ORAL HEALTH PROBLEMS AND COST ANALYSIS OF DENTAL PROGRAM AMONG PRIMARY SCHOOL CHILDREN IN BANGKOK SERVED BY MAHIDOL UNIVERSITY FACULTY OF DENTISTRY THAILAND

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บทคัดย่อและแฟ้มข้อมูลฉบับเต็มของวิทยานิพนธ์ตั้งแต่ปีการศึกษา 2554 ที่ให้บริการในคลังปัญญาจุฬาฯ (CUIR)
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ปัญหาทันตสุขภาพและการวิเคราะห์ต้นทุนโครงการส่งเสริมสุขภาพช่องปากในโรงเรียนประถมศึกษา กรุงเทพมหานคร โดยคณะทันตแพทย์ศาสตร์ มหาวิทยาลัยมหิดล ประเทศไทย

นางสาวณิชา ลักษมีจรัลกุล

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ณิชา ลักษมีจรัลกุล : ปัญหาทันตสุขภาพและการวิเคราะห์ต้นทุนโครงการส่งเสริมสุขภาพช่องปากในโรงเรียนประถมศึกษา กรุงเทพมหานคร โดยคณะทันตแพทย์ศาสตร์ มหาวิทยาลัยมหิดล ประเทศไทย (ORAL HEALTH PROBLEMS AND COST ANALYSIS OF DENTAL PROGRAM AMONG PRIMARY SCHOOL CHILDREN IN BANGKOK SERVED BY MAHIDOL UNIVERSITY FACULTY OF DENTISTRY THAILAND) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: นพ. อเลซซิโอ พันซ่า, 113 หน้า.

โรคฟันผุและเหงือกอักเสบเป็นโรคที่พบบ่อยในกลุ่มเด็กปฐมศึกษา การศึกษาย้อนหลังนี้เพื่อวิเคราะห์ปัญหาสุขภาพช่องปากและปัจจัยเสี่ยงของกลุ่มเด็กอายุ 6-14 ปี ในโรงเรียนประถมศึกษาสังกัด กรุงเทพมหานคร โดยใช้ข้อมูลจากบันทึกการตรวจสุขภาพช่องปากของเด็กนักเรียนจำนวน 509 คน ดัชนีฟันผุในฟันน้ำนมของเด็กชั้น ป.1 อยู่ในเกณฑ์ระดับสูงร้อยละ 82.6 ในขณะที่ดัชนีฟันผุในฟันแท้ของเด็ก ป.2 ถึง ป.4 ที่อยู่ในเกณฑ์ระดับสูงมีเพียงร้อยละ 2.5 นอกจากนี้ ปัญหาเหงือกอักเสบยังพบมากถึงร้อยละ 76.8 การวิเคราะห์ตัวแปรถดถอยพบปัจจัยที่มีความสัมพันธ์อย่างมีนัยสำคัญทางสถิติกับฟันผุในฟันน้ำนมคือสุขอนามัยช่องปากที่ไม่ดี (Adj OR=12.04, 95% of CI = 1.11-131.28) เพศ ระดับชั้นการศึกษา และโรคประจำตัว มีความสัมพันธ์กับฟันผุในฟันแท้ (Adj OR=2.32, 95% of CI =1.25-4.32, Adj OR=2.05, 95% of CI =1.04-4.06 และ Adj OR= 4.09, 95% of CI =2.01-8.32) ส่วนโรคเหงือกอักเสบพบปัจจัยที่เกี่ยวข้องคือโรงเรียนและสุขอนามัยช่องปาก (Adj OR= 3.5, 95% of CI =1.71-7.37 และ Adj OR=19.09, 95% of CI =5.12-71.24) ควรมีการตรวจคัดกรองและจัดโครงการทันตกรรมป้องกันเพื่อส่งเสริมสุขภาพช่องปากในเด็กกลุ่มนี้ การวิเคราะห์ต้นทุนโครงการทันตกรรมป้องกันในโรงเรียนประถมของคณะทันตแพทยศาสตร์ มหาวิทยาลัยมหิดลประจำปีการศึกษา 2558 คิดเป็นจำนวนเงิน 1,373,754.39 บาท ประกอบด้วย ต้นทุนค่าแรงร้อยละ 20.85 ต้นทุนวัสดุร้อยละ 8.45 ต้นทุนค่าเสื่อมอุปกรณ์ครุภัณฑ์ร้อยละ 42.73 ต้นทุนค่าใช้จ่ายอื่นๆร้อยละ 27.79 ค่าใช้จ่ายรายหัวต่อจำนวนเด็กประถมที่เข้ารับการบริการ คิดเป็นจำนวนเงิน 2,348.30 บาท ค่าใช้จ่ายในเรื่องเงินเดือนสำหรับอาจารย์ทันตแพทย์ ค่าวัสดุ และ อุปกรณ์ในการเคลือบหลุมร่องฟันและอุดฟัน คิดเป็นสัดส่วนที่มากที่สุดในต้นทุนค่าแรง ต้นทุนวัสดุ และต้นทุนค่าเสื่อมอุปกรณ์ครุภัณฑ์

สาขาวิชา สาธารณสุขศาสตร์ ลายมือชื่อนิสิต .....

ปีการศึกษา 2558 ลายมือชื่อ อ.ที่ปรึกษาหลัก .....

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KEYWORDS: ORAL HEALTH PROBLEMS / DENTAL CARIES / GINGIVITIS / RISK FACTORS / SCHOOLCHILDREN / COST ANALYSIS

NICHA LUKSAMIJARULKUL: ORAL HEALTH PROBLEMS AND COST ANALYSIS OF DENTAL PROGRAM AMONG PRIMARY SCHOOL CHILDREN IN BANGKOK SERVED BY MAHIDOL UNIVERSITY FACULTY OF DENTISTRY THAILAND. ADVISOR: ALESSIO PANZA, M.D., 113 pp.

