proportions of children having good OHRQoL in groups with high socioeconomic status, high social capital and good oral status would not equal to those in groups with low socioeconomic status, low social capital and poor oral status.

Ha: $\pi a \neq \pi o$

3.4.4.3 Null hypothesis: Median school performance scores of children in groups with high socioeconomic status, high social capital, good oral status, good OHRQoL and low school absence would equal to those in groups with low socioeconomic status, low social capital, poor oral status, poor OHRQoL and high school absence.

Ho: $\mu a = \mu o$

μa = Median school performance scores of children in groups with high socioeconomic status, high social capital, good oral status, good OHRQoL and low school absence

μo = Median school performance scores of children in groups with low socioeconomic status, low social capital, poor oral status, poor OHRQoL and high school absence.

Alternative hypothesis: Median school performance scores of children in groups with high socioeconomic status, high social capital, good oral status, good OHRQoL and low school absence would not equal to those in groups with low socioeconomic status, low social capital, poor oral status, poor OHRQoL and high school absence.

Ha: $\mu a \neq \mu o$

CHAPTER 4
DESCRIPTIVE RESULTS

This chapter presents the descriptive results of the study in relation to sample characteristics including sociodemographic and economic status (SDES), social capital, oral behaviours, oral status, oral health-related quality of life and school performance.

4.1 Sociodemographic and economic status and social capital of children and parents

A total of 1,429 primary-schoolchildren (96.2% response rate) returned positive consent forms approved by their parents and participated in this study. SDES and social capital of children were presented in Table 1. Sample were aged between 11.0 and 16.0 with a mean (SD) age of 11.8 (0.5) years. Half were boys (50.3%), 76.1% studied in small or medium school size. Sixty percent attended public rural schools, 28.2% attended public urban schools while 11.8% attended private schools. For social capital characteristics of children, numbers of students per teacher ranged from 6.7 - 24.9 with a mean (SD) of 17.1 (4.1). Numbers of close friends ranged from 0-45.0 with a mean (SD) of 5.4 (4.7). Twenty-eight percent and 53.8% of children had high perceived trust their friends and parental support of their school work. Thirty-eight percent of children were ever engaged in school activities.

Table 1. Distribution of sociodemographic characteristics and social capital of children (n = 1,429).

Variables	%	Mean (SD)	Range
Sociodemographic characteristics			
Age		11.8 (0.5)	11.0 - 16.0
11 yr	22.1		
12 yr	72.6		
13 yr	4.5		
14-16 yr	0.8		
Sex			
Boy	50.3		
Girl	49.7		
School type			
Public rural	60.0		
Public urban	28.2		
Private	11.8		
School size			
Small	10.4		
Medium	65.7		
Large	23.9		
Social capital			
Numbers of students per teacher		17.1 (4.1)	6.7 - 24.9
Numbers of close friends		5.4 (4.7)	0 - 45.0
Trust in close friends			
Never	4.5		
Little	20.3		
Moderate	46.9		
High	28.3		
Parental support in school work			
Never	2.7		
Little	7.8		
Moderate	35.7		
High	53.8		
Engagement in school activities			
No	61.4		
Yes	38.6		

In term of SDES and social capital of parents (Table 2), a total of 984 parents of children (66.3% response rate) returned the questionnaires. The majority of children lived in low family income (72.1%) and had father with low educational level (70.4%). Children whose parents frequently participated in school meetings and had high expectation in their graduation were 61.9% and 47.7% respectively.

Table 2. Distribution of socioeconomic status and social capital of parent (n = 984).

Variables	%
Socio-economic status	
Family income	
<10,000	41.2
10,001-15,000	30.9
15,001-30,000	17.9
30,001-50,000	7.5
>50,000	2.5
Highest father's education	
Never	1.4
Primary school	48.0
Secondary school	21.0
12 years schooling	22.4
Bachelor degree or more	7.2
Social capital	
Parent's participation in school meeting	
Never	5.7
Sometimes	32.0
Often	24.3
Always	38.1
Parental expectation	
Never	4.5
Secondary school	12.9
12 years schooling	34.8
Bachelor degree	27.4
More than bachelor degree	20.3

4.2 School oral health-related environments

Table 3. Distribution of school oral health-related environments among school (n = 55) and children (n = 1,429).

School environments	N (% of school)	N (% of children)
Ever receiving OHPS award		
Never	34 (61.8)	901 (63.1)
Provincial level	12 (21.8)	268 (18.7)
More than provincial level	9 (16.4)	260 (18.2)
Free toothbrushing		
Never	0 (0.0)	0 (0.0)
Used to have (not present)	2 (3.6)	87 (6.1)
Present for less than 2 years	5 (9.1)	177 (12.4)
Present for 2 years or more	48 (87.3)	1,165 (81.5)
Simple oral examination		
Never	0 (0.0)	0 (0.0)
Used to have (not present)	5 (9.1)	168 (11.8)
Present for less than 2 years	7 (12.7)	214 (14.9)
Present for 2 years or more	43 (78.2)	1,047 (73.3)
Integrated oral education		
Never	6 (10.9)	206 (14.4)
Used to have (not present)	5 (9.1)	91 (6.4)
Present for less than 2 years	14 (25.5)	389 (27.2)
Present for 2 years or more	30 (54.5)	743 (52.0)
Availability of fresh fruit		
Never	4 (7.3)	238 (16.7)
Used to have (not present)	4 (7.3)	97 (6.7)
Present for less than 2 years	14 (25.4)	294 (20.6)
Present for 2 years or more	33 (60.0)	800 (56.0)
Items sold in schools		
- Fresh starchy snacks		
Never	13 (23.6)	233 (16.3)
Sometimes	20 (36.4)	389 (27.2)
Present for less than 2 years	6 (10.9)	185 (13.0)
Present for 2 years or more	16 (29.1)	622 (43.5)
- Meat snacks		
Never	16 (29.1)	304 (21.3)
Sometimes	14 (25.5)	258 (18.0)
Present for less than 2 years	4 (7.3)	65 (4.5)
Present for 2 years or more	21 (38.2)	802 (56.2)
- Crispy packed snacks		
Never	18 (32.7)	473 (33.1)
Sometimes	23 (41.8)	525 (36.6)
Present for less than 2 years	4 (7.3)	90 (6.3)
Present for 2 years or more	10 (18.2)	341 (23.9)

School environments	N (% of school)	N (% of children)
- Ice-cream		
Never	17 (30.9)	298 (20.9)
Sometimes	11 (20.0)	323 (22.6)
Present for less than 2 years	4 (7.3)	109 (7.6)
Present for 2 years or more	23 (41.8)	699 (48.9)
- Candies		
Never	42 (76.4)	1,056 (73.9)
Sometimes	10 (18.1)	247 (17.3)
Present for less than 2 years	0 (0.0)	0 (0.0)
Present for 2 years or more	3 (5.5)	126 (8.8)
- Sweetened milk		
Never	28 (50.9)	634 (44.4)
Sometimes	14 (25.5)	314 (21.9)
Present for less than 2 years	5 (9.1)	106 (7.5)
Present for 2 years or more	8 (14.5)	375 (26.2)
- Sweetened drinks		
Never	10 (18.2)	187 (13.1)
Sometimes	17 (30.9)	398 (27.8)
Present for less than 2 years	7 (12.7)	172 (12.1)
Present for 2 years or more	21 (38.2)	672 (47.0)
- Soft drinks		
Never	39 (70.9)	807 (56.5)
Sometimes	10 (18.2)	395 (27.6)
Present for less than 2 years	0 (0.0)	0 (0.0)
Present for 2 years or more	6 (10.9)	227 (15.9)

OHPS, oral health promoting school.

From the fifty-five primary schools, most provided free toothbrushing for children (87.3%) and had simple oral examination by teachers (78.2%). Sixty percent provided free fresh fruit with meals, 54.5% integrated oral education while around one-third ever received an OHPS award (38.2%). Around a quarter to half of schools usually sold fresh starchy snacks (40.0%), meat snacks (45.5%), crispy packed snacks (25.5%), ice-cream (49.1%), sweetened milk (23.6%) and sweetened drinks (50.9%), while soft drinks and candies were sold in only 10.9% and 5.5% of schools respectively. Percentages of children attending schools with certain school environments are similar to those on school units (Table 3).

4.3 Oral behaviours

Table 4. Oral behaviours among children (n = 1,429).

Variables		N (%)
Frequency of brushing	No	965 (65.0)
	Yes	464 (35.0)
Brushing after lunch	Never/hardly ever	457 (32.0)
	Sometimes	627 (43.9)
	Usually	345 (24.1)
Daily sweets consumption	No	573 (40.1)
	1 type	482 (33.7)
	2 types	237 (16.6)
	3 types	89 (6.2)
	4 types	27 (1.9)
	5 types	21 (1.5)
Consumption of each item		
- Crispy packed snacks	Never/hardly ever	176 (12.3)
	Sometimes	426 (29.8)
	Every day	827 (57.9)
- Ice-cream	Never/hardly ever	551 (38.6)
	Sometimes	622 (43.5)
	Every day	256 (17.9)
- Candies	Never/hardly ever	676 (47.3)
	Sometimes	505 (35.3)
	Every day	248 (17.4)
- Sweetened milk	Never/hardly ever	536 (37.5)
	Sometimes	528 (37.0)
	Every day	365 (25.5)
- Sweetened drinks	Never/hardly ever	536 (37.5)
	Sometimes	649 (45.4)
	Every day	244 (17.1)
- Soft drinks	Never/hardly ever	503 (35.2)
	Sometimes	603 (42.2)
	Every day	323 (22.6)

Thirty-five percent of children usually brushed their teeth at least twice per day, while a quarter usually brushed their teeth after lunch (24.1%). More than half consumed sweets every day (59.9%) (Table 5). Regarding the each type of snacks/drinks consumption, percentages of children who consumed crispy packed snacks, ice-cream, candies, sweetened milk, sweetened drinks and soft drinks every day were 57.9%, 17.9%, 17.4%, 25.5%, 17.1% and 22.6% respectively.

Table 5. Distribution of oral behaviours among children (n = 1,429).

Variables		N (%)
Frequency of brushing	No	965 (65.0)
	Yes	464 (35.0)
Brushing after lunch	No	1,084 (75.9)
	Yes	345 (24.1)
Daily sweets consumption	No	573 (40.1)
	Yes	856 (59.9)
Consumption of each item		
- Crispy packed snacks	No	602 (42.1)
	Yes	827 (57.9)
- Ice-cream	No	1,173 (82.1)
	Yes	256 (17.9)
- Candies	No	1,181 (82.6)
	Yes	248 (17.4)
- Sweetened milk	No	1,064 (74.5)
	Yes	365 (25.5)
- Sweetened drinks	No	1,185 (82.9)
	Yes	244 (17.1)
- Soft drinks	No	1,106 (77.4)
	Yes	323 (22.6)

4.4 Oral status

Caries prevalence was 61.7% with a mean (SD) DMFT score of 1.8 (2.1). Mean (SD) DT, MT and FT scores were 1.3 (1.9), 0.03 (0.2) and 0.4 (1.0) respectively. Thirty-one percent and 29.2% of children had high level of DT and DMFT scores respectively (Table 6). The OHI-S scores ranged from 0-5.3 with a median (IQR) of 1.3 (1.2). Fifty-eight percent of children had fair or poor oral hygiene. The intraclass correlation coefficients (ICC) ranged from 77.4-94.5 and 78.9-93.6 for dental caries and oral hygiene status respectively, indicating very good agreements.

Table 6. Distribution of oral status among children (n = 1,429).

Variables	N (%)	Average	Range
Oral status			
Untreated decayed (DT > 0)	715 (50.0)		
DT		Mean (SD)=1.3 (1.9)	0 - 14.0
Low	984 (68.9)		
High	445 (31.1)		
Missing teeth due to caries (MT > 0)	36 (2.5)		
MT		Mean (SD)=0.03 (0.19)	0 - 2.0
Filled teeth (FT > 0)	325 (22.7)		
FT		Mean (SD)=0.4 (1.0)	0 - 8.0
Incidence of caries (DMFT > 0)	881 (61.7)		
DMFT		Mean (SD)=1.8 (2.1)	0 - 14.0
Low	1,029 (72.0)		
High	400 (29.2)		
OHI-S		Median (IQR)=1.3 (1.2)	0 - 5.3
Excellent	7 (0.5)		
Good	598 (41.8)		
Fair	708 (49.6)		
Poor	116 (8.1)		

SD, standard deviation; IQR, interquartile range.

4.5 Oral Health-Related Quality of Life and school absence

A total of 1,418 primary-schoolchildren (95.5% response rate) were interviewed. The analyses on intra-examiner/interviewer reliability indicated very good agreements (ICC = 0.86-0.91). Prevalence, intensity and score of oral impacts among children were presented in Table 7. The overall prevalence of oral impacts was high (82.6%). However, mean (SD) overall impact scores were low (8.1 (8.8)). Among the eight performances assessed, the prevalence of impacts on Eating and Cleaning were similar (56.3%, and 55.9% respectively), followed by Emotional state (42.6%). Mean performance scores for each performance ranked in a similar pattern to the prevalence findings, that is, highest for Eating, followed by Cleaning and Emotional state. Findings regarding the intensity of oral impacts indicated that the highest proportion (29.3%) of children had impacts at the little level, while 17.6% and 15.8% were impacted at moderate and very little levels respectively.

Table 7. Prevalence, intensity and scores of oral impacts assessed by the Child Oral Impacts on Daily Performances (Child-OIDP) index among children (n = 1,418).

		Child-OIDP							
Oral impacts	Overall impacts	Eating	Speaking	Cleaning teeth	Relaxing, sleeping	Emotion	Smiling	Study	Social contact
Prevalence (%)	82.6	56.3	7.7	55.9	16.7	42.6	20.9	13.0	18.3
Intensity (%)									
Very little	15.8	15.0	3.6	18.2	6.4	15.0	6.9	5.2	7.2
Little	29.3	22.8	3.0	20.2	7.4	15.0	4.8	6.2	7.1
Moderate	17.6	10.2	0.8	9.3	2.1	6.3	4.1	1.3	2.2
Severe	14.7	7.1	0.3	6.4	0.4	4.5	4.2	0.3	1.6
Very severe	5.2	1.2	0.0	1.8	0.4	1.8	0.9	0.0	0.2
Scores*									
Range	0-55.6	0-9	0-6	0-9	0-9	0-9	0-9	0-6	0-9
Mean (SD)	8.1 (8.8)	1.5 (1.9)	0.1 (0.6)	1.5 (2.0)	0.3 (0.9)	1.1 (1.8)	0.6 (1.6)	0.2 (0.7)	0.4 (1.1)
Percentiles (25, 50, 75)	(1.4, 5.6, 11.1)	(0, 1, 2)	(0, 0, 0)	(0, 1, 2)	(0, 0, 0)	(0, 0, 2)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)

*Maximum scores of specific performance impacts = 9; possible maximum scores of Child-OIDP = 100.

Distributions of CS impacts attributed to different oral diseases and school absence among children were shown in Table 8. Findings revealed that CS impacts attributed to dental caries and periodontal diseases were highest (38.3% and 40.6% respectively), CS impacts attributed to oral lesions (29.4%), and CS impacts attributed to natural processes (22.9%). Impact scores of CS impacts attributed to dental caries ranged from 0-55.6 with a mean (SD) of 3.4 (6.8), while those of periodontal disease ranged from 0-38.9 with a mean (SD) score of 2.1 (4.1). Impact scores of CS impacts attributed to oral lesions ranged from 0-52.8 with a mean (SD) of 2.0 (4.3), while those of natural processes ranged from 0-52.8 with a mean (SD) score of 1.7 (4.5). CS impacts attributed to dental caries obtained the highest prevalence on 4 performances. Dental caries was the main cause of impact on Eating, Relaxing, Emotional state, and Study, while Cleaning and Social contact were mostly impacted by periodontal disease, Speaking by oral lesions, and Smiling by malocclusions. Detailed characteristics of CS-impacts attributed to certain kinds of oral diseases are shown in Tables 8-10.