Dental caries and gingivitis are common oral diseases in schoolchildren. This retrospective analysis was done to assess oral health problems and risk factors of children aged 6-14 years in selected primary school in Bangkok. Data of 509 schoolchildren were analyzed. The dmft index for grade 1 children demonstrated that prevalence of caries in primary teeth of grade 1 children was 82.6%. On the contrary, children in grade 2-6, high level of caries in permanent teeth was only 2.5%. Besides, gingivitis affected main group of children (76.8%). After logistic regression analysis found only poor oral hygiene significantly associated with dmft level (Adj OR=12.04, 95% of CI = 1.11-131.28). Gender, educational level and underlying diseases were significantly associated with DMFT level (Adj OR=2.32, 95% of CI =1.25-4.32, Adj OR=2.05, 95% of CI =1.04-4.06, and Adj OR= 4.09, 95% of CI =2.01-8.32, respectively). For gingivitis, school and oral hygiene were significantly associated factors (Adj OR= 3.5, 95% of CI =1.71-7.37, and Adj OR=19.09, 95% of CI =5.12-71.24) It indicated that early detection and prevention program should be provided for this group of children. The estimated costs of school oral health program, Faculty of Dentistry, Mahidol University in academic year 2015 was 1,373,754.39 baht comprised of labor cost (20.85%), material cost (8.45%), capitation cost (42.73%) and miscellaneous (27.97%). Capitation of this program equal to 2,348.30 baht per child. Salaries of supervisor, costs of equipment and material for sealant, PRR and filling were a majority part of labor costs, capital costs and material costs, respectively. Particularly, in capital cost and material costs were accountable for more than half of total costs.

Field of Study: Public Health Student's Signature .....

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LIST OF ABBREVIATIONS

dmft(s)	decay missing filling tooth(surface) in deciduous dentition
DMFT(S)	Decay Missing Filling Tooth (Surface) in permanent dentition
OHI-S	Simplified Oral Hygiene Index
DI-S	Simplified Debris Index
CI-S	Simplified Calculus Index
CDC	The Centers for Disease Control and Prevention
ADA	American Dental Association
WHO.	World Health Organization
PRR	Preventive Resin Restoration
MoPH	Ministry of Public Health
CAPP	Country/Area Profile Program
CPI	Community Periodontal Index
BMA	Bangkok metropolitan administration
MOE	Thai Ministry of Education
OHI	Oral Hygiene Instruction

CHAPTER I

INTRODUCTION

1.1 Background & rationale

Epidemiological data from several countries indicates that prevalence of dental caries is sharply increasing(1), particularly among school children. Although oral health of children has been improving in the present day, tooth caries still remains a public health problem, even though it is preventable. A large number of children in many low income countries are affected by dental caries(2), and most are left untreated by reason of limited access to oral health services.(3) In Thailand, dental caries in children have continuously increased during the past two decades. The seventh National Oral Health Survey in 2012 found that 78.5% of 5-6 years old children and 52.3% of 12 years old children were affected by dental caries.(4) Moreover, the prevalence of gingivitis in children is very high, the majority of children are affected.

Oral health problems can affect many aspect of child's life, untreated caries can lead to pain, irreversible damage, more serious general health problems, lost school time, low self-esteem and poor quality of life. The delay in treatment not only results in aggravation of disease, but also costs of care are considerably increased as a consequence.

School is an important setting for oral health promotion in Thailand. It can provide a supportive environment, for example, providing place and sanitation facilities for tooth promotion activities. More importantly, schools may be a place where oral health services are provided for high risk children, who had limited access to dental

care. This is a common situation in many low income countries, compounded by a lack of dental personnel.(5)

Interventions for preventing dental caries including fluoride varnishes and sealants have been known as effective ways to reduce the risk of these lesions.(6) There are two common and widely available options that can be administered. Oral health education is a traditionally one of preventive dentistry that involves considerable investments of time, energy, personnel and money. However, there has been a burden of justified criticism, due to lack of evidence based effectiveness.(7)

Cost analysis of school oral health program was related to improving oral health status is a simply economic evaluation technique that involves systematic data collection, categorization and analysis of program costs and costs of illness. It can be used as a stand-alone technique and not necessary to combine with effectiveness assessment technique, Cost analysis, itself, can be used to compare alternative techniques. This is one of the good tools to evaluate allocation of health resources.(8) However, there are few studies about cost analysis of school prevention program and none of them was done in academic setting. This research project determines the oral health problems in schoolchildren and the cost of school oral health program under the academic setting (Mahidol University) and help to anticipate the favorable decision in future.

1.2 Research Questions

- What are the oral health problems among primary school children in this selected schools in Bangkok?
- What is the severity of oral health problems, among these school children?

- What are factors associated with oral health problems among this selected schools' children in Bangkok?
- What are the estimated costs of school oral program under academic setting?

Null Hypothesis:

There is no associated factors with oral health problems among primary school children in Bangkok.

Alternative Hypothesis:

There are some factors associated with oral health problems among primary school children in Bangkok.

1.3 Study Objectives

General Objective:

- To assess oral health problems and to estimate the costs of oral health program from secondary data of school oral health program at Faculty of Dentistry, Mahidol University.

Specific Objectives:

- To identify the oral health problems including caries status and gingivitis among primary school children in selected schools in Bangkok.
- To find prevalence and severity of oral health problems in these selected school children.
- To identify factors associated with oral health problems in this target group (selected school children).