For school absence, during the past semester, 75.4% of children missed school. Numbers of absent day ranged from 0 to 30, with a median (IQR) of 2.0 (4.0) absent days. Sixty-two percent of children missed school 2 or more days (Table 8).

Table 8. Distribution of Condition-Specific (CS) impacts and school absence among children (n = 1,418).

Variables	N (%)	Mean (SD)	Range
CS impacts attributed to dental caries		3.4 (6.8)	0 - 55.6
No	875 (61.7)		
Yes	543 (38.3)		
CS impacts attributed to periodontal disease		2.1 (4.1)	0 - 38.9
No	847 (59.7)		
Yes	571 (40.3)		
CS impacts attributed to oral lesions		2.0 (4.3)	0 - 52.8
No	1,001 (70.6)		
Yes	417 (29.4)		
CS impacts attributed to malocclusions		0.7 (2.5)	0 - 25.0
No	1,259 (88.8)		
Yes	159 (11.2)		
CS impacts attributed to enamel defects and dental anomalies		0.4 (1.8)	0 - 20.8
No	1,316 (92.8)		
Yes	102 (7.2)		
CS impacts attributed to traumatic dental injuries		0.06 (0.63)	0 - 12.5
No	1,402 (98.9)		
Yes	16 (1.1)		
CS impacts attributed to tooth loss		0.01 (0.48)	0 - 18.1
No	1,417 (99.9)		
Yes	1 (0.1)		
CS impacts attributed to natural process			
No	1,093 (77.1)	1.7 (4.5)	0 - 52.8
Yes	325 (22.9)		
School absence			
Median (IQR) = 2.0 (4.0)			0 - 30.0
Numbers of absent day			
Never	352 (24.6)		
1 day	181 (12.7)		
2 days	229 (16.0)		
3 days	154 (10.8)		
4 days	121 (8.5)		
5 days	139 (9.7)		
6 days	27 (1.9)		
7 days	77 (5.4)		
8 days/more	138 (10.4)		

SD, standard deviation; IQR, interquartile range.
Maximum Child-Oral Impacts on Daily Performances scores = 100.

Table 9. Frequency of Condition-Specific (CS) impacts attributed to oral diseases on the eight daily life performances among children (n = 1,418).

	CS-impacts attributed to certain (%)							
	Dental caries	Periodontal disease	Oral lesions	Malocclusions	Enamel defects and dental anomalies	Traumatic dental injuries	Tooth loss	Natural process
Overall affected	38.3	40.3	29.4	11.2	7.2	1.1	0.1	22.9
Performance affected								
Eating	28.1	5.3	22.0	0.4	0	0.2	0.1	14.9
Speaking	1.9	0.5	4.6	0.1	0	0	0	1.3
Cleaning teeth	13.5	24.5	20.2	1.1	0	0	0	12.5
Relaxing/sleeping	12.5	0.7	2.5	0	0	0	0	2.7
Emotional state	17.7	10.4	12.8	2.9	1.6	0.1	0.1	10.3
Smiling	2.4	3.7	0	8.6	6.6	0.9	0.1	1.6
Study	9.1	1.6	1.8	0	0	0	0	1.8
Social contact	4.0	12.8	1.3	0.4	0.3	0	0	1.1

Table 10. Intensity and extent of condition-specific (CS) impacts attributed to dental caries and periodontal disease among children (n = 1,418).

	Percentage of those with impacts (%)	
	Dental caries	Periodontal disease
Intensity		
None	61.7	59.7
Very little	8.3	11.4
Little	11.7	14.5
Moderate	8.8	7.3
Severe	6.7	5.2
Very severe	2.8	1.9
Extent		
1 PWI*	14.1	27.7
2 PWI	9.4	7.8
3 PWI	7.5	3.3
4 PWI	3.6	1.1
5 PWI	2.2	0.3
6 PWI	1.1	0.1
7 PWI	0.1	0
8 PWI	0	0

*PWI = Number of performance with impacts

4.6 School performance

School performance referring to scores of eight subjects of which possible maximum scores were one-hundred were shown in Table 11. A total of 1,210 children's school performance records (81.5% response rate) were collected. Children's total school performance scores ranged from 149.5-641.0. A median (IQR) score was 344 (123.1).

Table 11. Distribution of school performance scores among children (n = 1,210).

Variables	Median (IQR)	Range
Subject		
- Thai language	44.0 (18.0)	8.0 - 80.0
- Socio-cultural education	48.0 (24.0)	8.0 - 92.0
- English language	27.5 (12.5)	5.0 - 97.5
- Mathematics	35.0 (20.0)	0.0 - 100.0
- Sciences	38.0 (17.5)	8.0 - 88.5
- Hygiene and physical education	52.0 (20.0)	8.0 - 84.0
- Arts	45.0 (20.0)	5.0 - 85.0
- Work and technology	56.0 (24.0)	8.0 - 80.0
Total score [a]	344.0 (123.1)	149.5 - 641.0

[a]Possible total maximum scores of eight subjects = 800; Maximum scores of each subject = 100.

CHAPTER 5
ASSOCIATIONS OF SCHOOL ORAL HEALTH-RELATED ENVIRONMENTS WITH ORAL BEHAVIOURS AND ORAL STATUS

In this chapter, the descriptive results of sociodemographic and economic status (SDES), oral behaviours and oral status, are compared and their associations are explored. The chapter reports two main parts. The first part assesses the associations of school oral health-related environments with children's oral behaviours adjusting for SDES. The second part assesses the associations of school oral health-related environments and dental caries adjusting for SDES and oral behaviours.

5.1 Associations of school oral health-related environments with children's oral behaviours

Univariate analyses revealed statistically significant associations of school environments with oral behaviours (Table 12). Children in schools that provided toothbrushing free of charge and those with integrated oral education were significantly more likely to brush at least twice per day. Children in schools with integrated oral education were also significantly more likely to brush after lunch. Daily sweets consumption habit was significantly less likely in children attending schools where free fresh fruit was provided (55.1% vs 63.9%), but more likely in those attending schools having simple oral examination and integrated oral education. In addition, children in schools selling sweetened milk and meat snacks consumed sweets every day significantly more than those in schools without such items (65.4% vs. 55.5% and 61.4% vs. 55.2% respectively) (Table 12).

Regarding certain items of snacks/drinks consumption, significant association between snacks/drinks sales and children's daily consumption were found for ice-cream, that is, children in schools selling ice-cream were significantly more likely to consume ice-cream every day (Table 12).

Table 12. Sschool oral health-related environments associated with oral behaviours in children (n = 984).

Variables		%	Oral behaviours			
			Brushing twice a day	Brushing after lunch	Sweets consumption	Consumption of certain item
Study sample		100	43.6	26.5	58.7	N/A
Ever receiving OHPS award	No	56.6	44.9	25.0	59.1	N/A
	Yes	43.4	41.9	28.6	58.3	
Free toothbrushing	No	23.4	37.8	27.8	N/A	N/A
	Yes	76.6	45.4*	26.1		
Simple oral examination	No	27.5	40.6	30.3	49.1	N/A
	Yes	72.5	44.7	25.1¶	62.4***	
Integrated oral education	No	44.7	37.0	23.0	54.1	N/A
	Yes	55.3	48.9***	29.4*	62.5**	
Availability of fresh fruit	No	41.4	N/A	N/A	63.9	N/A
	Yes	58.6			55.1**	
Items sold in schools						
- Fresh starchy snacks	No	42.7	N/A	N/A	59.0	N/A
	Yes	57.3			58.5	
- Meat snacks	No	42.4	N/A	N/A	55.2	N/A
	Yes	57.6			61.4*	
- Crispy packed snacks	No	73.7	N/A	N/A	60.6	58.3
	Yes	26.3			53.7	52.9¶
- Ice-cream	No	45.4	N/A	N/A	56.2	12.8
	Yes	54.6			60.9¶	23.8***
- Candies	No	92.8	N/A	N/A	57.9	18.1
	Yes	7.2			69.0¶	12.7
- Sweetened milk	No	67.4	N/A	N/A	55.5	23.4
	Yes	32.6			65.4**	29.0¶
- Sweetened drinks	No	39.8	N/A	N/A	58.7	16.1
	Yes	60.2			58.8	17.7
- Soft drinks	No	87.4	N/A	N/A	58.5	20.7
	Yes	12.6			60.5	25.0

***P < 0.001, **P < 0.01, *P < 0.05, ¶P < 0.2 (Chi-square test).
N/A, analysis not performed due to non-theoretical association.
OHPS, oral health promoting school.

In addition, associations of school oral health-related environments with the three items of snacks/drinks consumption, including crispy packed snacks, ice-cream and sweetened milk were explored (Table 13). Crispy packed snacks consumption was significantly less likely in children attending schools with integrated oral education and schools selling meat snacks, ice-cream and sweetened drinks, but more likely in those attending schools where free fresh fruit was provided. Ice-cream consumption was significantly less likely in children attending schools ever receiving OHPS award and schools where free fresh fruit was provided, but more likely in those

attending schools with integrated oral education and schools selling fresh starchy snacks, meat snacks, ice-cream and sweetened milk. Children in schools selling candies were significantly more likely to consume sweetened milk every day.

Table 13. School oral health-related environments associated with daily items consumption behaviours in children (n = 984).

Variables		%	Oral behaviours		
			Crispy packed snacks consumption	Ice-cream consumption	Sweetened milk consumption
Study sample		100	56.9	18.8	25.2
Ever receiving OHPS award	No	56.6	55.5	21.7	26.8
	Yes	43.4	58.8	15.0**	23.2
Free toothbrushing	No	23.4	55.7	15.7	21.3
	Yes	76.6	57.3	19.8¶	26.4¶
Simple oral examination	No	27.5	60.1	17.0	21.8
	Yes	72.5	55.7	19.5	26.5¶
Integrated oral education	No	44.7	61.4	13.6	23.0
	Yes	55.3	53.3*	23.0***	27.0¶
Availability of fresh fruit	No	41.4	52.8	22.1	27.5
	Yes	58.6	59.8*	16.5*	23.6¶
Items sold in schools					
- Fresh starchy snacks	No	42.7	60.0	16.0	23.1
	Yes	57.3	54.6¶	20.9*	26.8¶
- Meat snacks	No	42.4	61.6	15.1	23.0
	Yes	57.6	53.4*	21.5*	26.8¶
- Crispy packed snacks	No	73.7	58.3	19.7	24.4
	Yes	26.3	52.9¶	16.2	27.4
- Ice-cream	No	45.4	65.5	12.8	22.8
	Yes	54.6	49.7***	23.8***	27.2¶
- Candies	No	92.8	57.5	18.7	24.3
	Yes	7.2	49.3¶	19.7	36.6*
- Sweetened milk	No	67.4	58.2	15.1	23.4
	Yes	32.6	54.2	26.5***	29.0¶
- Sweetened drinks	No	39.8	62.5	16.8	23.0
	Yes	60.2	53.2**	20.1¶	26.7¶
- Soft drinks	No	87.4	57.4	19.1	24.8
	Yes	12.6	53.2	16.9	28.2

***P < 0.001, **P < 0.01, *P < 0.05, ¶P < 0.2 (Chi-square test).
OHPS, oral health promoting school.

5.2 Associations of sociodemographic and economic status with children's oral behaviours

Univariate analyses revealed statistically significant associations of SDES with oral behaviours (Table 14). Girls and children living in a high income family were more likely to brush their teeth at least twice per day than their counterparts. Sex, school type, school size and family income were associated with brushing after lunch, while school type was significantly associated with sweets consumption. For items of snacks/drinks consumption behaviours, children living in a high income family were less likely to consume crispy packed snacks. School type and school size were associated with ice cream's consumption, while sex and school type were significantly associated with sweetened milk's consumption.

5.3 Associations of school oral health-related environments with children's oral behaviours adjusting for sociodemographic and economic status and other school environments

Multiple logistic regressions models were shown in Table 15. When SDES were entered into the model (model 1), the association between providing free toothbrushing and children's brushing frequency as well as the association between selling meat snacks and children's daily sweets consumption became non-significant. Further adjusting for other environmental variables (model 2), children in schools with integrated oral education remained significantly more likely to brush their teeth twice a day as well as to brush after lunch. Furthermore, children's daily sweets consumption remained significantly negatively associated with the availability of free fresh fruit in school meals, and positively associated with the availability on sales of sweetened milk in schools.

In addition, multivariate logistic regressions were also performed to ascertain the associations of school oral health-related environments and crispy packed snacks, ice-cream and sweetened milk consumption (Table 16). Children in schools selling ice-cream remained significantly more likely to consume ice-cream every day.

Table 14. Distribution of sociodemographic and economic status (SDES) and their associations with oral behaviours in children (n = 984).

Variables		%	Oral behaviours					
			Brushing twice a day	Brushing after lunch	Sweets consumption	Daily crispy packed snacks' consumption	Daily ice cream's consumption	Daily sweeten milks' consumption
Study sample		100	43.6	26.5	58.7	56.9	18.8	25.2
SDES								
Age	11 yr	21.2	47.8	22.5	59.8	53.6	17.7	26.8
	≥ 12 yr	78.8	42.5¶	27.6¶	58.5	57.8	19.1	24.8
Sex	Boy	49.5	33.5	23.2	57.1	54.6	17.9	22.2
	Girl	50.5	53.5***	29.8*	60.4	59.2¶	19.7	28.2*
School type	Public rural	57.1	43.2	35.8	53.6	60.1	15.7	20.3
	Public urban	33.3	43.3	16.5	65.2	52.7	24.7	30.8
	Private	9.6	46.8	6.4***	67.0***	52.1¶	17.0**	35.1***
School size	Small/medium	71.6	43.8	33.2	57.3	58.0	16.3	23.7
	Large	28.4	43.0	9.7***	62.4¶	54.1	25.1**	29.0¶
Family income	Low	72.2	40.6	29.0	57.2	59.7	18.6	23.8
	High	27.8	51.5**	20.1**	62.8¶	49.6**	19.3	28.8¶

***$P < 0.001$, **$P < 0.01$, *$P < 0.05$, ¶$P < 0.2$ (Chi-square test).

Table 15. Logistic regression models for the associations of school oral health-related environments with oral behaviours in children (n = 984).

		Brushing twice a day		Brushing after lunch		Sweets consumption	
		model 1	model 2	model 1	model 2	model 1	model 2
Variables		AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)
Free toothbrushing	No	1	1	-	-	N/A	N/A
	Yes	1.30 (0.95, 1.78)	0.98 (0.69, 1.40)				
Simple oral examination	No	-	-	1	1	1	1
	Yes			0.93 (0.66, 1.32)	0.74 (0.50, 1.09)	1.52 (1.11, 2.10)**	1.18 (0.80, 1.73)
Integrated oral education	No	1	1	1	1	1	1
	Yes	1.69 (1.30, 2.21)***	1.70 (1.27, 2.29)***	1.51 (1.08, 2.11)*	1.70 (1.18, 2.45)**	1.37 (1.03, 1.84)*	1.09 (0.77, 1.54)
Availability of fresh fruit	No	N/A	N/A	N/A	N/A	1	1
	Yes					0.70 (0.53, 0.93)*	0.73 (0.53, 0.99)*
Items sold in schools							
- Meat snacks	No	N/A	N/A	N/A	N/A	1	1
	Yes					1.07 (0.78, 1.47)	0.92 (0.64, 1.32)
- Ice-cream	No	N/A	N/A	N/A	N/A	1	1
	Yes					0.94 (0.70, 1.27)	0.82 (0.58, 1.15)
- Candies	No	N/A	N/A	N/A	N/A	1	1
	Yes					1.63 (0.57, 4.65)	1.64 (0.53, 5.08)
- Sweetened milk	No	N/A	N/A	N/A	N/A	1	1
	Yes					1.89 (1.26, 2.85)**	1.78 (1.14, 2.78)*

***$P < 0.001$, **$P < 0.01$, *$P < 0.05$.

Model 1: adjusted for SDES significantly associated with each oral behaviour outcome; model 2: further adjusted for other school environmental variables.