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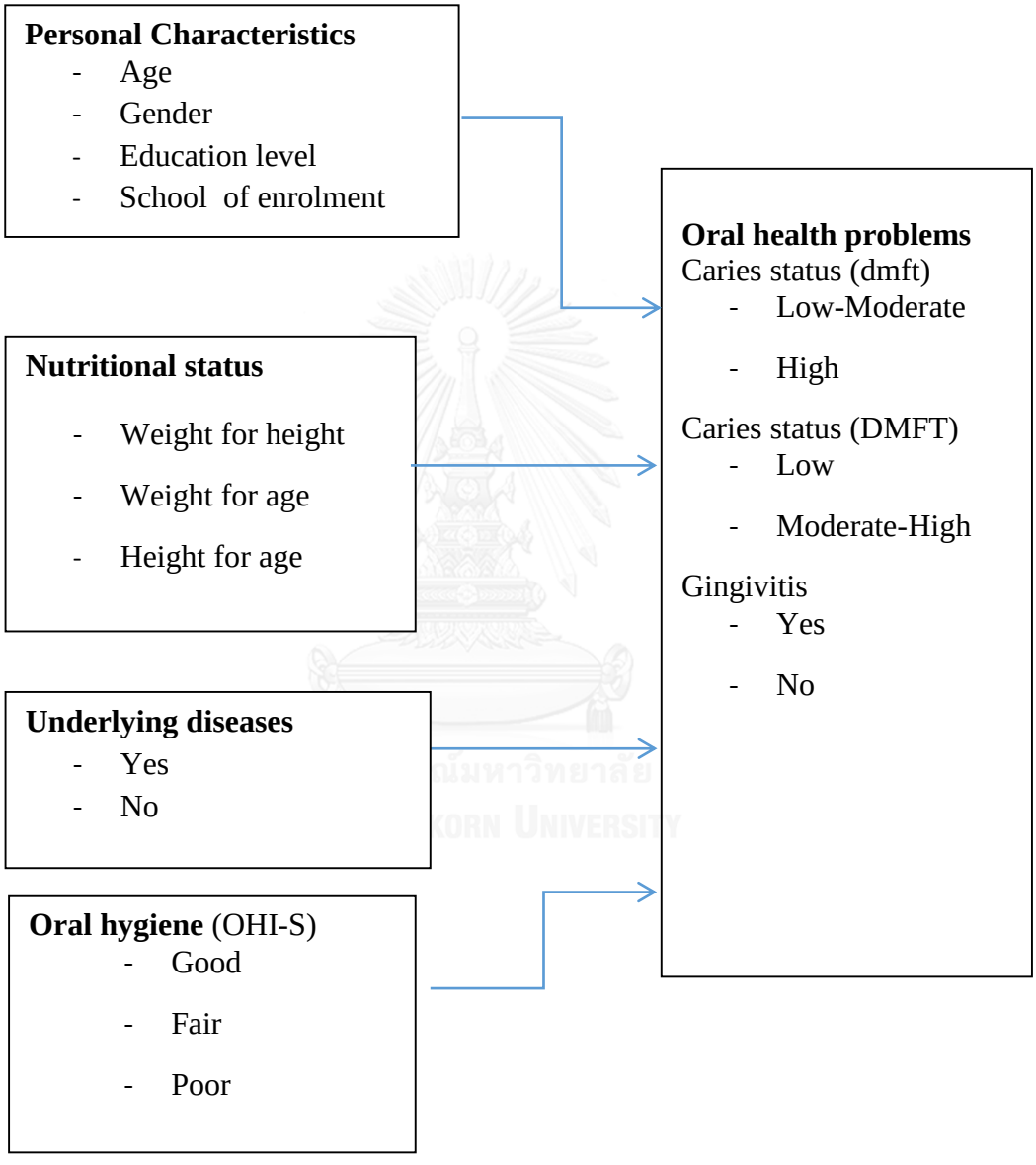
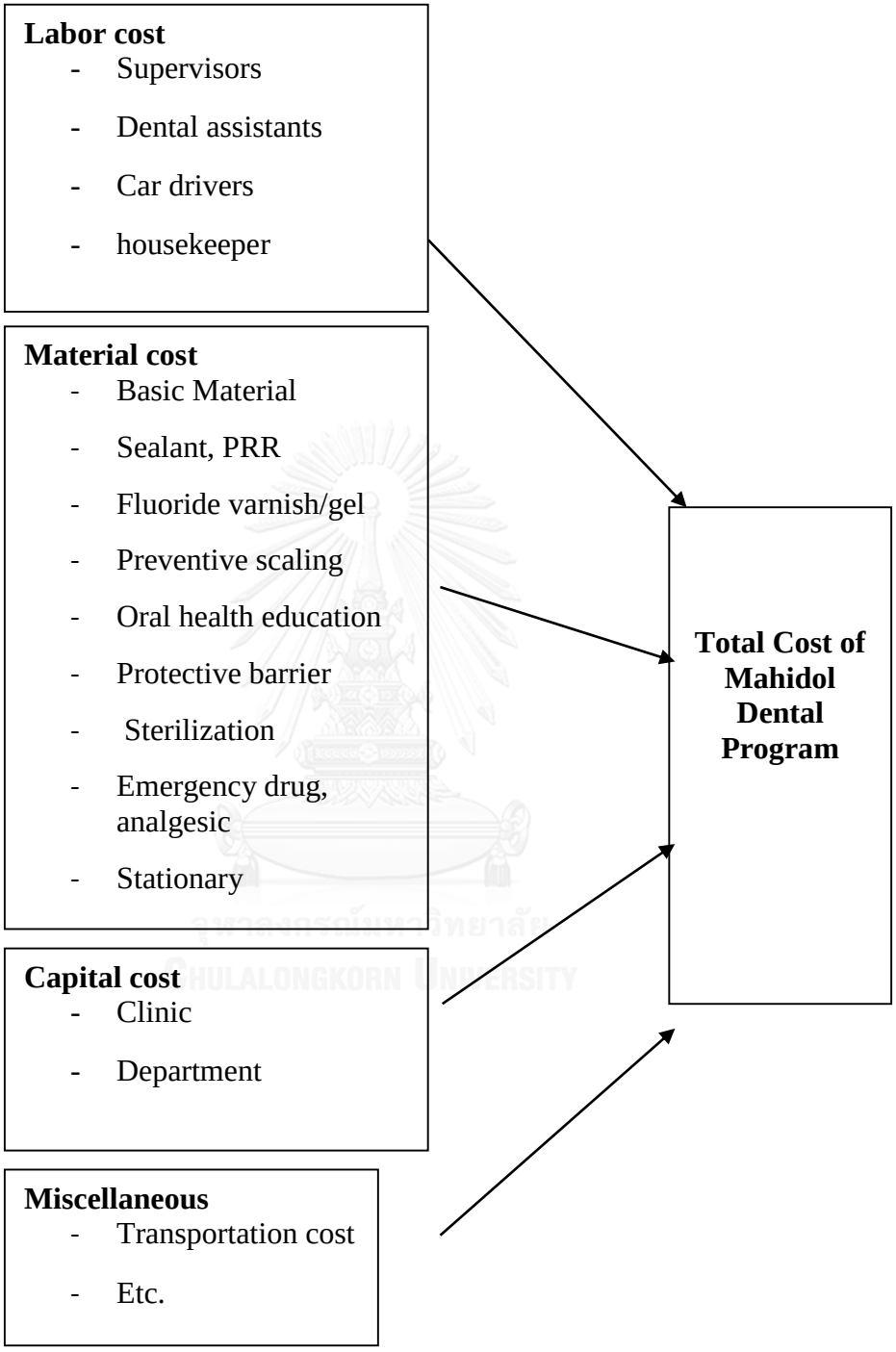
- To estimate costs of school oral program done by academic setting.

1.4 Conceptual Framework



Cost analysis



1.5 Operational Definition

Age: completed year of age in last birthday as obtained from the school data base.

Education level: school grade of children (1-6 for primary school) divided according to the Thai Ministry Of Education into early primary school (grade 1-4) and late primary school (grade 5-6).

School of enrolment: all 4 selected school in Bangkok that use in the Mahidol oral health program including Wat Devarajkunchorn School, Wat Sawaswaree Srimaram School, Wat Samananam Borihan School, and Pratumnak Suan Kularb School.

Nutritional status: classified by the researcher using weight and height obtained from the school data base according to the graph showing the growth of national Thai children age 5-18 years separated by gender. As fallow, (see Annex 1-4)

- Weight for height: classify as wasting, quite wasting, normal, overweight, obesity (Wasting - Moderate and severe - below minus two standard deviations from median weight for height of reference population.)(9)
- Weight for age: classify as underweight, quite underweight, normal, overweight, obesity (Underweight - Moderate and severe - below minus two standard deviations from median weight for age of reference population; severe - below minus three standard deviations from median weight for age of reference population.)(9)
- Height for age: classify as stunted, quite stunted, normal, quite tall, tall **(**Stunting - Moderate and severe - below minus two standard deviations from median height for age of reference population.)(9)

Underlying diseases: medical history or current condition that concern with individual health, as follows allergy, asthma, drug allergy, food allergy, etc. Classified as present or not present.

Oral hygiene: use "Simplified Oral Hygiene Index" or OHI-S to classify oral hygiene status(10), based on the amount of debris and calculus appeared on representative tooth, calculated from two components: OHI-S = DI-S + CI-S (see detail at Annex5)

Caries status: defined by DMFT(S) for permanent teeth and dmft(s) for deciduous teeth. DMFT and DMFS are means to numerically definite the prevalence of caries, obtained by calculating the number of Decayed (D), Missing (M), and Filled (F) (see Annex6)

Total Cost of Mahidol Dental program: include cost of both course based and school based practice calculate from Labor Cost of all staffs, Material Cost*, Capital Cost* and miscellaneous cost in recent academic year (2015). Identification incurred expenses and costs associated with Mahidol dental operating school program as obtained from community department and procurement section. (see Annex7-9)

*Including material and equipment cost of Sealant, Fluoride varnish, Oral health education, Preventive scaling, filling and tooth extraction

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CHAPTER II

LITERATURE REVIEW

2.1 Dental Caries (Tooth Decay)

Dental caries or cavity, more commonly known as tooth decay, is the breakdown of the tooth structure. This is an infectious, transmissible disease caused by bacteria in oral cavity.(11) For instance *Streptococcus mutans* (12) and *Lactobacillus* species.(13) This bacteria colonize on the teeth and producing acid. Dental cavity is caused by the action of acids on the tooth surface (enamel). The acid is produced by reaction of sugars that we consume with bacteria present in the dental plaque. The acid leads to a loss of minerals, calcium and phosphate, from the tooth surface; this is called demineralisation process. Every day, minerals in saliva are deposited to and lost from a enamel surface. Minerals from the foods and waters consumed, such as fluoride, calcium, and phosphate are re-deposited (remineralization) to repair the enamel layer. When demineralization excess more than remineralization tooth cavity occur. If the process continually, bacteria destroy tooth structure, eventually infect to the pulp tissue. Pain may occur prior to or subsequent to pulpal infection. Dental cavity has been thought of as multifactorial since it is influenced by dietary and host factors.(12, 14) The role of saliva as a defense mechanism against dental cavity is well documented.(15) These defense mechanism include salivary flow rate, clearance, buffer capacity, antimicrobial effect, and calcium and phosphate delivery for remineralization.(16)

Type of dental caries

Based on Anatomical site

Pits and fissures caries

Bacteria rapidly colonize on pits and fissures of the newly erupted teeth, Caries expand as it penetrates in to the enamel. This surface is the highest prevalence of all caries. Their high susceptibility to caries depend on shape, morphological variation and depth of pit and fissures. Entry site may appear much smaller than actual lesion, making clinical diagnosis difficult. Sealing of pits and fissures after tooth eruption may be the most effective in resistance to caries.

Smooth surface caries

Less favorable site for plaque attachment, usually attaches on the smooth surface that are near the gingiva or are under proximal contact. In very young patients the gingival papilla completely fills the interproximal space under a proximal contact. This condition is less favorable habitat for bacterial plaque. The proximal surfaces are particularly susceptible to caries due to extra shelter provided to resident plaque owing to the proximal contact area. Consequently proximal caries is less lightly to develop where this favorable soft tissue architecture exists.

Root surface caries

Root-surface caries is more common in older patients when gingival recession root surface exposure to the oral environment. The proximal root surface, particularly near the cervical line, often is unaffected by the action of hygiene procedures, such as flossing, because it may have concave anatomic surface contours and surface roughness at the termination of the enamel. The cementum covering the root surface is extremely

thin and provides little resistance to caries attack. Root caries progress more rapidly because of the lack of protection from and enamel covering.

Based on progression

Acute caries

Acute caries is a rapid process involving a large number of teeth. These lesions are lighter colored than the other types, being light brown or grey. Pulp exposures and sensitive teeth are often observed in patients with acute caries. It has been suggested that saliva does not easily penetrate the small opening to the carious lesion, consequently there are little opportunity for buffering or neutralization.