AOR, adjusted odd ratio; 95% CI, 95% confidence interval.

Table 16. Logistic regression models for the associations of school oral health-related environments with items consumption behaviours in children (n = 984).

		Crispy packed snacks consumption		Ice-cream consumption		Sweetened milk consumption	
Variables		model 1 AOR (95% CI)	model 2 AOR (95% CI)	model 1 AOR (95% CI)	model 2 AOR (95% CI)	model 1 AOR (95% CI)	model 2 AOR (95% CI)
Ever receiving OHPS award	No	-	-	-	1		-
	Yes				0.71 (0.44, 1.16)		
Free toothbrushing	No	-	-	-	1		-
	Yes				0.86 (0.48, 1.55)		
Integrated oral education	No	-	-		1		-
	Yes			-	1.79 (1.03, 3.13)*		
Availability of fresh fruit	No	-	-		1		-
	Yes				0.92 (0.58, 1.46)		
Items sold in schools							
- Fresh starchy snacks	No	-	-	-	1		-
	Yes				1.10 (0.64, 1.91)		
- Meat snacks	No	-	-	-	1		-
	Yes				0.92 (0.49, 1.74)		
- Crispy packed snacks	No	1	-	-	-		-
	Yes	0.85 (0.63, 1.17)					
- Ice-cream	No	-	-	1	1		-
	Yes			1.90 (1.28, 2.82)**	2.14 (1.28, 3.57)**		
- Sweetened milk	No	-	-	-	1	1	-
	Yes				1.89 (1.05, 3.41)*	1.29 (0.83, 2.01)	
- Sweetened drinks	No	-	-	-	1		-
	Yes				0.62 (0.33, 1.17)		

***$P < 0.001$, **$P < 0.01$, *$P < 0.05$.

Model 1: adjusted for SDES significantly associated with each oral behaviour outcome; model 2: further adjusted for other school environmental variables.

AOR, adjusted odd ratio; 95% CI, 95% confidence interval.

5.4 Associations of school oral health-related environments with children's oral status

Univariate analyses revealed that children in schools ever receiving an award had significantly lower DT score, while those in schools providing free fresh fruit with meals had significantly lower DT and DMFT scores than their counterparts (Table 17). However, children in schools with free toothbrushing, simple oral examination and integrated oral education were significantly more likely to have high dental caries and fair/poor oral hygiene. In term of snack/drinks sold in schools, meat snacks, ice-cream, sweetened milk and sweetened drinks were significantly associated with high caries, while crispy packed snacks was significantly associated with low caries.

Table 17. School oral health-related environments associated with oral status in children (n = 984).

		%	Oral status		
Variables			DT (high)	DMFT (high)	OHI-S (fair/poor)
Study sample		100	31.2	29.3	58.2
Ever receiving OHPS award	No	56.6	34.8	30.7	60.5
	Yes	43.4	26.5**	27.4	55.3¶
Free toothbrushing	No	23.4	27.4	21.3	48.3
	Yes	76.6	32.4¶	31.7**	61.3***
Simple oral examination	No	27.5	26.9	21.0	38.7
	Yes	72.5	32.8¶	32.4***	65.6***
Integrated oral education	No	44.7	24.5	23.0	40.7
	Yes	55.3	36.6***	34.4***	72.4***
Availability of fresh fruit	No	41.4	42.8	37.3	N/A
	Yes	58.6	23.1***	23.6***	
Items sold in schools					
- Fresh starchy snacks	No	42.7	29.3	30.5	N/A
	Yes	57.3	32.6	28.4	
- Meat snacks	No	42.4	26.6	27.1	N/A
	Yes	57.6	34.6**	30.9¶	
- Crispy packed snacks	No	73.7	34.9	31.7	N/A
	Yes	26.3	20.8***	22.4**	
- Ice-cream	No	45.4	27.5	27.1	N/A
	Yes	54.6	34.3*	31.1¶	
- Candies	No	92.8	32.1	29.9	N/A
	Yes	7.2	19.7¶	21.1¶	
- Sweetened milk	No	67.4	24.3	24.4	N/A
	Yes	32.6	45.5***	39.3***	
- Sweetened drinks	No	39.8	25.3	25.0	N/A
	Yes	60.2	35.1**	32.1*	
- Soft drinks	No	87.4	32.0	29.8	N/A
	Yes	12.6	25.8¶	25.8	

***$P < 0.001$, **$P < 0.01$, *$P < 0.05$, ¶$P < 0.2$ (Chi-square test).
N/A, analysis not performed due to non-theoretical association.

5.5 Associations of sociodemographic and economic status with children's oral status

Univariate analyses revealed that age, sex, school type and school size were associated with DT and DMFT scores, while sex and school type were associated with OHIS-S score (Table 18).

Table 18. Sociodemographic and economic status (SDES) associated with oral status in children (n = 984).

Variables		%	Oral status		
			DT (high)	DMFT (high)	OHI-S (fair /poor)
Study sample		100	31.2	29.3	58.2
Age	11 yr	21.2	36.8	36.4	62.2
	≥ 12 yr	78.8	29.7*	27.4**	57.2¶
Sex	Boy	49.5	26.9	26.3	62.6
	Girl	50.5	35.4**	32.2*	53.9**
School type	Public rural	57.1	25.1	24.4	48.2
	Public urban	33.3	43.9	39.3	82.0
	Private	9.6	23.4***	23.4***	35.1***
School size	Small/medium	71.6	25.0	24.8	57.4
	Large	28.4	47.0***	40.5***	60.2
Family income	Low	72.2	31.1	29.3	59.6
	High	27.8	31.4	29.2	54.7¶

$^{***}P < 0.001$, $^{**}P < 0.01$, $^{*}P < 0.05$, $^{¶}P < 0.2$ (Chi-square test).

5.6 Associations of oral behaviours with children's oral status

The analysis on the associations between the three oral behaviours and oral status showed that brushing after lunch were significantly more likely to have low dental caries and good oral hygiene (Table 19). Children brushed their teeth at least twice per day were significantly associated with good oral hygiene.

Table 19. Oral behaviours associated with oral status in children (n = 984).

Variables		%	Oral status		
			DT (high)	DMFT (high)	OHI-S (fair/poor)
Brushing twice a day	No	56.4	31.7	28.8	62.2
	Yes	43.6	30.5	29.8	53.1**
Brushing after lunch	No	73.5	33.6	31.0	73.3
	Yes	26.5	24.5**	24.5*	52.5***
Sweets consumption	No	41.3	28.3	27.1	-
	Yes	58.7	33.2¶	30.8	

$^{***}P < 0.001$, $^{**}P < 0.01$, $^{*}P < 0.05$, $^{¶}P < 0.2$ (Chi-square test).

5.7 Associations of school oral health-related environments with children's oral status adjusting for sociodemographic and economic status, other school environments and oral behaviours

Multivariate analyses of dental caries were present in Table 20. After controlling for SDES (model 1), association of selling ice-cream and sweetened drinks with caries became non-significant. In model 2, controlling for the effects of other environments, the significance of free toothbrushing, integrated oral education and selling soft drinks on dental caries vanished. The final model (model 3) where oral behaviours were included showed that children in schools that provided free fresh fruit with meals, sold meat snacks, crispy packed snacks and candies significantly had fewer dental caries, in term of DT or DMFT scores, than their counterparts. Selling meat snacks was significantly associated with both lower DT and DMFT scores. The unexpected significant association between selling candies and low dental caries might be due to the very low proportion (7.2%) of children studying in school where candies were sold. On the other hand, children in schools that sold sweetened milk, sweetened drinks and soft drinks had a significantly greater chance to have high level of dental caries. In addition, high DMFT scores were found to significantly associate with school's arranging simple oral examination, while DT scores were not.

For OHI-S score, children in schools with free toothbrushing, children who brushed their teeth at least twice per day or brushed after lunch were significantly more likely to have good oral hygiene (Table 21, model 3). In addition, the unexpected significant association between school oral health-related environments and OHI-S score were found. Children in schools with simple oral examination and integrated oral education were significantly more likely to have fair/poor oral hygiene.

Table 20. Logistic regression models for the associations of school oral health-related environments and oral behaviours with dental caries in children (n = 984).

Variables		DT score (high)			DMFT score (high)		
		model 1 AOR (95% CI)	model 2 AOR (95% CI)	model 3 AOR (95% CI)	model 1 AOR (95% CI)	model 2 AOR (95% CI)	model 3 AOR (95% CI)
Ever receiving OHPS award	No	1	1	1	-	-	-
	Yes	0.88 (0.65, 1.21)	0.94 (0.64, 1.37)	0.95 (0.65, 1.41)			
Free toothbrushing	No	1	1	1	1	1	1
	Yes	1.74 (1.18, 2.56)**	0.86 (0.42, 1.77)	0.79 (0.39, 1.62)	2.23 (1.49, 3.33)***	1.10 (0.56, 2.15)	1.05 (0.54, 2.05)
Simple oral examination	No	1	1	1	1	1	1
	Yes	1.61 (1.11, 2.32)*	1.44 (0.71, 2.92)	1.53 (0.75, 3.11)	2.15 (1.47, 3.14)***	2.13 (1.15, 3.97)*	2.22 (1.20, 4.14)*
Integrated oral education	No	1	1	1	1	1	1
	Yes	1.83 (1.30, 2.58)***	1.35 (0.86, 2.10)	1.47 (0.94, 2.30)	1.74 (1.24, 2.45)**	1.27 (0.82, 1.96)	1.33 (0.86, 2.06)
Availability of fresh fruit	No	1	1	1	1	1	1
	Yes	0.46 (0.34, 0.63)***	0.58 (0.37, 0.93)*	0.62 (0.39, 0.99)*	0.61 (0.45, 0.84)**	0.94 (0.61, 1.44)	0.99 (0.64, 1.54)
Items sold in schools							
- Meat snacks	No	1	1	1	1	1	1
	Yes	0.65 (0.44, 0.94)*	0.51 (0.30, 0.86)*	0.46 (0.26, 0.78)**	0.60 (0.41, 0.87)**	0.38 (0.23, 0.62)***	0.35 (0.21, 0.58)***
- Crispy packed snacks	No	1	1	1	1	1	1
	Yes	0.38 (0.25, 0.56)***	0.47 (0.24, 0.93)*	0.42 (0.21, 0.84)*	0.54 (0.37, 0.79)**	0.90 (0.53, 1.53)	0.87 (0.51, 1.49)
- Ice-cream	No	1	1	1	1	1	1
	Yes	0.79 (0.56, 1.12)	1.07 (0.65, 1.75)	1.15 (0.70, 1.90)	0.76 (0.54, 1.07)	0.81 (0.50, 1.32)	0.85 (0.52, 1.39)
- Candies	No	1	1	1	1	1	1
	Yes	0.14 (0.05, 0.43)***	0.10 (0.02, 0.43)**	0.09 (0.02, 0.41)**	0.29 (0.09, 0.91)*	0.22 (0.06, 0.86)*	0.23 (0.06, 0.90)*
- Sweetened milk	No	1	1	1	1	1	1
	Yes	2.08 (1.39, 3.12)***	2.48 (1.39, 4.42)**	2.53 (1.41, 4.54)**	1.65 (1.10, 2.50)*	1.65 (0.95, 2.86)	1.66 (0.95, 2.90)
- Sweetened drinks	No	1	1	1	1	1	1
	Yes	0.92 (0.65, 1.30)	1.10 (0.63, 1.92)	1.19 (0.67, 2.11)	0.95 (0.67, 1.35)	1.81 (1.08, 3.03)*	1.92 (1.14, 3.24)*
- Soft drinks	No	1	1	1	-	-	-
	Yes	0.31 (0.17, 0.58)***	2.48 (0.98, 6.30)	2.87 (1.11, 7.40)*			
Brushing after lunch	No	-	-	1	-	-	1
	Yes			0.67 (0.46, 0.97)*			0.76 (0.52, 1.09)
Sweets consumption	No	-	-	1	-	-	-
	Yes			1.02 (0.75, 1.38)			

***$P < 0.001$, **$P < 0.01$, *$P < 0.05$.

Model 1: adjusted for SDES significantly associated with each outcome; model 2: further adjusted for other school environmental variables; model 3: further adjusted for oral behaviours significantly associated with each outcome. AOR, adjusted odd ratio; 95% CI, 95% confidence interval.

Table 21. Logistic regression models for the associations of school oral health-related environments and oral behaviours with OHI-S score in children (n = 984).

		OHI-S (fair/poor)		
Variables		model 1 AOR (95% CI)	model 2 AOR (95% CI)	model 3 AOR (95% CI)
Ever receiving OHPS award	No	1	1	1
	Yes	1.44 (1.06, 1.94)*	1.11 (0.80, 1.54)	1.22 (0.88, 1.70)
Free toothbrushing	No	1	1	1
	Yes	1.57 (1.14, 2.18)**	0.52 (0.32, 0.84)**	0.55 (0.34, 0.89)*
Simple oral examination	No	1	1	1
	Yes	2.90 (2.11, 3.99)***	2.91 (1.82, 4.63)***	2.67 (1.67, 4.27)***
Integrated oral education	No	1	1	1
	Yes	2.54 (1.89, 3.42)***	2.10 (1.46, 3.00)***	2.51 (1.73, 3.65)***
Oral behaviours				
Brushing twice a day	No	-	-	1
	Yes			0.72 (0.53, 0.98)*
Brushing after lunch	No	-	-	1
	Yes			0.67 (0.35, 0.74)***

$^{***}P < 0.001$, $^{**}P < 0.01$, $^{*}P < 0.05$.

Model 1: adjusted for SDES significantly associated with outcome; model 2: further adjusted for other school environmental variables; model 3: further adjusted for oral behaviours significantly associated with outcome.

AOR, adjusted odd ratio; 95% CI, 95% confidence interval.

CHAPTER 6
THE HIERARCHICAL RELATIONSHIPS OF SCHOOL PERFORMANCE WITH CS OHRQOL, SCHOOL ABSENCE AND ORAL STATUS

In this chapter, the descriptive results of sociodemographic and economic status (SDES), social capital, oral status, Condition-Specific Oral Health-Related Quality of Life (CS OHRQoL), school absence and school performance, are compared and their associations are examined. The chapter reports two main parts. The first part explores the hierarchical relationships of children's school performance with CS OHRQoL, school absence, oral status and SDES as well as social capital. CS OHRQoL and school absence were considered as proximal determinants whereas oral status, socioeconomic background and social capital were considered as distal determinants affecting school marks. The second part explores the associations between CS OHRQoL and relating oral status adjusting for SDES and social capital.

6.1 Associations of Condition-Specific Oral Health-Related Quality of Life with oral status, sociodemographic and economic status and social capital

Table 22 revealed the univariate analyses of CS impacts associated with SDES, social capital and oral status. CS impacts attributed to dental caries were statistically significantly associated with school type, father's education and parental expectation, while that of periodontal disease were associated with school type and parental expectation. Dental caries (both DMFT and DT scores) were significantly associated with CS impacts attributed to dental caries, whereas oral hygiene status was not associated with CS impacts attributed to periodontal disease.

Multivariate analyses on the associations of CS impacts with oral status were shown in Table 23. Children whose father obtained high education and parental expectation were high, were significantly less likely to have CS impacts attributed to dental caries (model 1). Similarly, children whose parental expectations were high were less likely to have CS impacts attributed to periodontal disease. Children attending public urban school were also less likely to reported CS impacts attributed

to periodontal disease compared to those in rural schools. After adjusting for SDES and social capital in model 2, children with high dental caries, either high DMFT or DT scores, were three times significantly more likely to have CS impacts attributed to dental caries. This showed the effect of dental caries on CS OHRQoL indicated as pathway c in the framework (Figure 4).

Table 22. Distribution of sociodemographic and economic status (SDES), social capital and oral status, and their associations with school performance and Condition-Specific (CS) impacts attributed to dental caries and periodontal disease in children (n = 925).