Chronic caries

These lesions are usually of long-standing involvement, affect a fewer number of teeth, and are smaller than acute caries. Pain is not a common feature because of protection afforded to the pulp by secondary dentin. The decalcified dentin is dark brown and leathery. Pulp prognosis is hopeful in that the deepest of lesions usually requires only prophylactic capping and protective bases. The lesions range in depth and include those that have just penetrated the enamel.

Arrested caries

Caries which becomes static and does not show any tendency for further progression. Both deciduous and permanent affected. With the shift in the oral conditions, even advanced lesions may become arrested. Arrested caries involving dentin shows a marked brown pigmentation and induration of the lesion. Sclerosis of dentinal tubules and secondary dentin formation commonly occur. Exclusively seen in caries of occlusal surface with large open cavity in which there is lack of food retention.

Also on the proximal surfaces of tooth in cases in which the adjacent approximating tooth has been extracted.

Although dental caries are preventable diseases, they remain the most common chronic disease of children and youths. This is also one of the most costly diet- and behavior-related diseases.[2, 17] While there has been a significant decrease in tooth caries in some countries, a large number of children around the world are still affected from this disease. Statistics indicate that at least 25% of 5- to 6-year-old children, and more than 90% in some low-income countries have experience in tooth decay.[2] There are different numbers across countries and discrepancies between regions, provinces, districts, cities and areas.(3, 18) Eastern Mediterranean and South-East Asia regions, dental caries is an important cause of disability.(19)

In Thailand, the prevalence of dental cavity in young children is still high despite efforts to control the disease through public health programs. The 7th Thai national oral health survey found that the prevalence of dental caries of permanent teeth measured at the cavitation level was 52.3% with a mean DMFT of 1.3 in 12 years old children. For the primary dentition the prevalence was 78.5% with a mean dmft of 4.4 in 5 years old children. (4)

Caries Index

Caries Index: use DMFT and DMFS present the number of dental cavity in each individual. *(Klein and Palmer, 1938;1940)* DMFT and DMFS are means to numerically definite the prevalence of caries, obtained by calculating the number of Decayed (D), Missing (M), and Filled (F) (13, 20, 21)

DMFT and DMFS = D+M+F teeth (T) or surfaces (S). (see Annex 6)

Calculation of DMFT \ DMFS:

For individual: DMF = D + M + F

For population: Mean DMF = Total DMF / Total No. of the subjects examined

WHO generated a scale to classify caries severity: DMFT values between 0.0 and 1.1 were very low; 1.2–2.6 were low; 2.7–4.4 were moderate, 4.5–6.5 were high, and values exceeding 6.6 were very high.(14, 18)

For primary dentition, caries risk was based on baseline dmft index: low (dmft=0), moderate (dmft=1-4), high (dmft >4), with almost half of the teeth belonging to the high-risk group.(22)

2.2 Gum Disease

Gum disease is a condition of inflamed gingiva, caused by bacterial plaque that accumulate along the gum line over time and secreted toxins. This plaque is a mixture of saliva, food and bacteria. Early symptoms of gum disease (gingivitis) include redness of gum, swelling gum and bleeding per gum without pain. These are very common clinical manifest and most people cannot detect. A pain symptom appear in more advanced gum disease by means of the formation of gum pockets and the loss of bone around the teeth. Advanced gum disease can cause loss of the sound teeth, called periodontitis. Bacteria in gum pockets cause an infection, swelling, pain, and further bone destruction. (13)

Risk factor of Gum disease

The main cause of periodontal (gum) disease is plaque. However, other factors can contribute to periodontal disease. These include:

Age: studies indicate that older people have the highest rates of periodontal disease. Data from the Centers for Disease Control and Prevention indicates that over 70% of Americans 65 and older have periodontitis.

Hormonal changes: such as those occurring during pregnancy, puberty, menopause, and monthly menstruation, make gums more sensitive, which makes it easier for gingivitis to develop.

Genetics: research has indicated that some people may be genetically susceptible to gum disease. Despite aggressive oral care habits, these people may be more likely to develop periodontal disease. Identifying these people with a genetic test before they even show signs of the disease and getting them into early intervention treatment may help them keep their teeth for a lifetime.

Illnesses: some systemic diseases that interfere with the body's inflammatory system may worsen the condition of the gums. These include cardiovascular disease, diabetes and rheumatoid arthritis. Cancer and HIV interfere with the immune system. Diabetes affects the body's ability to use blood sugar, patients with this disease are at higher risk of developing infections, including periodontal disease.

Stress is linked to many serious conditions such as hypertension, cancer, and numerous other health problems. Stress also is a risk factor for periodontal disease. Research demonstrates that stress can make it more difficult for the body to fight off infection, including periodontal diseases.

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Medications: Some drugs such as anti-depressants have effect on reducing the salivary flow rate, which has a protective effect on teeth and gums. Some drugs, such as the anticonvulsant medication (Dilantin) and the anti-angina drug (Procardia and Adalat), can cause abnormal growth of gum tissue.

Poor oral hygiene and parafunction habits such as not brushing and flossing on a daily basis, make it easier for gingivitis to develop. Clenching or grinding your teeth can put excess force on the supporting tissues of the teeth and could speed up the rate at which these periodontal tissues are destroyed.

Poor nutrition and obesity: A diet low in important nutrients can compromise the body's immune system and make it harder for the body to fight off infection. Because periodontal disease begins as an infection, poor nutrition can worsen the condition of your gums. In addition, research has shown that obesity may increase the risk of periodontal disease.

Smoking: Tobacco use is linked with many serious illnesses such as cancer, lung disease and heart disease, as well as numerous other health problems. Tobacco users also are at increased risk for periodontal disease. Studies have shown that tobacco use may be one of the most significant risk factors in the development and progression of periodontal disease.

There are 2 main stages of periodontal (gum) disease

STAGE 1: Gingivitis

This stage is easier to treat because it only affects the gums and is reversible with good oral hygiene. Clinical sign are red, swollen and bleeding gums. Left untreated, gingivitis can lead to a more serious condition known as periodontitis.

STAGE 2: Periodontitis

Periodontitis is a cascade of problems that may occur when gingivitis is left untreated. Bacteria cause chronic infection, pockets formation or spaces form between tooth and gum.

Can cause destruction of bone support. Several factors work together to cause irreversible bone loss, and could lead to surgery.

Gum disease affects children in all countries, similar to tooth decay, it is one of the most common chronic diseases in many countries. The world prevalence of gum disease in children is very high, the majority of children being affected (23) with 50% to 100% of 12-year-old children having the signs of gingiva inflammation.(5) The rate of gingivitis is higher in older children and teenagers.

In Thailand, The national oral health survey conducted in 2012 found that the prevalence of gum disease in 12-years old children was up to 50.3%.

Simplified Oral Hygiene Index

By Green and Vermillion (1964)(10) calculated from two components:

Simplified Debris Index (DI-S) + Simplified Calculus Index (CI-S) (see Annex 5)

The six representative teeth that are selected for this index consists of 4 posterior teeth which are the first completely erupted molars. Buccal surfaces are used for scoring on the maxilla and lingual surface on mandible. Other two are labial surfaces of the maxillary right central incisor and mandibular left central incisor, if

one of these teeth are missing, the next tooth in the same segment would be used for the index.(10)

The level are: Good = 0 -1.2, fair = 1.3 - 3.0, Poor = 3.1 – 6 .*(24)*

2.3 Poor Oral Health and Effect on Children

Poor oral hygiene together with dietary sugars can causes gum disease and dental cavity. Both may lead to discomfort, pain and loss of tooth. In Thailand, half the children of age 12 claimed pain or discomfort from teeth within the past year and 40% of children had tooth extraction at their last visit to the dentist. Similar patterns are observed in other countries such as China, Jordan1 or Madagascar.(25) Results of untreated oral disease, may have an intense impact on quality of life. Children who suffer from poor oral health are 12 times more likely to have more restricted-activity days including missing school than those who do not. Each year, more than 50 million hours are lost from school due to oral problems.(5) Tooth cavity and gum disease (gingivitis) are among the most widespread conditions, impacting on an self-appearance. Importantly, loss of functional tooth can affect children's nutritional intake, subsequently, their growth and development.(26) Some study in Bangladesh found the association between untreated dental caries and being underweight in primary school children.(27)

The experience of pain, problems with eating and chewing, embarrassment about the appearance, discoloration, shape of damage teeth can distract children from play and effective learning. Oral health affects general health. If left untreated, oral diseases can have adverse consequences. Oral infection can be life-threatening. It has been considered a risk factor for many general health conditions. Systemic spread of

bacterial microorganisms can cause, or seriously worsen, infections throughout the body, particularly among children with low immune systems, congenital heart disease and diabetes. Studies have suggested that oral diseases (such as dental caries and gingivitis) are related with various problems(28) including malnutrition, impaired speech function, psychological problems, cardiovascular disease, diabetes and even cancer. Several study has reported the association between oral health and quality of life.(28) A number of oral health related quality of life measures have been developed to assess the functional, psychological, social and economic consequences. Generally, poor oral health has an undesirable impact on quality of life, influencing eating abilities, self-confidence, mental health, social interaction, personal relationships, enjoyment of life, general health and well-being. Low quality of life also relate to oral health problem and less access to dental care. (5)

Early onset of gum disease and dental caries are reversible, with appropriate measures and treatment care. Whereas, most advanced condition are irreversible. For instance, once tooth cavity occur in permanent teeth, it lasts for a lifetime. Even when the teeth have been restored, the fillings still remain in the mouth for life and may need a replacement from time to time. Advanced or progress lesions become more serious and difficult to treat. Obviously, it must be emphasized that prevention is better than cure.

2.4 Preventive Dental Care

Fluoride

Fluoride is a mineral, found naturally in many foods and water. It helps tooth more resistant to acid from bacterial plaque and prevent tooth cavity. Moreover it can

reverses early tooth lesion (demineralization). In child under 6 years old, systemic fluoride become incorporated into the formation of permanent teeth, making it difficult for acids to demineralize the teeth. Fluoride helps promote remineralization together with disrupts acid production in erupted teeth of both children and adults. Apart from food and water, Fluoride comes from dentifrice or professionally-applied topical fluoride application. Fluoride is use in two difference ways; Topical and systemic fluorides. Topical fluorides are applied directly to the tooth surface. For instances, fluoride dentifrice, fluoride rinses and in office fluoride treatments. Systemic fluorides are used by oral intake, such as fluoride in food, fluoridated water and dietary fluoride supplements. When fluoride is available both topically and systemically, the effective reduction in dental cavity is achieved. Dentists have recommended the use of fluoride treatments to help protect the tooth from decay, especially high caries risk children. Several studies on topical fluoride applications, which include fluoride toothpaste, mouth rinses, gels and varnishes, found that topical fluorides have been confidently established as beneficial in preventing decay in children aged 5 to 16 years.(29) Among of these topical fluoride applications, Fluoride varnish is common use in school prevention program.

Fluoride varnish is effective in preventing cavity on smooth surface of teeth. The quality of evidence for the efficacy of fluoride varnish in preventing and controlling dental cavity in the permanent teeth of moderate/high-risk children is high. According to the Centers for Disease Control and Prevention (CDC) and the ADA. These organizations strongly recommend fluoride varnish because of consistent, good quality, patient-oriented evidence. The ADA rates the quality of evidence for the efficacy of

fluoride varnish in preventing and controlling dental cavity in the primary teeth of high-risk children as high.

Sealants

Dental sealants are resin coatings that are applied to the grooves (pit and fissure) on the chewing surfaces of the posterior teeth to protect them from tooth cavity. Most cavity in children and teenagers occur on these surfaces. Sealants protect the chewing surfaces from tooth decay by being a barrio for bacteria and food particles and keep them out of these grooves. Permanent molars are the most likely to benefit from sealants. It is better to apply the sealant as soon after the teeth have erupted, before they have a chance to decay. A sealant can last for as long as 5 to 10 years. Sealants should be checked at your regular dental appointment and can be reapplied if they are no longer in place.

The effectiveness of sealant had been studied by many reports.(22) CDC had recommend the use of sealants in school-based dental care programs. A cost-effectiveness analysis of a school-based dental sealant program for low-income children estimated that over a 5 year period, costs of care for the group given dental sealants were almost 20 percent lower than for the control group.