			CS impacts (%)		School performance
Variables		%	Dental caries	Periodontal disease	Median (IQR)
SDES					
Age	11 yr	21.5	40.7	37.2	349.5 (124.0)
	≥ 12 yr	78.5	37.9	39.3	338.8 (114.0)
Sex	Boy	49.1	38.1	39.4	317.3 (111.9)
	Girl	50.9	38.9	38.2	361.5 (111.0)***
School type	Public rural	57.6	39.8	42.0	327.5 (110.8)
	Public urban	33.5	40.3	35.5	351.3 (109.8)
	Private	8.9	23.2*	30.5*	398.5 (124.9)***
Family income	Low	71.5	40.2	38.9	335.0 (110.5)
	High	28.5	34.1¶	38.6	356.3 (125.4)***
Father's education	Low	70.4	42.2	39.8	331.0 (105.0)
	High	29.6	29.6***	36.5	373.0 (118.3)***
Social capital					
Numbers of close friends			-0.02[a]	-0.04[a]	0.01[a]
Trust in close friends	Low	69.5	40.0	38.3	337.5 (108.0)
	High	30.5	35.1¶	40.1	350.8 (131.8)¶
Parental support	Low	45.0	38.9	40.4	331.3 (109.0)
	High	55.0	38.1	37.5	352.5 (120.5)***
Engagement in school activities	No	56.8	40.4	41.0	326.5 (107.0)
	Yes	43.2	36.0¶	36.0¶	357.3 (122.3)***
Numbers of students per teacher			0.03[a]	0.02[a]	0.06¶[a]
Parent's participation	Infrequent	61.9	37.2	39.8	331.3 (105.3)
	Frequent	38.1	39.3	38.2	348.5 (119.5)***
Parental expectation	Low	52.3	44.0	43.0	312.0 (102.9)
	High	47.7	32.4***	34.2**	371.5 (109.8)***
Oral status					
DMFT	Low	70.8	30.8	-	346.5 (122.0)
	High	29.2	57.0***		335.3 (103.3)¶
DT	Low	68.9	30.8	-	344.0 (120.8)
	High	31.1	55.6***		337.3 (104.0)
OHI-S	Good	41.8	-	37.0	347.0 (124.0)
	Fair/poor	58.2		40.1	337.0 (104.8)¶

***$P < 0.001$, **$P < 0.01$, *$P < 0.05$, ¶$P < 0.2$ (Chi-square test, [a]Spearman correlation).

Table 23. Logistic regression models for the associations of sociodemographic and economic status (SDES), social capital and oral status with Condition-Specific (CS) impacts attributed to dental caries and periodontal disease in children (n = 925).

		CS impacts attributed to dental caries			CS impacts attributed to periodontal disease	
Variables		model 1 AOR (95% CI)	model 2 (DMFT) AOR (95% CI)	model 2 (DT) AOR (95% CI)	model 1 AOR (95% CI)	model 2 AOR (95% CI)
SDES						
School type	Public rural	1	1	1	1	1
	Public urban	1.08 (0.80, 1.45)	0.93 (0.68, 1.27)	0.90 (0.66, 1.22)	0.76 (0.57, 1.02)	0.69 (0.50, 0.94)*
	Private	0.63 (0.34, 1.16)	0.66 (0.35, 1.23)	0.70 (0.38, 1.30)	0.67 (0.39, 1.13)	0.71 (0.41, 1.20)
Family income	Low	1	1	1	-	-
	High	1.02 (0.73, 1.43)	1.01 (0.71, 1.42)	1.02 (0.72, 1.43)		
Father's education	Low	1	1	1	-	-
	High	0.69 (0.49, 0.97)*	0.72 (0.51, 1.02)	0.68 (0.48, 0.96)*		
Social capital						
Trust in close friends	Low	1	1	1	-	-
	High	0.85 (0.63, 1.14)	0.86 (0.63, 1.16)	0.88 (0.65, 1.19)		
Engagement in school activities	No	1	1	1	1	1
	Yes	0.85 (0.64, 1.12)	0.87 (0.65, 1.16)	0.90 (0.68, 1.19)	0.79 (0.60, 1.04)	0.81 (0.62, 1.07)
Parental expectation	Low	1	1	1	1	1
	High	0.73 (0.54, 0.97)*	0.67 (0.50, 0.91)**	0.67 (0.49, 0.91)**	0.75 (0.57, 0.99)*	0.75 (0.57, 0.99)*
Oral status						
DMFT	Low	-	1	-	-	-
	High		3.03 (2.24, 4.10)***			
DT	Low	-	-	1	-	-
	High			2.93 (2.17, 3.95)***		

***$P < 0.001$, **$P < 0.01$, *$P < 0.05$.

Model 1: adjusted for SDES and social capital confounders; model 2: further adjusted for oral status related to CS impacts.

AOR, adjusted odd ratio; 95% CI, 95% confidence interval.

6.2 Associations of school performance with Condition-Specific Oral Health-Related Quality of Life, school absence, oral status, sociodemographic and economic status and social capital

Univariate analyses on the associations between school performance and its deterministic variables are present in Tables 22 and 24. School performance were significantly associated with almost all SDES and social capital variables with an exception of age, numbers of close friends and perceived trust in close friends (Table 22). Median performance scores differed ($P < 0.2$) between children with low and high DMFT scores as well as between those with low and high OHI-S scores. For CS impacts and school absence (Table 24), children having CS impacts attributed to dental caries and those missing school 2 or more days statistically significantly had lower school performance compared to their counterparts.

Table 24. Distribution of Condition-Specific (CS) impacts attributed to dental caries and periodontal disease and school absence, and their associations with school performance among children (n = 925).

		School performance
Variables	%	Median (IQR)
CS impacts attributed to dental caries		
No	61.5	349.5 (118.3)
Yes	38.5	326.8 (108.0)***
CS impacts attributed to periodontal disease		
No	61.2	348.3 (123.5)
Yes	38.8	333.0 (99.0)**
School absence		
No	27.5	353.0 (115.3)
Yes	72.5	335.5 (116.5)***
Numbers of absent day		
0 or 1 day	40.5	352.5 (124.5)
2 days/more	59.5	334.0 (108.8)***

***$P < 0.001$, **$P < 0.01$, *$P < 0.05$, ¶$P < 0.2$ (Chi-square test).
IQR, interquartile range.

Multiple linear regression models for school performance following conceptual hierarchical framework (Figure 4) were shown in Table 25. After adjusting for all SDES and social capital variables (model 1), associations of family income and proportions of students per teacher with school performance became non-significant. In models 2 where DMFT was entered and consequently, model 3 where CS impacts

attributed to dental caries was further included, the strength of association between father's education and school performance was attenuated but remained statistically significant, indicating that father's education exerted its effect on school performance partially directly (pathway f) and partially via oral status and CS impacts (pathways a, c, e). For most of the SDES and social capital variables: sex, school type, children's engagement in school activities, parent's participation in school meeting and parental expectation, their associations with school performance remained almost unchanged in a fully adjusted model, indicating that such deterministic variables directly affected school performance (pathway f). Oral status was entered into models 2. High DMFT score was significantly related to lower school performance, whereas high OHI-S score was not.

Table 25. Multiple linear regression models of school performance, by sociodemographic and economic status (SDES), social capital, oral status, Condition-Specific (CS) impacts and school absence in 925 Thai primary-schoolchildren.

	School performance, β (95% CI)		
Variables	model 1	model 2	model 3
SDES			
Sex (girl)	0.24 (32.26, 51.82)***	0.25 (32.91, 52.48)***	0.24 (32.22, 51.78)***
School type			
Public rural	Reference	Reference	Reference
Public urban	0.08 (2.13, 26.14)*	0.08 (3.13, 27.18)*	0.08 (2.87, 26.81)*
Private	0.17 (31.41, 72.08)***	0.17 (31.11, 71.71)***	0.17 (30.19, 70.62)***
Family income (high)	0.05 (-2.91, 20.79)	0.05 (-2.71, 20.94)	0.05 (-2.39, 21.15)
Father's education (high)	0.09 (4.33, 27.60)**	0.08 (3.66, 26.92)*	0.08 (3.08, 26.28)*
Social Capital			
Trust in close friends (high)	-0.01 (-11.17, 10.14)	-0.01 (-11.58, 9.70)	-0.01 (-12.82, 8.42)
Parental support (high)	0.04 (-2.81, 16.79)	0.04 (-2.63, 16.94)	0.04 (-2.49, 16.98)
Engagement in school activities (yes)	0.16 (17.46, 36.99)***	0.15 (17.12, 36.63)***	0.15 (16.25, 35.70)***
Numbers of students per teacher	0.05 (-0.31, 2.63)	0.06 (-0.21, 2.73)	0.05 (-0.30, 2.63)
Parent's participation (high)	0.10 (7.93, 27.84)***	0.10 (7.68, 27.57)***	0.10 (7.84, 27.64)***
Parental expectation (high)	0.22 (27.24, 48.45)***	0.22 (27.57, 48.75)***	0.21 (25.39, 46.62)***
Oral status			
DMFT (high)		-0.06 (-21.42, -0.28)*	-0.04 (-18.75, 2.95)
OHI-S (high)		-0.02 (-13.68, 7.28)	
OHRQoL and school absence			
CS impacts attributed to dental caries (yes)			-0.07 (-23.16, -2.97)*
Numbers of absent day (2 days/more)			-0.06 (-19.94, -0.39)*

***$P < 0.001$, **$P < 0.01$, *$P < 0.05$.

Model 1 adjusted for all SDES and social capital; model 2 further adjusted for certain oral status; model 3 further adjusted for CS impacts attributed to certain oral status and school absence.

β, regression coefficient; 95% CI, 95% confidence interval.

Note: β (95% CI) of SDES and social capital variables presented in model 2 belong to the DMFT model, those of the OHI-S model not presented.

When CS impacts attributed to dental caries and school absence were furthered entered into the model 3, DMFT score became not significantly associated with school performance whereas CS impacts and school absence were. This clearly showed that DMFT score exerted its effect on school performance via CS impacts and/or school absence (pathways c, e). The finding was in line with findings on oral status associated with CS impacts (Table 23), that is, DMFT was significantly associated with CS impacts after controlling for SDES and social capital variables (pathway c). CS impacts attributed to dental caries and school absence were the proximal variables (pathway e) having the similar effects on school performance (Table 25). The separate effects of CS-impacts attributed to dental caries and school absence on school performance were also analysed. When only school absence was furthered entered into the model 3, both DMFT score and school absence were significantly associated with school performance (Table 26). This finding confirms the significant effects of school absence and dental caries on school performance, independently of each other. Furthermore, if only CS impacts attributed to dental caries was entered into the model 3 (Table 27), DMFT score became not significantly associated with school performance whereas CS impacts was. This finding clearly shows that the effect of dental caries on school performance was actually through the CS-impacts.

Table 26. Multiple linear regression models of school performance, by sociodemographic and economic status (SDES), social capital, oral status, and school absence in 925 Thai primary-schoolchildren.

	School performance, β (95% CI)		
Variables	model 1	model 2	model 3
SDES			
Sex (girl)	0.24 (32.26, 51.82)***	0.25 (32.91, 52.48)***	0.24 (31.92, 51.54)***
School type			
Public rural	Reference	Reference	Reference
Public urban	0.08 (2.13, 26.14)*	0.08 (3.13, 27.18)*	0.08 (3.09, 27.10)*
Private	0.17 (31.41, 72.08)***	0.17 (31.11, 71.71)***	0.17 (31.10, 71.62)***
Family income (high)	0.05 (-2.91, 20.79)	0.05 (-2.71, 20.94)	0.05 (-2.47, 21.14)
Father's education (high)	0.09 (4.33, 27.60)**	0.08 (3.66, 26.92)*	0.08 (3.98, 27.21)**
Social Capital			
Trust in close friends (high)	-0.01 (-11.17, 10.14)	-0.01 (-11.58, 9.70)	-0.01 (-12.34, 8.94)
Parental support (high)	0.04 (-2.81, 16.79)	0.04 (-2.63, 16.94)	0.04 (-2.69, 16.85)
Engagement in school activities (yes)	0.16 (17.46, 36.99)***	0.15 (17.12, 36.63)***	0.15 (16.66, 36.14)***
Numbers of students per teacher	0.05 (-0.31, 2.63)	0.06 (-0.21, 2.73)	0.05 (-0.31, 2.63)
Parent's participation (high)	0.10 (7.93, 27.84)***	0.10 (7.68, 27.57)***	0.10 (7.44, 27.30)***
Parental expectation (high)	0.22 (27.24, 48.45)***	0.22 (27.57, 48.75)***	0.22 (26.61, 47.82)***
Oral status			
DMFT (high)		-0.06 (-21.42, -0.28)*	-0.06 (-21.85, 0.73)*
School absence			
Numbers of absent day (2 days/more)			-0.06 (-20.30, -0.69)*

***$P < 0.001$, **$P < 0.01$, *$P < 0.05$.

Model 1 adjusted for all SDES and social capital; model 2 further adjusted for certain oral status; model 3 further adjusted for CS impacts attributed to certain oral status and school absence.

β, regression coefficient; 95% CI, 95% confidence interval.

Table 27. Multiple linear regression models of school performance, by sociodemographic and economic status (SDES), social capital, oral status, and Condition-Specific (CS) impacts in 925 Thai primary-schoolchildren.

	School performance, β (95% CI)		
Variables	model 1	model 2	model 3
SDES			
Sex (girl)	0.24 (32.26, 51.82)***	0.25 (32.91, 52.48)***	0.25 (33.19, 52.70)***
School type			
Public rural	Reference	Reference	Reference
Public urban	0.08 (2.13, 26.14)*	0.08 (3.13, 27.18)*	0.08 (2.90, 26.89)*
Private	0.17 (31.41, 72.08)***	0.17 (31.11, 71.71)***	0.17 (30.19, 70.69)***
Family income (high)	0.05 (-2.91, 20.79)	0.05 (-2.71, 20.94)	0.05 (-2.62, 20.96)
Father's education (high)	0.09 (4.33, 27.60)**	0.08 (3.66, 26.92)*	0.08 (2.76, 25.99)*
Social Capital			
Trust in close friends (high)	-0.01 (-11.17, 10.14)	-0.01 (-11.58, 9.70)	-0.01 (-12.08, 9.15)
Parental support (high)	0.04 (-2.81, 16.79)	0.04 (-2.63, 16.94)	0.04 (-2.44, 17.07)
Engagement in school activities (yes)	0.16 (17.46, 36.99)***	0.15 (17.12, 36.63)***	0.15 (16.70, 36.15)***
Numbers of students per teacher	0.05 (-0.31, 2.63)	0.06 (-0.21, 2.73)	0.06 (-0.20, 2.73)
Parent's participation (high)	0.10 (7.93, 27.84)***	0.10 (7.68, 27.57)***	0.10 (8.08, 27.91)***
Parental expectation (high)	0.22 (27.24, 48.45)***	0.22 (27.57, 48.75)***	0.21 (26.30, 47.50)***
Oral status			
DMFT (high)		-0.06 (-21.42, -0.28)*	-0.04 (-18.26, 3.46)
OHRQoL			
CS impacts attributed to dental caries (yes)			-0.08 (-23.44, -3.23)*

***$P < 0.001$, **$P < 0.01$, *$P < 0.05$.

Model 1 adjusted for all SDES and social capital; model 2 further adjusted for certain oral status; model 3 further adjusted for CS impacts attributed to certain oral status and school absence.

β, regression coefficient; 95% CI, 95% confidence interval.

CHAPTER 7
DISCUSSION

The main objectives of this study were to explore the associations of school oral health-related environments and oral status adjusting for sociodemographic and economic status (SDES) and oral behaviours, and to explore the hierarchical relationships of children's school performance scores with Condition-Specific Oral Health-Related Quality of Life (CS OHRQoL), school absence, oral status and SDES as well as social capital.