Oral health education

The aims of Oral Health Education are preventing the dental disease and promoting dental health at early stages.(7) Schools are important places to shape the health, education and well-being of children. there was no conclusion, that oral health promotion activities reduce dental caries, even if changes in behavior were achieved and that, unless fluoride was used in one or other of its forms, oral health promotion activities were ineffective.(30) According to A systematic review Effectiveness of oral

health education programs, five studies showed a significant decrease in the caries increment. The results of four other studies were not significant. A study by Blair et al. showed a 20% decrease in caries increment. The review showed that studies done in schools were effective and health promotion was a prominent feature in most of the effective studies.(31) Oral health education is effective in improving the knowledge attitude and practice regarding oral health and in reducing the plaque, bleeding on probing of the gingival and caries increment and in improving the gingival health.(32) (30)

In Thailand, This school-based intervention study has demonstrated that optimizing fluoride interventions (tooth brushing) can have a significant impact on oral health with up to 34 % reductions in caries incidence for all schools included in the study and up to 41% for the most cooperative school.(33)

Oral Health Promoting School

Good oral hygiene can help to prevent tooth cavity as well as gum disease. Dental preventive care is an important factor to reach and maintain good oral health. However, a substantial proportion of children, mostly among children in low income countries,(33) have no access to professional care. A large number of children have no chance to visit dentist before starting school.(31) In some areas, a substantial proportion of school children who never have dental visit. Consequently, a small number of children have preventive professional care. Many of them go to the dental office when they have pain, an experience that may have a lasting effect through life and prove to be unfavorable to overall oral health.(34)

At the global level, children attend primary schools around 80% and complete at least 4 years of education 60%, with variations between countries and gender. Thus,

schools are an important setting to reach over 1 billion children worldwide and, through them, families and community members.(5) Promoting children's oral health through schools is strongly recommended by the World Health Organization (19, 33) the potential for actions has been described in detail in the manual "World Health Organization. Oral health through schools. Geneva: WHO Document 11, 2003" (19). The school oral health initiative focuses on oral self-care practices, effective use of fluoride, healthy lifestyles in relation to diet and nutrition, personal hygiene and healthy environments related to the school and access to optimal sanitary facilities.(33)

Effective oral hygiene practices, healthy dietary behaviors and appropriate use of fluorides, together with sustainable, effective and accessible professional care, are keys to maintain good oral health. The school provides an excellent setting for delivering oral health services for children. Individuals, families, community, schools, education authorities, healthcare providers and government departments should work collaboratively to reduce risk factors and to promote oral health, incorporating the guiding principles for health promotion.(19)

In Thailand, the net enrolment rate were 90.05% and 72.22% for primary (6 to 11 years) and secondary school age children (12 to 17 years) in year 2009. Oral problem is one of 3 leading health problems among school children in Thailand. This view is consistent with the 2007 survey which found that 515,000 school students missed school due to dental caries, equivalent to 1.3 million person-days of school missed. The large number of children with dental health problems can have long-range adverse health impacts of these children (other than the loss of education). It is important that children develop the knowledge and skills to maintain oral hygiene and to eat properly

to prevent oral and dental health problems. This should be a continuous health promotion activity in schools.

There are many oral health prevention program in school such as topical fluoride application, the use of fluoride mouth rinses, oral health education, tooth brushing program with a fluoride toothpaste and flossing, healthy diet and regular dental examination. Thailand has long experience of school health interventions with extensive school-based tooth brushing and sealant programs. (Table 1) School-based tooth brushing for primary school children has been promoted and is practiced in many schools. However, this project is inconsistent and dependent on the enthusiasm of teachers to ensure that it is correctly carried out (35). Although school-based health promotion programs are well accepted in Thailand, it is reported that only 38.5% of primary schools in the country conduct teacher-supervised tooth brushing programs.

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Table A Dental health care programs implemented for school children in Thailand

Period	Program	Brief activities
1988	Oral Health Surveillance and Dental Health Promotion Program for primary school Children	Dental examination by school teachers After-lunch tooth brushing program Oral health education
1996	Small scale school dental sealant	Sealant in grade 1
1999	Health Promoting School (Oral health integrated in health promotion)	Key indicators for oral health; dental examination, no caries on permanent teeth (fillings are acceptable), no gingivitis After-lunch tooth brushing with fluoride toothpaste Healthy food in school
2003	Sweet enough project	Creating network and campaign to reduce sugar consumption
2005	Oral Health Promotion and Prevention in School Children Project under National Health Security (Large scale school dental sealant)	Full mouth examination grade 1 and 3 children Sealant grade 1 children After-lunch tooth brushing in primary school

Oral health programs in Thailand have focused on primary school children, there is a significant scope for improvement of oral health among young children, particularly among the underprivileged groups and children who at high risk of dental cavity, through the optimization of school programs. The development of an enhanced school program to include oral health education, combined with enabling and

monitoring tooth brushing with efficacious toothpaste formulations, should significantly reduce dental caries and improve the oral health of children in Thailand relative to the current regime.

2.5 Community Dentistry Department of Mahidol University

Department of Community Dentistry is virtually concerned equipping dental students in the skills that enable them to practice and serve the community on preventing, controlling oral disease and promoting oral health through organized community efforts. The Department also places emphasis on research and advancement in the specialty of Dental Public Health Science in order to help improve the quality of life related to oral health of Thai people.

Course

Dental students have been assigned into separate 4 primary schools. As follow Wat Devarajkunchorn School, Wat Sawaswaree Srimaram School, Wat Samananam Borihan School, and Pratumnak Suan Kularb School. Each group of dental students is responsible for conducting oral health survey, identify the problem and related factors of oral health status of school children. Collected data were analyzed and help planning of providing school-based preventive dentistry program e.g. intervention, exhibition, health promotion activity with participation of relevant stakeholders at least once. Each group of dental students has to submit the plan to the department of community dentistry, launch the activities follow the plan, evaluate the implementation and submit report of the activity done throughout the year together with data files. Individual dental student have to submit chart record of daily practice every visit. The records are

checked by a supervisor who in charge in that particular day. During daily practice in school, dental students do some implementations of preventive program, for example applying sealant, students have to check by the supervisor every steps of treatment. Oral health education is performed by dental student and dental assistant students. Dental student should inform the topics and objectives of the oral health education before beginning the activity to the responsible supervisor. One session is approximately 20-40 minutes.