7.1 Associations of school oral health-related environments with oral behaviours and oral status

The study provided the evidence on the association of school oral health-related environments with children's oral behaviours as well as dental caries. Availability of free fresh fruit in school meals could help reducing daily sweets consumption in children. This finding was consistent with previous school-based food policies studies reporting that free fruit/vegetable programme could increase in children's fruit and vegetable intake, while sweets consumption was decreased (196-198). Moreover, this is the first study to our knowledge reporting the significant association between availability of free fresh fruit and lower caries among children. A previous studies also reported that schools having food policy could decrease the obesity rate among children (199). Children in schools with food programme tended to increase their fruit and vegetables consumptions and decrease their total calorie intake as well as the chance of being overweight (196, 199). Furthermore, this study showed that lower caries was significantly associated with non-sugary snacks sale in schools, including meat snacks and crispy packed snacks. No sugar-added starch food (e.g. potatoes, bread) are considered low cariogenic (200), however, crispy packed snacks in terms of fried chips/flours are high in fats and salts and therefore, not recommended. Meat is also non-cariogenic, and can be recommended as healthy choices. However meat that contains high amount of fat as well as processed meat should be avoided (201).

As expected, the availability of sweets was positively associated with sweets consumption. This study found that children in school with sweetened milk sales were more likely to consume sweets every day. The result was consistent with a previous study investigating the association between school food policies specifically to sweetened beverages and beverage consumption among children. Jones et al. (2010) (202) reported that children attending schools that restricted the availability of sweetened beverage consumed sweetened beverage significantly less than their counterparts. Moreover, our study found that availability of sugary drinks, including sweetened milk, sweetened drinks and soft drinks were significantly associated with high caries. This finding was consistent with the only one previous study on the comparable issue. Thornley et al. (2017) (203) showed that 8- to 11-year-olds children attending school with restrictive food environment policies such as a ban sugary drinks and providing free drinking water significantly had fewer dental caries. The significant associations of school food environments with sweets consumption behaviour as well as dental caries among schoolchildren imply that "making healthier choice the easier choices" (204) is an important strategy to promote healthy lifestyle and good oral health. Food policy in schools that limits sugar-added or unhealthy snacks, and increase the availability of low sugar and healthy snacks, free fresh fruit in particular, should be recommended as one of the strategies to promote oral and general health. Irregular finding on the association between availability of candies and low dental caries might be explained by data disproportion as only 7% of children studies in schools with candies sales. While percentages of candy sales in schools are high in many countries such as 90% in Netherlands and 40% in the United States (205, 206), the very low percentages of candies sales as found in this study might be the consequence of a long-term school health promotion project in Thailand aiming to restrict sugary snacks, especially candies and soft drinks in schools (207).

In addition to the availability of free fresh fruit and snacks sales in schools, this study indicated that children in schools with continuously integrated oral education in their school curriculum were more likely to brush their teeth twice per day and brush after lunch. These findings could be compare to a number of previous studies (208-211) showing the effectiveness of educational programme on children's toothbrushing behaviours. For example, Tai et al. (2009) (208) reported that a

biweekly oral educations during a three-year programme successfully increased percentages of children who brushed their teeth twice a day. Petersen et al. (2004) (211) found that training workshop on oral education for teachers and monthly oral education sessions in curriculum within a three-year period could improve children's tooth brushing at least twice a day and use of fluoride toothpaste.

However, the current study did not find the significant association of having oral education in school curriculum with dental caries. Possible reasons might relate to a short-term follow-up as the current study applied a 2 years period as a cut-point, while a previous study found significant association between oral education programme and caries increment in long-term follow up. Lai et al. (2016) (212) reported that children attending schools having an intensive ten-year period of oral education including, daily brushing and flossing practices in school day and annual meeting to encourage oral hygiene instruction improvement, had lower caries than those in a comparison group. Oral educational programme in school might be able to decrease dental caries among children if the programme has been conducted in an intensive form and in a long period of time. Moreover, our findings indicated that simple oral examination done by teacher were associated with high DMFT score, but not with DT score. This finding might imply the adverse effect of the traditional restorative approach in which initial carious lesions were detected and referred for filling, resulting in unnecessarily high restored teeth (213).

There are several strengths of the current study. Through the three steps of multivariate analyses, the effects of SDES and other school environments were revealed. The effects of SDES were shown in models 1 (Table 19), for example, after adjusting SDES, selling meat snacks, ice-cream and candies were not significantly associated with daily sweets consumption, neither were ice-cream and sweetened drinks with dental caries. These results implied that the SDES were fundamental determinant affecting sweets consumption behaviour and dental caries among children.After adjusting for other school environments in models 2 (Table 14 and 19), most unexpectedly significant associations of providing free toothbrushing, simple oral examination and integrated oral education with sweet consumption and dental caries became non-significant. Findings showed the confounding effect of other school environments on the association of explanatory environmental variables with

sweet consumption behaviour and dental caries. Furthermore, oral behaviours were included in the final model, thus, findings implied the effect of school environment on dental caries independently of behaviours as measured in this study.

However, the important limitations of this study related to a short-term threshold of environmental factors. The availability of certain environments for at least two years were applied, as a consequence, their significant associations with dental caries might be undermined. Reasons for using 2 years period related to the unstable oral health policies and food arrangements in many schools in Thailand. School policies or food quality frequently changed by new schools directors or teachers who were in charge with. Thus, there were few schools that could maintain their oral health-supportive environment for at least 3 years, a period that was expected to have the beneficial effect on dental caries. The second limitation of this study related to the difficulties in collecting oral health behaviours that could well present the actual dental caries protective behaviours of children, particularly on sugars consumption habit. The variable on sweets consumption used in this study was not significantly associated with dental caries, and did not attenuate the effects of food environment when entered into the models. Another limitation of the current study relates to the calibration exercise on examining children's oral hygiene. Repeated examinations of dental plaque on the same subject was inappropriate for testing examiners' reliability because dental plaque was partially removed from prior examiners. Other method such as using video in the calibration exercise would be more appropriate. Further longitudinal studies following the long-term availability of oral health-supportive environment as well as studies using more precise behavioural variables and oral hygiene would be recommended in order to ascertain the effects of environments on children's oral health.

7.2 The hierarchical relationships of school performance with Condition-Specific Oral Health-Related Quality of Life, school absence and oral status

This study confirmed with the existing knowledge on the more important role of dental caries, than gingival diseases or poor oral hygiene, on children's quality of life. None of previous studies reporting similar finding did not control for social capital variables, while our study included SDES as well as social capital variables in

the multivariate analyses. The significant association between dental caries and CS OHRQoL was consistent with a number of previous studies using CS OHRQoL measure (214-216). A previous study that applied CS OHRQoL measure and did not find significant association with dental caries might relate to their analysis where CS impact score was used, while all previous studies using the intensity or presence/absence of CS impacts reported the significant associations with dental caries. Intensity of impacts was found to better represent subjective perception than the impact scores (34). Our finding regarding oral hygiene or gingivitis agreed with previous studies reporting the non-significant association between poor oral hygiene and CS impacts attributed to gingivitis (35, 216). However, significant associations were reported by a study where severe forms of gingivitis were used as independent variables (217). Findings from the current and previous studies implied that if the goal of oral health services are the improvement of quality if life, dental caries should be considered as a major dental public health problem in school-aged children (36). Gingivitis or poor oral hygiene is unlikely to adversely affect children's quality of life unless the disease progresses to a severe stage.

Furthermore, this study also confirmed with previous studies on the significant associations of dental caries and OHRQoL with school marks (11, 39, 44, 218-220). Detty and Oza-Frank (2014) (218) used aggregated school-level data on caries prevalence and school performance index scores in third grade schoolchildren, and found that they were significantly related. Paula et al. (2016) (219) reported the significant associations of examination scores on five subjects obtained from different school examinations with dental caries in 8-10 year-old children. Blumenshine et al. (2008) (44) showed that children with both poor dental and general health rated by their parents were significantly more likely to be perceived by their parents as having poor school performance. Seirawan et al. (2012) (39) found that children who were reported by their parents as having toothache were significantly more likely to have lower grade point average. Previous studies that applied generic OHRQoL measure also reported that children with higher oral impact scores were significantly more likely to have lower school marks (11, 220). In addition, school absence that was found to be another proximal determinant affecting school performance in the current study was consistent with existing literatures. Losing learning time might lead to

academic disadvantage as previous studies reporting low school performance in children who missed school due to any reason (11, 44) or due to dental problem (40).

Further to previous studies, our study has added a new knowledge to the literatures by using a hierarchical technique on the analyses of associations between the three groups of parameters: dental caries, OHRQoL and school marks. We found that CS impacts attributed to dental caries and school absence accounted for the significant association of dental caries with school marks (pathways c, e). Our finding in the model 2 where OHRQoL not yet controlled indicated that dental caries was negatively associated with and high school marks (pathway d). When OHRQoL and school absence were entered into the model 3, association between dental caries and school marks became non-significant while OHRQoL and school absence revealed their significant associations with school marks (pathway e). These findings showed that the effect of dental caries on school marks was mediated through CS impacts attributed to dental caries and school absence. A previous study that applied the hierarchical technique to the analyses of school performance associated with oral status and school absence showed that the association between poor oral status and poor school performance existed independently of school absence (40). However, their analysis did not included OHRQoL as a mediator of the association between dental status and school performance.

Moreover, we found that, irrespective of oral health and OHRQoL as the mediators of relationship between SDES/social capital and school performance, SDES and social capital were independently significantly associated with children's school performance (pathway f). Our findings indicated that children whose father attained lower educational achievement and those studying in public rural schools had lower school performance. Existing educational literatures showed that lower parental education level was significantly related to lower school performance of children (9, 221, 222). Ruijsbroek et al. (2015) (222) reported that children's school performance was strongly affected by parental education, but slightly by children's health problems. Low level of education of parents may lead to low income, unemployment and low occupational social class. Brooks-Gunn and Duncan (1997) (9) found that children living in family with low economic status were more likely to miss school, to be labeled as problem students, to earn lower test scores and to drop out of schools.

Parental expectation was another strong distal determinant of school performance as found in this study. Previous studies showed that among several aspects of parental involvements in their child's education, parental expectation had the strongest effect on child's school performance (223, 224). Parental expectation might act as a mediator of the association between socioeconomic backgrounds, especially parents' education and income, and children's school performance (225).

Regarding the associations of social capital and oral health, out of the seven capital variables used in this study, only parental expectation was found to significantly associated with OHRQoL. Existing evidence on the effects of social capital on oral health are inconsistent. Some studies reported the non-significant association of mother's perceived social capital, including perception of reciprocal help, support and trust in the neighbourhood, and her rating of child's oral health (137). Pattussi et al. (2007) (226) showed that social support measured by the revised Kaplan scale was not associated with self-rated oral health among 14-15 year-old Brazilian children. On the other hand, Furuta et al. (2012) (143) found significant associations of neighborhood trust and trust between teacher and student with self-rated oral health among first year students at the university in Japan. A limited number of studies on this area as well as a wide and disparate range of social capital measures that were applied might cause ambiguous knowledge on this issue (227).

There are several strengths of the current study over previous studies. The association analyses of school performance and oral health were adjusted for potential SDES and social capital. While some of the previous studies controlled for SDES, none of them include social capital, which certainly has the effects on school performance as above discussed. Our study's findings showed that regardless of the effects of SDES and social capital on school marks, children with high dental caries were more likely to have oral impacts on their quality of life and subsequently, have low school performance. Moreover, CS impacts were used, instead of parental perceptions or overall oral impacts. Since specific oral conditions (i.e. dental caries, oral hygiene status) were used as the distal determinants of school marks, therefore, it would be more accurate to apply CS impacts attributed to certain oral conditions as the proximal determinants in the models. In addition, research involving children's school performance might found the difficulty in accessing data from actual

examinations, particularly the national standard ones. This might be a reason why parental perceptions, different school examinations or standard examination scores of some subjects were used by previous studies (11, 39, 40, 218-220). However, the current study could obtained data from the National Standard Examination and applied the total scores to the analyses. Another issue that should be further investigated relates to the potential effect of school dental services, particularly preventive measures such as sealant, on dental caries and school performance of children. Detty and Oza-Frank (2014) (218) found that the high prevalence of untreated caries was associated with poor school performance in children attending schools without a dental sealant program, but not in school with a dental sealant program after controlling for school's socio-economic backgrounds. Further studies including school dental sealant programme service as another environmental factor would be useful for developing strategies to reduce dental caries and enhancing school performance of children.

CHAPTER 8
CONCLUSION

1. School oral health-related environments, especially food environment, were associated with sweets consumption behaviour and dental caries. Availability of free fresh fruit in school meals associated with lower sweets consumption and lower dental caries in children. Non-sugary snacks, ie. meat snacks and crispy packed snacks sales in schools associated with low dental caries, while sugary beverages, ie. sweetened milk, sweetened drinks and soft drinks sales in schools associated with high dental caries.

2. Children in schools with integrated oral education into school curriculum were more likely to brush their teeth twice a day as well as to brush after lunch, but not to consume sweets and to have low dental caries.

3. Dental caries was associated with Condition-Specific (CS) impacts attributed to dental caries, while oral hygiene was not associated with CS impacts attributed to periodontal disease, after controlling for sociodemographic and economic status and social capital. Dental caries should be considered as a major dental public health problem in school-aged children.

4. Dental caries was associated with school performance in children. There was no association between oral hygiene and school performance. From the hierarchical relationship on the analyses of the associations between the three groups of parameters: dental caries, Oral Health-Related Quality of Life/school absence and school performance. Dental caries exerted its effect on school performance through CS impacts attributed to dental caries and school absence.

5. Children's engagement in school activities, parent's participation in school meeting and parental expectation were strong social capital determinant of school

performance, while sex, school type and father's education were SDES associated with school performance as found in this study.

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APPENDIX A

QUESTIONNAIRE FOR ORAL BEHAVIOURS AND SOCIAL CAPITAL OF CHILDREN

แบบสัมภาษณ์กลุ่มวัยเรียน เด็กนักเรียนระดับชั้นประถมศึกษาปีที่ 6 จังหวัดสระแก้ว

ชื่อ-สกุล..... โรงเรียน.....

ที่อยู่ ตำบล..... อำเภอ..... วันที่สัมภาษณ์ .....

ส่วนที่ 1 : ข้อมูลทั่วไป ทำเครื่องหมาย × หน้าคำตอบที่ใกล้ความเป็นจริงมากที่สุด

1. เพศ (1) ชาย (2) หญิง

2. อายุนับถึงวันเกิดครั้งสุดท้าย.....ปี (ไม่นับจำนวนเดือน)

3. ที่ตั้งของบ้าน (ผู้สัมภาษณ์ช่วยดูจากที่อยู่ของเด็ก) (1) ในเขตเทศบาล (2) นอกเขตเทศบาล

4. ปัจจุบัน มีสมาชิกในบ้านที่อยู่ด้วยกันเป็นประจำ(รวมตัวนักเรียนด้วย)
   เป็นผู้ใหญ่(อายุตั้งแต่ 18 ปีขึ้นไป).....คน เป็นเด็ก(อายุน้อยกว่า 18 ปี).....คน

5. จำนวนปีเต็มที่เรียนอยู่ที่โรงเรียนแห่งนี้.....ปี (ไม่นับจำนวนเดือน)

6. เงินค่าขนมไปโรงเรียนสัปดาห์(7วัน)ละ.....บาท (ถ้าได้รับเป็นวันหรือเดือน ให้คำนวณเป็นสัปดาห์)

7. นักเรียนใช้เงินซื้อขนม/อาหารว่าง/เครื่องดื่ม สัปดาห์(7วัน)ละ .....บาท

8. จำนวนวันที่ขาดเรียนตั้งแต่เรียนอยู่ชั้นป.6 (ดูจากแบบบันทึกของครูประจำชั้น).....วัน

ส่วนที่ 2 : ข้อมูลพฤติกรรมที่เกี่ยวข้องกับสุขภาพช่องปาก

พฤติกรรมด้านการแปรงฟันและการเลือกใช้ยาสีฟัน

9. นักเรียนแปรงฟันตอนเช้าหรือไม่

(0) ไม่เคย (1) แปรงบ้างไม่แปรงบ้าง (2) ทุกวันหรือเกือบทุกวัน

10. นักเรียนแปรงฟันหลังอาหารกลางวัน ที่โรงเรียน หรือไม่

(0) ไม่เคย (1) แปรงบ้างไม่แปรงบ้าง (2) ทุกวันหรือเกือบทุกวัน

11. นักเรียนแปรงฟันก่อนเข้านอนหรือไม่ (ถ้าตอบข้อ 1หรือ 2 ระบุต่อด้วยว่ากินหลังแปรงฟันอีกหรือไม่)

(0) ไม่เคย

(1) แปรงบ้างไม่แปรงบ้าง แล้วกินอาหาร/ขนม/น้ำหวาน หรือไม่

() นานๆครั้งหรือไม่กินเลย () กินบางครั้ง () กินทุกครั้งหรือเกือบทุกครั้ง

(2) แปรงทุกวันหรือเกือบทุกวัน แล้วกินอาหาร/ขนม/น้ำหวาน หรือไม่

() นานๆครั้งหรือไม่กินเลย () กินบางครั้ง () กินทุกครั้งหรือเกือบทุกครั้ง

12. นักเรียนแปรงฟันนานเท่าไร

(1) น้อยกว่าครึ่งนาที (2) ครึ่งนาที แต่ไม่ถึง 2 นาที (3) 2 นาทีขึ้นไป (4) ไม่แน่ใจ

13. ในการแปรงฟันแต่ละครั้ง นักเรียนบ้วนน้ำอย่างไร

(1) บ้วนน้ำจากมือ 1-2 ครั้ง (2) บ้วน 1 แก้ว (3) บ้วนมากกว่า 1 แก้ว (4) บ้วนเรื่อยๆไม่เคยสนใจ

14. ใช้ยาสีฟันยี่ห้อ..... (ผู้สัมภาษณ์พิจารณาว่ามีฟลูออไรด์หรือไม่)

(0) ไม่มีฟลูออไรด์ (1) มีฟลูออไรด์ (2) ไม่แน่ใจ

พฤติกรรมด้านการรับบริการทางทันตกรรม

15. ตั้งแต่เรียนอยู่ชั้นป.6 เคยได้รับการตรวจฟันจากทันตบุคลากรหรือไม่ (0) ไม่เคย (1) เคย

16. ตั้งแต่เรียนอยู่ชั้นป.6 เคยทำฟันหรือไม่ (0) ไม่เคย (1) เคย

พฤติกรรมด้านการกินขนมและเครื่องดื่ม

นักเรียนกินขนม/เครื่องดื่มต่อไปนี้บ่อยแค่ไหน (สัปดาห์มี 7 วัน) ให้กา X ในช่องว่าง	นานๆกินที หรือไม่ค่อยกิน (0)	กินบ้าง สัปดาห์ละ 2-5 วัน (1)	เกือบทุกวัน หรือทุกวัน วันละครั้ง (2)	ทุกวัน วันละ 2 ครั้งขึ้นไป (3)
17. น้ำหวาน/น้ำผลไม้เติมน้ำตาล				
18. น้ำอัดลม				
19. นมปรุงแต่งรส/นมเปรี้ยว				
20. ลูกอม/ท้อฟฟี่				
21. ไอศกรีม				
22. ขนมถุง/ห่อประเภทแป้งกรอบ				

ส่วนที่ 3 : **ข้อมูลด้านทุนทางสังคม**

23. นักเรียนมีเพื่อนสนิทที่โรงเรียนจำนวน.....คน

24. นักเรียนรู้สึกไว้ใจ สนิทใจ สามารถพูดคุยเรื่องส่วนตัวของนักเรียนกับเพื่อนสนิทได้แค่ไหน

(0) ไม่เลย (1) เล็กน้อย (2) ปานกลาง (3) มาก

25. นักเรียนรู้สึกเป็นที่ยอมรับ หรือเป็นที่รักของเพื่อนสนิทของนักเรียนแค่ไหน

(0) ไม่เลย (1) เล็กน้อย (2) ปานกลาง (3) มาก

26. วันที่ไปโรงเรียน ตอนเช้าก่อนเข้าเรียน นักเรียนเดินไปโรงเรียน ทำกิจกรรมหรือเล่นกับเพื่อนๆหรือไม่

(0) นานๆครั้งหรือไม่เคยเลย (1) บางวัน (2) ทุกวันหรือเกือบทุกวัน

27. วันที่ไปโรงเรียน หลังเลิกเรียน นักเรียนเดินกลับบ้าน ทำกิจกรรมหรือเล่นกับเพื่อนๆหรือไม่

(0) นานๆครั้งหรือไม่เคยเลย (1) บางวัน (2) ทุกวันหรือเกือบทุกวัน

28. ในวันหยุดเสาร์อาทิตย์ นักเรียนพบปะ พูดคุย หรือออกไปเล่นกับเพื่อนๆหรือไม่

(0) นานๆครั้งหรือไม่เคยเลย (1) บางวัน (2) ทุกวันหรือเกือบทุกวัน

29. นักเรียนเคยได้รับมอบหมายจากครู ให้เป็นผู้นำโครงการหรือทำกิจกรรมต่างๆ ที่เกี่ยวกับ การดูแลสุขภาพช่องปากของนักเรียนในโรงเรียน และระบุจำนวนปี (0) ไม่เคย (1) เคย ได้แก่ (ตอบได้มากกว่า 1 ข้อ)

( ) ผู้นำดูแลการแปรงฟัน.....ปี ( ) ผู้นำเรื่องขนม/เครื่องดื่มในโรงเรียน.....ปี

( ) ผู้นำให้ความรู้สุขภาพช่องปาก.....ปี ( ) ผู้นำเรื่องนมฟลูออไรด์.....ปี ( ) อื่นๆ ระบุ...../.....ปี

30. นักเรียนเคยได้รับมอบหมายจากครู ให้เป็นผู้นำโครงการหรือกิจกรรมต่างๆ ในโรงเรียน และระบุจำนวนปี

(0) ไม่เคย (1) เคย ได้แก่ (ตอบได้มากกว่า 1 ข้อ)

( ) หัวหน้า/รองหัวหน้าชั้นเรียน.....ปี ( ) สารวัตรนักเรียน.....ปี

( ) โครงการพุทธศาสนา.....ปี ( ) อื่นๆ ระบุ..... .....ปี

31. นักเรียนรู้สึกว่าโรงเรียนมีส่วนช่วยผลักดัน หรือกระตุ้นนักเรียนในการสอบ O-Net แค่ไหน

(0) ไม่เลย (1) เล็กน้อย (2) ปานกลาง (3) มาก

32. นักเรียนรู้สึกว่าผู้ปกครองสนใจ ดูแล เอาใจใส่นักเรียน เรื่องทั่วๆไปในชีวิตประจำวันแค่ไหน

(0) ไม่เลย (1) เล็กน้อย (2) ปานกลาง (3) มาก

33. นักเรียนรู้สึกว่าผู้ปกครองมีส่วนช่วยผลักดัน หรือกระตุ้นเรื่องการเรียน เช่น ทำการบ้าน อ่านหนังสือ แค่ไหน

(0) ไม่เลย (1) เล็กน้อย (2) ปานกลาง (3) มาก

34. ในวันหยุดเสาร์อาทิตย์ นักเรียนออกไปทำกิจกรรมต่างๆ หรือไปเที่ยวข้างนอกกับผู้ปกครอง หรือไม่

(0) นานๆครั้งหรือไม่เคยเลย (1) บางวัน (2) ทุกวันหรือเกือบทุกวัน

APPENDIX B

QUESTIONNAIRE FOR SOCIOECONOMIC BACKGROUNDS AND SOCIAL CAPITAL OF PARENT

แบบสอบถาม สำหรับผู้ปกครอง ของเด็กนักเรียนระดับชั้นประถมศึกษาปีที่ 6 จังหวัดสระแก้ว

ส่วนที่ 1 : ข้อมูลด้านสถานะทางเศรษฐกิจสังคม ทำเครื่องหมาย ✕ หน้าคำตอบที่ใกล้ความเป็นจริงมากที่สุด

1. ความสัมพันธ์ของท่าน (ผู้ตอบแบบสอบถาม) กับนักเรียน

(1) บิดา (2) มารดา (3) ผู้ปกครองอื่นที่ไม่ใช่บิดาหรือมารดา

* ถ้าเป็นบิดาหรือมารดา ให้**ข้ามไปตอบข้อ** 4 *

ถ้าท่านเป็นผู้ปกครองที่ดูแลนักเรียน ให้ตอบแบบสอบถาม**ทุกข้อ**

2. การศึกษาขั้นสูงสุดของท่าน

(0) ไม่เคยเรียน (1) ประถมศึกษา (2) มัธยมศึกษาตอนต้น

(3) มัธยมศึกษาตอนปลาย/ปวช. (4) ปวส./อนุปริญญา (5) ปริญญาตรีหรือสูงกว่า

3. อาชีพของท่าน

(1) ผู้ทำงานด้านบริหาร กรรมการบริหาร หรือหัวหน้าฝ่ายต่างๆ ในองค์กรขนาดใหญ่ หรือเจ้าของกิจการขนาดใหญ่ที่มีพนักงานมากกว่า 25 คน หรือวิชาชีพเฉพาะ เช่น วิศวกร ครูทุกระดับชั้น แพทย์ พยาบาลวิชาชีพ

(2) เจ้าหน้าที่หรือพนักงานทั่วไปในสายงานต่างๆ โดยไม่ได้เป็นหัวหน้าเช่น การเงิน บัญชี เลขา ช่างเทคนิคด้านวิศวกรรมและวิทยาศาสตร์ (เช่น ไฟฟ้า เครื่องกล อิเล็กทรอนิกส์) ผู้ช่วยด้านการแพทย์ เจ้าหน้าที่สาธารณสุข ครูผู้ช่วย ไม่เกี่ยวข้องกับการบริหาร หรือเป็นเจ้าของธุรกิจขนาดเล็กที่มีพนักงานน้อยกว่า 25 คน เกษตรกรรมโดยมีที่ดินของครอบครัว

(3) เจ้าหน้าที่ตำรวจ ทหารชั้นผู้น้อย ผู้ประกอบอาชีพเกษตรกรรม ค้าขาย ช่างฝีมือด้านต่างๆ ทำงานโรงงาน ขับรถรับจ้างหรืองานบริการต่างๆ เช่น พนักงานขายของ พนักงานเก็บเงิน รักษาความปลอดภัย ผู้ใช้แรงงาน

(4) ไม่ได้ทำงาน หรือตกงาน (เกษียณ แม่บ้าน นักเรียน นักศึกษา)

4. สถานภาพของนักเรียน และบิดา-มารดา

(1) นักเรียนอาศัยอยู่ร่วมกันกับทั้งบิดาและมารดา

(2) นักเรียนอาศัยอยู่กับบิดาหรือมารดา คนใดคนหนึ่ง (3) นักเรียนไม่ได้อาศัยอยู่กับทั้งบิดาและมารดา

5. การศึกษาขั้นสูงสุดของบิดา

(0) ไม่เคยเรียน (1) ประถมศึกษา (2) มัธยมศึกษาตอนต้น

(3) มัธยมศึกษาตอนปลาย/ปวช. (4) ปวส./อนุปริญญา (5) ปริญญาตรีหรือสูงกว่า

6. อาชีพของบิดา

(1) ผู้ทำงานด้านบริหาร กรรมการบริหาร หรือหัวหน้าฝ่ายต่างๆ ในองค์กรขนาดใหญ่ หรือเจ้าของกิจการขนาดใหญ่ที่มีพนักงานมากกว่า 25 คน หรือวิชาชีพเฉพาะ เช่น วิศวกร ครูทุกระดับชั้น แพทย์ พยาบาลวิชาชีพ

(2) เจ้าหน้าที่หรือพนักงานทั่วไปในสายงานต่างๆ โดยไม่ได้เป็นหัวหน้าเช่น การเงิน บัญชี เลขา ช่างเทคนิคด้านวิศวกรรมและวิทยาศาสตร์ (เช่น ไฟฟ้า เครื่องกล อิเล็กทรอนิกส์) ผู้ช่วยด้านการแพทย์ เจ้าหน้าที่สาธารณสุข ครูผู้ช่วย ไม่เกี่ยวข้องกับการบริหาร หรือเป็นเจ้าของธุรกิจขนาดเล็กที่มีพนักงานน้อยกว่า 25 คน เกษตรกรรมโดยมีที่ดินของครอบครัว

(3) เจ้าหน้าที่ตำรวจ ทหารชั้นผู้น้อย ผู้ประกอบอาชีพเกษตรกรรม ค้าขาย ช่างฝีมือด้านต่างๆ ทำงานโรงงาน ขับรถรับจ้างหรืองานบริการต่างๆ เช่น พนักงานขายของ พนักงานเก็บเงิน รักษาความปลอดภัย ผู้ใช้แรงงาน

(4) ไม่ได้ทำงาน หรือตกงาน (เกษียณ แม่บ้าน นักเรียน นักศึกษา)

7. การศึกษาขั้นสูงสุดของมารดา

(0) ไม่เคยเรียน (1) ประถมศึกษา (2) มัธยมศึกษาตอนต้น

(3) มัธยมศึกษาตอนปลาย/ปวช. (4) ปวส./อนุปริญญา (5) ปริญญาตรีหรือสูงกว่า

8. อาชีพของมารดา

(1) ผู้ทำงานด้านบริหาร กรรมการบริหาร หรือหัวหน้าฝ่ายต่างๆ ในองค์กรขนาดใหญ่ หรือเจ้าของกิจการขนาดใหญ่ที่มีพนักงาน มากกว่า 25 คน หรือวิชาชีพเฉพาะ เช่น วิศวกร ครูทุกระดับชั้น แพทย์ พยาบาลวิชาชีพ

(2) เจ้าหน้าที่หรือพนักงานทั่วไปในสายงานต่างๆ โดยไม่ได้เป็นหัวหน้าเช่น การเงิน บัญชี เลขา ช่างเทคนิคด้านวิศวกรรมและวิทยาศาสตร์ (เช่น ไฟฟ้า เครื่องกล อิเล็กทรอนิกส์) ผู้ช่วยด้านการแพทย์ เจ้าหน้าที่สาธารณสุข ครูผู้ช่วย ไม่เกี่ยวข้องกับการบริหาร หรือเป็นเจ้าของธุรกิจขนาดเล็กที่มีพนักงานน้อยกว่า 25 คน เกษตรกรรมโดยมีที่ดินของครอบครัว

(3) เจ้าหน้าที่ตำรวจ ทหารชั้นผู้น้อย ผู้ประกอบอาชีพเกษตรกรรม ค้าขาย ช่างฝีมือด้านต่างๆ ทำงานโรงงาน ขับรถรับจ้าง หรืองานบริการต่างๆ เช่น พนักงานขายของ พนักงานเก็บเงิน รักษาความปลอดภัย ผู้ใช้แรงงาน

(4) ไม่ได้ทำงาน หรือตกงาน (เกษียณ แม่บ้าน นักเรียน นักศึกษา)

9. รายได้ของท่านและผู้มีรายได้ทุกคนในบ้าน <u>รวมกันเฉลี่ยต่อเดือน</u>

(0) น้อยกว่า 10,000 บาท (1) 10,001 -15,000 บาท

(2) 15,001 – 30,000 บาท (3) 30,001 – 50,000 บาท

(4) มากกว่า 50,000 บาท

ส่วนที่ 2 : **ข้อมูลด้านทุนทางสังคมในครอบครัว**

ท่านทำกิจกรรมต่อไปนี้บ่อยแค่ไหน (กา X ในช่อง)	ไม่เคย (0)	บางครั้ง (1)	เกือบทุกครั้ง (2)	ทุกครั้ง (3)
10. ให้คำปรึกษาเรื่องงาน หรือการบ้านของนักเรียน				
11. ตรวจสอบว่านักเรียนทำงานหรือการบ้านเสร็จหรือไม่				
12. ช่วยทำงานหรือการบ้านของนักเรียน				
13. ร่วมประชุมผู้ปกครอง ที่โรงเรียนของนักเรียนจัดขึ้น				
14. เป็นอาสาสมัครช่วยงานต่างๆที่โรงเรียนของนักเรียน				
15. ร่วมกิจกรรมงานรื่นเริงต่างๆ ที่โรงเรียนของนักเรียนจัดขึ้น เช่น งานปีใหม่ งานวันพ่อ งานวันแม่				

16. ความคาดหวังทางการศึกษาของท่านต่อนักเรียน

(1) ไม่คาดหวัง (2) จบชั้นม.3 (3) จบชั้นม.6

(4) จบ ปวส./อนุปริญญา (5) จบปริญญาตรี (6) จบสูงกว่าปริญญาตรี

17. ท่านรู้จัก พบปะ พูดคุย หรือมีกิจกรรมร่วมกันเป็นครั้งคราวกับเพื่อนของนักเรียน จำนวน…….คน

APPENDIX C

QUESTIONNAIRE FOR SCHOOL ENVIRONMENTAL FACTORS

แบบสัมภาษณ์ครูและบุคลากรในโรงเรียน จังหวัดสระแก้ว

ชื่อ-สกุล.....ตำแหน่ง.....เบอร์มือถือ.....

ชื่อโรงเรียน.....ตำบล.....อำเภอ.....

ส่วนที่ 1 : **ข้อมูลทั่วไปของโรงเรียน**

1. สังกัดของโรงเรียน (1) รัฐบาล (2) เอกชน

2. ขนาดของโรงเรียน (1) ขนาดเล็ก (2) ขนาดกลาง (3) ขนาดใหญ่

3. ที่ตั้งของโรงเรียน (1) ในเขตเทศบาล (2) นอกเขตเทศบาล

4. นักเรียนทั้งโรงเรียน.....คน / ครูทั้งหมด.....คน (รวมครูและนักเรียนชั้นอนุบาล)

5. นักเรียนชั้นป.6 ทั้งหมด.....คน / ห้องเรียนชั้นป.6.....ห้อง

ส่วนที่ 2 : **ข้อมูลด้านทุนทางสังคมของโรงเรียน**

6. ในรอบ 1 ปีการศึกษา โรงเรียนจัดประชุมเชิญผู้ปกครองนักเรียนชั้นป.6 เข้าร่วมเป็นประจำทุกปี

(0) ไม่เคย (1) 1 ครั้ง (2) 2 ครั้ง (3) 3 ครั้งขึ้นไป ระบุ.....ครั้ง

7. ใน 1 ปีที่ผ่านมา โรงเรียนจัดกิจกรรมต่างๆของโรงเรียน โดยมีคนในชุมชนเข้าร่วมกิจกรรม

(0) ไม่เคย (1) 1 ครั้ง (2) 2 ครั้ง (3) 3 ครั้งขึ้นไป ระบุ.....ครั้ง

8. ใน 1 ปีที่ผ่านมา โรงเรียนเข้าไปมีส่วนร่วมกับกิจกรรมต่างๆที่หน่วยงานหรือคนในชุมชนจัดขึ้น

(0) ไม่เคย (1) 1 ครั้ง (2) 2 ครั้ง (3) 3 ครั้งขึ้นไป ระบุ.....ครั้ง

9. ใน 1 ปีที่ผ่านมา โรงเรียนได้รับเงินหรือสิ่งสนับสนุน จากหน่วยงานหรือคนในชุมชน

(ไม่รวมสิ่งสนับสนุนที่ได้รับจากกบริษัทเอกชน เช่น น้ำอัดลม ไอศครีม)

(0) ไม่เคย (1) เคย ได้แก่ (ตอบได้มากกว่า 1 ข้อ)

( ) เงิน จำนวน.....บาท ( ) อุปกรณ์การเรียน ( ) อุปกรณ์กีฬา

( ) อื่นๆ ระบุ.....

10. ใน 1 ปีที่ผ่านมา โรงเรียนมีการติดต่อประสานงานกับเจ้าหน้าที่สาธารณสุข หรือมีเจ้าหน้าที่มาจัดกิจกรรมที่โรงเรียน ในเรื่องที่เกี่ยวข้องกับ**สุขภาพช่องปาก และอาหาร/ขนม**ของนักเรียน

(0) ไม่เคย (1) 1 ครั้ง (2) 2 ครั้ง (3) 3 ครั้งขึ้นไป ระบุ.....ครั้ง

11. ใน 1 ปีที่ผ่านมา โรงเรียนมีการติดต่อประสานงานกิจกรรมด้าน**ส่งเสริมสุขภาพช่องปาก**ของนักเรียน ร่วมกับโรงเรียนอื่นๆ

(0) ไม่เคย (1) 1 ครั้ง (2) 2 ครั้ง (3) 3 ครั้งขึ้นไป ระบุ.....ครั้ง

12. โรงเรียนเคยได้รับรางวัลเกี่ยวกับกิจกรรมส่งเสริมสุขภาพช่องปากของนักเรียน

(0) ไม่เคย (1) รางวัลระดับจังหวัด (2) รางวัลสูงกว่าระดับจังหวัด

13. โดยปกติ โรงเรียนจะจัดสอนติวเพิ่มเฉพาะการเตรียมตัวสอบ O-Net ของนักเรียน ชั้นป.6 ทั้งหมด.....ชั่วโมง

ส่วนที่ 3 : ข้อมูลด้านปัจจัยสิ่งแวดล้อมทางสังคมที่เอื้อต่อการส่งเสริมสุขภาพช่องปากของนักเรียนในโรงเรียน				
<u>ปัจจุบัน</u> โรงเรียนมีกิจกรรมต่อไปนี้หรือไม่	ไม่มี และ ไม่เคยมี (0)	เคยมี แต่ปัจจุบัน เลิกแล้ว (1)	มีเป็นประจำ ต่อเนื่องกัน ไม่ถึง 2 ปี (2)	มีเป็นประจำ ต่อเนื่องกัน ตั้งแต่ 2 ปีขึ้นไป (3)
14. เข้าร่วมการประกวดกิจกรรมทันตสุขภาพในโรงเรียน ที่หน่วยงานสาธารณสุขจัดขึ้น				
15. มีชมรมหรือกลุ่มนักเรียนจัดกิจกรรมที่เกี่ยวข้องกับสุขภาพช่องปากของนักเรียน				
16. ตรวจสุขภาพช่องปากของนักเรียน<u>โดยครู</u> อย่างน้อยปีละ 1 ครั้ง				
17. จัดการเรียนรู้เกี่ยวกับทันตสุขภาพ<u>เพิ่มเติม</u> จากหลักสูตรปรกติของกระทรวงศึกษา				
18. จัดกิจกรรมแปรงฟันหลังอาหารกลางวัน ครอบคลุมนักเรียนทุกคน				
19. จัดน้ำดื่มสะอาดบริการนักเรียนฟรี				
20. จัดผลไม้สดในมื้ออาหารกลางวันของนักเรียน อย่างน้อย 3 วัน/สัปดาห์				
<u>ปัจจุบัน</u> โรงเรียนมีการ**<u>ขาย</u>**ขนมหรือเครื่องดื่มอะไรบ้าง	ไม่มี (0)	มีบ้าง ไม่มีบ้าง (1)	มีเป็นประจำ ต่อเนื่องกัน ไม่ถึง 2 ปี (2)	มีเป็นประจำ ต่อเนื่องกัน ตั้งแต่ 2 ปีขึ้นไป (3)
21. ผลไม้สด				
22. กลุ่มขนมปัง (แซนวิช ซาลาเปา ขนมจีบ)				
23. กลุ่มเนื้อสัตว์ (หมูปิ้ง ไส้กรอก ลูกชิ้น)				
24. น้ำเปล่า				
25. น้ำหวาน/น้ำผลไม้เติมน้ำตาล				
26. น้ำอัดลม				
27. นมปรุงแต่งรส/นมเปรี้ยว				
28. ลูกอม/ท๊อฟฟี่				

APPENDIX D

ORAL EXAMINATION RECORD FORM

Date……..…/……../……... Examiner □

DENTAL STATUS Duplication □

Crown	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**21**	**22**	**23**	**24**	**25**	**26**	**27**

	47	**46**	**45**	**44**	**43**	**42**	**41**	**31**	**32**	**33**	**34**	**35**	**36**	**37**
Crown														

Permanent teeth	**Status**	**Permanent teeth**	**Status**
0	Sound	5	Missing, any other reason
11	Decayed	6	Fissure sealant
15	Distinct cavity with visible dentin	7	Bridge abutment, special crown or veneer
16	Extensive distinct cavity with visible pulp	8	Unerupted tooth
		T	Trauma (fracture)
21,25,26	Filled with decay	9	Not recorded
3	Filled no decay		
4	Missing as a result of caries		

Debris Index

16 B	**11 La**	**26 B**
46 Li	**31 La**	**36 Li**

0 = No debris or stain
1 = Soft debris or stains < 1/3
2 = Soft debris 1/3 - 2/3
3 = Soft debris > 2/3

Calculus Index

16 B	**11 La**	**26 B**
46 Li	**31 La**	**36 Li**

0 = No calculus
1 = Supragingival calculus < 1/3
2 = Supragingival calculus 1/ 3 - 2/3 or individual flecks of subgingival calculus around cervical
3 = Supragingival calculus > 2/3 or continuous heavy band of subgingival calculus around cervical

Immediate treatment need □ (0 = no, 1 = yes)

APPENDIX E

CHILD-ORAL IMPACTS ON DAILY PERFORMANCES (CHILD-OIDP)

RECORD FORM

ชื่อ-นามสกุล.....โรงเรียน.....

ใน 3 เดือน ที่ผ่านมา ตั้งแต่เดือน..... หรือตั้งแต่ช่วง ..... จนถึงวันนี้

นักเรียนรู้สึกว่ามีปัญหาใดของปากและฟันเกิดขึ้นบ้าง กาเครื่องหมาย □ ทั้งที่เคยเป็นแต่หายแล้ว และที่เป็นอยู่

1□ ปวดฟัน เสียวฟัน 2□ ฟันผุ ฟันเป็นรู 3□ ฟันแท้หัก บิ่นจากการกระแทก หกล้ม

4□ มีช่องว่างจากการไม่มีฟันแท้ (เช่น ถูกถอน, ไม่มีตามธรรมชาติ) 5□ ฟันสีเหลือง หรือดำ ผิดปรกติ

6□ ฟันขี่เล็กหรือใหญ่เกินไป 7□ ฟันเรียงไม่ดี ฟันซ้อนเก ยื่น เหยิน 8□ เหงือกอักเสบ เจ็บบวม มีเลือดออก

9□ หินปูน 10□ กลิ่นปาก 11□ แผลร้อนใน 12□ แผลในปาก ริมฝีปาก ปากแห้งแตก

13□ มีช่องว่างจากฟันแท้ยังไม่ขึ้น 14□ ฟันน้ำนมโยก หลุด 15□ ฟันกรามแท้ขี่ในขึ้น

16□ วัสดุอุดฟันแตก ปวดหลังอุดฟัน 17□ เครื่องมือจัดฟัน 18□ ข้อต่อขากรรไกรผิดปกติ มีเสียงดัง

19□ อื่นๆ ระบุ..... □20 ไม่มีความผิดปกติ หรือปัญหาใดๆเลย

ปัญหาที่บอกมาข้างบน ทำให้เกิดปัญหาตามข้อข้างล่างนี้ แต่ละข้อหรือไม่

Performance	Frequency (ความถี่)	Severity (ความรุนแรง)	Perceived causes	
			1	2
1. การกินอาหาร เช่น ข้าว ไอติม น้ำหวาน น้ำเย็น กัดขนม				
2. การพูดได้ตามปกติ ชัดเจน				
3. การทำความสะอาดช่องปาก เช่น บ้วนปาก แปรงฟัน				
4. การพักผ่อน นอนหลับ				
5. การรักษาอารมณ์ตามปกติ โดยไม่รู้สึกหงุดหงิด รำคาญใจ				
6. การยิ้ม หัวเราะ หรือให้คนอื่นเห็นฟันโดยไม่รู้สึกอาย				
7. การศึกษา เช่น เรียนหนังสือ ทำการบ้าน ขาดโรงเรียน (ที่เกิดจากปัญหาข้างต้น เช่น ขาดเรียนเพราะไปทำฟัน)				
* ใน 3 เดือน มีปัญหาด้านการศึกษาจากช่องปาก รวมกี่วัน*	.....**วัน**			
8. การออกไปพบผู้คน (เช่น ไปเที่ยวกับเพื่อน ไปบ้านเพื่อน)				

รู้สึกว่าปัญหาในช่องปากของตนเองโดยรวม มีมากน้อย รุนแรงแค่ไหน (0 - 3)

APPENDIX F

CONSENT FORM

เอกสารยินยอมเข้าร่วมการวิจัย

การวิจัยเรื่อง ความสัมพันธ์ของคุณภาพชีวิตในมิติสุขภาพช่องปากและผลการเรียน กับสถานะทางเศรษฐกิจและสังคม ทุนทางสังคม และปัจจัยทางสิ่งแวดล้อมของโรงเรียน: การศึกษาในเด็กนักเรียนชั้นประถมศึกษาปีที่ 6 ในจังหวัดสระแก้ว

ข้าพเจ้า (นาย, นาง, นางสาว, เด็กชาย, เด็กหญิง).....

อยู่บ้านเลขที่.....ถนน.....ตำบล/แขวง.....

อำเภอ/เขต.....จังหวัด.....รหัสไปรษณีย์.....

ก่อนที่จะลงนามในใบยินยอมให้ทำการวิจัยนี้

1. ข้าพเจ้าได้รับทราบรายละเอียดข้อมูลคำอธิบายสำหรับอาสาสมัครที่เข้าร่วมในการวิจัย รวมทั้งได้รับการอธิบายจากผู้วิจัยถึงวัตถุประสงค์ของการวิจัย วิธีการทำวิจัย อันตรายหรืออาการที่อาจเกิดขึ้นจากการทำวิจัยหรือจากยาที่ใช้ รวมทั้งประโยชน์ที่จะเกิดขึ้นจากการวิจัยอย่างละเอียดและมีความเข้าใจดีแล้ว
2. ผู้วิจัยรับรองว่าจะตอบคำถามต่างๆ ที่ข้าพเจ้าสงสัยด้วยความเต็มใจไม่ปิดบังซ่อนเร้นจนข้าพเจ้าพอใจ
3. ผู้วิจัยรับรองว่าจะเก็บข้อมูลเฉพาะเกี่ยวกับตัวข้าพเจ้าเป็นความลับและจะเปิดเผยได้เฉพาะในรูปที่เป็นสรุปผลการวิจัย การเปิดเผยข้อมูลเกี่ยวกับตัวข้าพเจ้าต่อหน่วยงานต่างๆ ที่เกี่ยวข้องกระทำได้เฉพาะกรณีจำเป็นด้วยเหตุผลทางวิชาการเท่านั้น และผู้วิจัยรับรองว่าหากเกิดอันตรายใดๆ จากการวิจัยดังกล่าว ข้าพเจ้าจะได้รับการรักษาพยาบาลโดยไม่คิดมูลค่า
4. ข้าพเจ้ามีสิทธิที่จะบอกเลิกการเข้าร่วมในโครงการวิจัยนี้เมื่อใดก็ได้และการบอกเลิกการเข้าร่วมการวิจัยนี้จะไม่มีผลต่อการรักษาโรคที่ข้าพเจ้าจะพึงได้รับต่อไป

ข้าพเจ้าจึงสมัครใจเข้าร่วมโครงการวิจัยนี้ตามที่ระบุในเอกสารข้อมูลคำอธิบายสำหรับอาสาสมัครและได้ลง นามในใบยินยอมนี้ด้วยความเต็มใจ และได้รับสำเนาเอกสารใบยินยอมที่ข้าพเจ้าลงนามและลงวันที่ และเอกสารยกเลิกการเข้าร่วมวิจัย อย่างละ 1 ฉบับ เป็นที่เรียบร้อยแล้ว

ลงนาม..... ผู้ยินยอม

(.....)

วันที่.....เดือน.....พ.ศ.....

ลงนาม..... พยาน

(.....)

วันที่.....เดือน.....พ.ศ.....

ลงนาม..... ผู้วิจัยหลัก

(.....)

วันที่.....เดือน.....พ.ศ.....

ข้าพเจ้าไม่สามารถอ่านหนังสือได้ แต่ผู้วิจัยได้อ่านข้อความในใบยินยอมนี้ให้แก่ข้าพเจ้าฟังจนเข้าใจดีแล้ว ข้าพเจ้าจึงลงนาม หรือประทับลายนิ้วหัวแม่มือขวาของข้าพเจ้าในใบยินยอมนี้ด้วยความเต็มใจ

ลงนาม.....ผู้ยินยอม

(.....)

วันที่.....เดือน.....พ.ศ.....

ลงนาม.....พยาน

(.....)

วันที่.....เดือน.....พ.ศ.....

ลงนาม.....ผู้วิจัยหลัก

(.....)

วันที่.....เดือน.....พ.ศ.....

ในกรณีที่ผู้ถูกทดลองยังไม่บรรลุนิติภาวะ จะต้องได้รับการยินยอมจากผู้ปกครองหรือผู้อุปการะโดยชอบด้วยกฎหมาย

ลงนาม..... ผู้ปกครอง

(.....)

วันที่.....เดือน.....พ.ศ.....

ลงนาม..... พยาน

(.....)

วันที่.....เดือน.....พ.ศ.....

ลงนาม..... ผู้วิจัยหลัก

(.....)

วันที่.....เดือน.....พ.ศ.....

APPENDIX G

PARTICIPANT INFORMATION SHEET

เอกสารข้อมูลคำอธิบายสำหรับอาสาสมัครที่เข้าร่วมในการวิจัย

1. การวิจัยเรื่อง ความสัมพันธ์ของคุณภาพชีวิตในมิติสุขภาพช่องปากและผลการเรียน กับสถานะทางเศรษฐกิจและสังคม ทุนทางสังคม และปัจจัยทางสิ่งแวดล้อมของโรงเรียน: การศึกษาในเด็กนักเรียนชั้นประถมศึกษาปีที่ 6 ในจังหวัดสระแก้ว

2. ชื่อผู้วิจัยหลัก นายอิสระพงศ์ แก้วกำเหนิดพงษ์

สถาบันที่สังกัด ภาควิชาทันตกรรมชุมชน คณะทันตแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

3. วัตถุประสงค์ของโครงการ ศึกษาความสัมพันธ์ของสถานะทางเศรษฐกิจและสังคม ทุนทางสังคม และปัจจัยทางสิ่งแวดล้อมในโรงเรียนกับคุณภาพชีวิตในมิติของสุขภาพช่องปากและผลการเรียนของเด็กนักเรียน

4. สถานที่ดำเนินการวิจัย จังหวัดสระแก้ว

5. วิธีการที่เกี่ยวข้องกับการวิจัย โดยสรุป สั้นๆ กระชับ ได้ใจความ และใช้ภาษาที่เข้าใจง่าย ควรหลีกเลี่ยงศัพท์ทางวิชาการ (ขอให้ระบุว่า การรักษาที่ให้ในการวิจัยและโอกาสโดยการสุ่มที่อาสาสมัครมีโอกาสได้รับการรักษาชนิดใด รวมทั้งกรรมวิธีที่อาจก่อให้เกิดอันตราย และส่วนที่เกี่ยวข้องกับการวิจัยซึ่งถือเป็นการทดลอง)

อาสาสมัครซึ่งเป็นนักเรียนชั้นป.6 ที่กำลังศึกษาอยู่ในโรงเรียนตัวอย่างที่ได้จากการสุ่มแบบแบ่งชั้นตามสัดส่วนจำนวนนักเรียนชั้นป.6 ในแต่ละโรงเรียน โดยอาสาสมัครจะได้รับการตรวจช่องปากโดยทันตแพทย์ด้วยอุปกรณ์ที่ปราศจากเชื้อ ซึ่งไม่ก่อให้เกิดความเสี่ยงใดๆแก่อาสาสมัคร รวมถึงได้รับรู้สภาพช่องปากของตน ได้รู้วิธีการแปรงฟันที่ถูกวิธี และการสัมภาษณ์ตามแบบสอบถาม โดยจะมีแบบสอบถามส่วนของผู้ปกครอง ซึ่งนักเรียนเป็นผู้นำไปให้ผู้ปกครองตอบแบบสอบถาม และนำกลับไปรวบรวมโดยครูประจำชั้น และครูผู้รับผิดชอบในแต่ละโรงเรียนจะเป็นผู้ตอบแบบสัมภาษณ์และร่วมให้ข้อมูลแก่ผู้สำรวจในการบันทึกข้อมูลแบบสังเกต ในโรงเรียน ในส่วนของผลการเรียน ครูผู้รับผิดชอบของแต่ละโรงเรียนจะเป็นผู้รวบรวมข้อมูลผลการเรียนของอาสาสมัคร

6. เหตุผลที่เชิญเข้าร่วมเป็นอาสาสมัครในโครงการ

ท่านได้รับเชิญให้เข้าร่วมเป็นอาสาสมัครในโครงการวิจัยนี้ เนื่องจากท่านมีบุตรหลานที่กำลังศึกษาอยู่ในชั้นประถมศึกษาปีที่ 6 ซึ่งเป็นกลุ่มที่ผู้วิจัยต้องการศึกษา

7. ความรับผิดชอบของอาสาสมัคร และ ระยะเวลาที่อาสาสมัครจะอยู่ในโครงการ

ขอให้ท่านปฏิบัติตามที่ผู้วิจัยแนะนำและอาสาสมัครจะอยู่ในการศึกษาเป็นเวลาไม่เกิน 7 วัน

8. ประโยชน์ของการวิจัยที่อาสาสมัครและ/หรือผู้อื่นที่อาจได้รับ

อาสาสมัครทุกท่านที่เข้าร่วมโครงการ จะได้รับการตรวจช่องปากโดยทันตแพทย์ ได้รับรู้สภาพช่องปากของตน และได้รับคำแนะนำและฝึกการแปรงฟันร่วมกับการใช้ยาสีฟันผสมฟลูออไรด์

9. ความเสี่ยงหรือความไม่สะดวกที่อาจจะเกิดขึ้นแก่อาสาสมัคร และในบางกรณีแก่ทารกในครรภ์ หรือทารกที่ดื่มนมมารดา

การตรวจฟันโดยทันตแพทย์ด้วยอุปกรณ์ที่ปราศจากเชื้อ และการสัมภาษณ์ตามแบบสอบถามไม่ก่อให้เกิดความเสี่ยงใดๆแก่อาสาสมัคร

10. ค่าใช้จ่ายที่อาสาสมัครจะต้องจ่าย หรืออาจจะต้องจ่าย

อาสาสมัครไม่ต้องจ่ายค่าใช้จ่ายใดๆ

11. การชดเชยใดๆ และการรักษาที่จะจัดให้แก่อาสาสมัครในกรณีที่ได้รับอันตรายซึ่งเกี่ยวข้องกับการวิจัย

หากท่านได้รับอันตรายจากการทำวิจัย ผู้วิจัยจะดำเนินการให้ท่านได้รับการรักษาโดยผู้วิจัยจะเป็นผู้รับผิดชอบค่าใช้จ่ายของการรักษา

12. การจ่ายค่าเดินทาง ค่าเสียเวลา แก่อาสาสมัครที่เข้าร่วมในการวิจัย

อาสาสมัครจะได้รับอุปกรณ์ดูแลสุขภาพช่องปากตนเอง คนละ 1 ชุด แต่ไม่มีค่าตอบแทนเป็นเงินใดๆให้

13. เหตุการณ์ที่อาจจะเกิดขึ้น หรือเหตุผลซึ่งผู้วิจัยจะต้องยกเลิกการเข้าร่วมในโครงการวิจัยของอาสาสมัคร

อาสาสมัครย้ายถิ่นฐานกะทันหันระหว่างดำเนินการเก็บข้อมูล หรืออาสาสมัครไม่สามารถให้ข้อมูลได้

14. มีการเก็บชิ้นตัวอย่างที่ได้มาจากอาสาสมัครเอาไว้ใช้ในโครงการวิจัยในอนาคตหรือไม่ เก็บจำนวนเท่าไหร่ อย่างไร และที่ไหน

ไม่มี

15. การกำกับดูแลและควบคุมการดำเนินโครงการ

ผู้กำกับดูแลการวิจัย ผู้ตรวจสอบ คณะกรรมการพิจารณาจริยธรรม และคณะกรรมการที่เกี่ยวข้องสามารถเข้าไปตรวจสอบการดำเนินโครงการ รวมทั้ง ตรวจสอบบันทึกข้อมูลของอาสาสมัคร เพื่อเป็นการยืนยันถึงขั้นตอนในการวิจัยทางคลินิกและข้อมูลอื่นๆ โดยไม่ล่วงละเมิดเอกสิทธิ์ในการปิดบังข้อมูลของอาสาสมัครตามกรอบที่กฎหมายและกฎระเบียบได้อนุญาตไว้ นอกจากนี้ โดยการลงนามให้ความยินยอม อาสาสมัครหรือผู้แทนตามกฎหมายจะมีสิทธิตรวจสอบและมีสิทธิที่จะได้รับข้อมูลด้วยเช่นกัน

16. จริยธรรมการวิจัย

การดำเนินการโครงการวิจัยนี้ ผู้วิจัยคำนึงถึงหลักจริยธรรมการวิจัย ดังนี้

1. หลักความเคารพในบุคคล (Respect for person) โดยการให้ข้อมูลจนอาสาสมัครเข้าใจเป็นอย่างดีและตัดสินใจอย่างอิสระในการให้ความยินยอมเข้าร่วมในการวิจัย รวมทั้งการเก็บรักษาความลับของอาสาสมัคร

2. หลักการให้ประโยชน์ไม่ก่อให้เกิดอันตราย (Beneficence/Non-Maleficence) ซึ่งได้ระบุในข้อ 8 และ 9 ว่าจะมีประโยชน์หรือความเสี่ยงกับอาสาสมัครหรือไม่

3. หลักความยุติธรรม (Justice) คือมีเกณฑ์คัดเข้าและคัดออกชัดเจน มีการกระจายความเสี่ยงและผลประโยชน์อย่างเท่าเทียมกัน โดยวิธีสุ่มเข้ากลุ่มศึกษา

17. ข้อมูลที่อาจนำไปสู่การเปิดเผยตัวของอาสาสมัครจะได้รับการปกปิด ยกเว้นว่าได้รับคำยินยอมไว้โดยกฎระเบียบและกฎหมายที่เกี่ยวข้องเท่านั้น จึงจะเปิดเผยข้อมูลแก่สาธารณชนได้ ในกรณีที่ผลการวิจัยได้รับการตีพิมพ์ ชื่อและที่อยู่ของอาสาสมัครจะต้องได้รับการปกปิดอยู่เสมอ และอาสาสมัครหรือผู้แทนตามกฎหมายจะได้รับแจ้งโดยทันท่วงที ในกรณีที่มีข้อมูลใหม่ซึ่งอาจใช้ประกอบการตัดสินใจของอาสาสมัครว่าจะยังคงเข้าร่วมในโครงการวิจัยต่อไปได้หรือไม่

18. หากท่านมีข้อสงสัยต้องการสอบถามเกี่ยวกับสิทธิของท่านหรือผู้วิจัยไม่ปฏิบัติตามที่เขียนไว้ในเอกสารข้อมูลคำอธิบายสำหรับผู้เข้าร่วมในการวิจัย ท่านสามารถติดต่อหรือร้องเรียนได้ที่ ฝ่ายวิจัย คณะทันตแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย ตึกสมเด็จย่า 93 ชั้น 10 หรือที่หมายเลขโทรศัพท์ 02-218-8816 ในเวลาทำการ

19. หากท่านต้องการยกเลิกการเข้าร่วมเป็นอาสาสมัครในโครงการนี้ ให้ท่านกรอกและส่งเอกสารขอยกเลิกมาที่

ทพ.อิสระพงศ์ แก้วกำเหนิดพงษ์

ที่อยู่ปัจจุบัน 21/78 ซอยเอกชัย 35 ถ.เอกชัย แขวงบางขุนเทียน เขตจอมทอง จ.กรุงเทพฯ 10150

โทรศัพท์ 0-24159844 โทรศัพท์มือถือ 0-814019834

20. อาสาสมัครสามารถติดต่อผู้วิจัยได้ตลอด 24 ชั่วโมง ที่:

ทพ.อิสระพงศ์ แก้วกำเหนิดพงษ์ โทรศัพท์ 0-24159844 โทรศัพท์มือถือ 0-814019834

รศ.ทพญ.ดร.สุดาดวง กฤษฎาพงษ์ โทรศัพท์มือถือ 0-817142132

สถานที่ทำงาน ภาควิชาทันตกรรมชุมชน คณะทันตแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย ถ.อังรีดูนังต์ เขตปทุมวัน แขวงวังใหม่ กรุงเทพฯ 10330

.....

(ทันตแพทย์อิสระพงศ์ แก้วกำเหนิดพงษ์)

ผู้วิจัยหลัก

วันที่...../...../.....

APPENDIX H
ETHICAL APPROVAL FORM

No. 030/2014

Study Protocol and Consent Form Approval

The Human Research Ethics Committee of the Faculty of Dentistry, Chulalongkorn University, Bangkok, Thailand has approved the following study to be carried out according to the protocol and patient/participant information sheet dated and/or amended as follows in compliance with the **ICH/GCP.**

Study Title	: ORAL HEALTH-RELATED QUALITY OF LIFE (OHRQOL) AND SCHOOL PERFORMANCE ASSOCIATED WITH SOCIOECONOMIC STATUS, SOCIAL CAPITAL AND SCHOOL ENVIRONMENTAL FACTORS: A STUDY IN GRADE 6 PRIMARY SCHOOLCHILDREN IN SAKAEO PROVINCE
Study Code	: HREC-DCU **2014-033**
Study Center	: Chulalongkorn University
Principle Investigator	: Dr. Issarapong Kaewkamnerdpong
Protocol Date	: April 11, 2014
Date of Approval	: May 6, 2014
Date of Expiration	: May 5, 2016

V. Lertchirakarn
.....
(Associate Professor Dr. Veera Lertchirakarn)
Chairman of Ethics Committee

K. Bhalang
.....
(Assistant Professor Dr. Kanokporn Bhalang)
Associate Dean for Research

*A list of the Ethics Committee members (names and positions) present at the Ethics Committee meeting on the date of approval of this study has been attached (upon requested). This Study Protocol Approval Form will be forwarded to the Principal Investigator.

Approval is granted subject to the following conditions: (see back of the approval)

VITA

Mr. Issarapong Kaewkamnerdpong was born on the fifth of January 1980. He was born in Bangkok, Thailand. He graduated the degree of Doctor Dental Surgery (D.D.S) from the Faculty of Dentistry, Chulalongkorn University. After graduation, he worked as head of dental public health office at the Sakaeo Provincial Public Health Office, Sakaeo province (2004-2010). In 2008, he started the post-graduate study for the Master of Public Health at the Faculty of Public Health, Mahidol University (2008-2009). In 2010, he worked as lecturer at the Department of Community Dentistry, Faculty of Dentistry, Chulalongkorn University. And he continued his education for the Degree of Doctor of Philosophy in Dental Public Health at the Faculty of Dentistry, Chulalongkorn University in 2011.