School-base prevention program include 3 main aspects: oral health service, oral health education and healthy school environment

1. Oral health service including apply fluoride vanish, sealant, preventive scaling, preventive resin restoration (PRR), filling, prolong deciduous tooth extraction. Fluoride varnish application is suggested to be done in the same visit as oral health survey or before other oral health services. Oral health service in school does not cover comprehensive treatment, a referral system to the department of pedodontic, faculty of dentistry, Mahidol University has been set to provide dental treatment for school children of Wat Sawaswaree Srimaram School and Wat Devarajkunchorn School. While other school children are refer to nearby public health setting.
2. Oral health education can range from a brief recommendation after dental treatment, using material to teach in class or exhibition.
3. healthy school environment is general environment which promote good health for e.g. provide facility and place for tooth brushing, place to keep toothbrushes, fluoridated milk, reduce sugar in food and drink, etc.

The first priority is primary care of permanent teeth which refers to fluoride varnish, sealant, PRR, scaling and fluoride application. The following table illustrates criteria for case selection and type of oral health service.(36)

Table B Criteria for case selection and type of oral health service in Mahidol Program

Type of service	Criteria for select case
Fluoride varnish	Every grade 1 and 2 school children Other grades where >1 smooth surface caries or white lesions in permanent teeth are found
Sealant	Newly erupted permanent teeth with deep pit and fissure
PRR	Permanent teeth with enamel caries
Cleaning (prophylaxis or scaling)	DI-S ≥ 1.9 or presence of gingivitis
Fluoride application	2 of 3 following criteria should be met - ≥ 1 smooth surface caries - ≥ 2 new caries teeth - Secondary caries Or every case whom got oral cleaning
Refer	- Permanent teeth: deeper than enamel caries, large and/or deep lesion, tooth fracture, caries expose pulp, and supernumerary teeth - Tooth with symptoms i.e. pain, swollen, abscess - Deciduous teeth; prolong retention and not mobility

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2.6 Cost of Dental Care

Dental services result in considerable costs about 5% to 10% of the total health expenditure or billions of dollars in developed countries each year.(37, 38) In many low income countries, the cost of dental treatment could easily exhaust the country's entire health budget. More than 50 million school hours in learning are lost due to dental problems. Preventive program, early diagnosis and timely treatment are important in efforts to contain the costs of oral diseases.

In terms of financial, personal and social impacts, neglect of dental care also costs high. Advanced disease may need more complex, costly and, possibly, more traumatic treatments, for example, surgery, root canal therapy, extractions and treatment under general anaesthesia and hospitalisation. Poor oral health in children often continues into adult, impacting on quality of life and economic productivity. A previous study has reported that investment in oral disease prevention and health promotion reduces costs in health expenditure and, in the long-term, it is more cost-effective.

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2.7 Cost Analysis

Definition of Cost

Cost can refers to the expense in the monetary form and non-monetary form used in order to produce the product and service. Usually, Cost refers to the amount of money or expense that the producer or service provider must pay in order to obtain the necessary raw material or service to use in producing goods or service. Cost refers to

the value of resources used to produce the final products or outputs or service. The cost will not be equal to the service charge.

Cost refers to the loss of resources which can be the value of benefit or monetary value in order to achieve the objective (value of resource used in production process). Cost refers to cash or something equivalent paid out to obtain the goods or services, which bring about the benefit to the organization at the present or in the future. When the benefit has occurred, the accounting will regard cost as an expense.

To summarize, cost refers to the investment made in order to obtain the final product, asset or any service. In accounting viewpoint, the cost that can be measured in the monetary unit will be taken into account whereas in economic viewpoint, opportunity cost, negative consequence and implicit cost are included into cost of the investment.

Cost analysis

Also called economic evaluation, is currently a somewhat controversial set of methods in program evaluation. One reason for the controversy is that these terms cover a wide range of methods, but are often used interchangeably.

At the most basic level, cost allocation is simply part of good program budgeting and accounting practices, which allow managers to determine the true cost of providing a given unit of service (Kettner, Moroney, & Martin, 1990).

Cost allocation

Cost allocation is a simpler concept than either cost-benefit analysis or cost-effectiveness analysis. It basically means setting up budgeting and accounting systems

in a way that allows program managers to determine a unit cost or cost per unit of service. This information is primarily a management tool. However, if the units measured are also outcomes of interest to evaluators, cost allocation provides some of the basic information needed to conduct more ambitious cost analyses such as cost-benefit analysis or cost-effectiveness analysis.

Unit Cost

Unit cost refers to the comparison between the resource used and result or output. Unit cost can be a tool to measure the efficiency of resource management, budget allocation, service charge determination or the decision to maintain or cancel some services.(39)

Unit cost analysis will be carried out in the period of time. Normally, it will be done on the yearly basis, during the end of fiscal year. However, to gain the better control of the resource, it can be conducted more often than once a year.(40)

Cost classification

Cost can be classify by many criteria. Cost classification by the disbursement criteria. It can be divided into two groups which comprising tangible or explicit cost, the cost which paid out and can be seen and intangible or implicit cost, the cost which not paid out and cannot be seen.

Cost classification by activity criteria. This can be divided into two groups, which consisting of direct cost and Indirect Cost.

Cost Determination

Determination of cost aims to identify the value of all resource that cost used up. It divides the resource into small units thus that it will be easier to analyze its relation to the final product or output. Cost data of intervention programs are gathered in logical

steps depending on the characteristic of each. Total direct cost of each service is found by summing their labor, material and capital cost.(39)

Total Direct Cost = Labor Cost + Material Cost + Capital Cost

1. ***Labor cost*** means the cost that paid to the staffs in exchange of their work. This includes wage, salary, overtime and other expenditure in performing their duty. Additionally, it includes the other allowance that paid out in term of money such as dental education. In accounting viewpoint, it is quite complicate to determine the labor cost as an indirect cost or direct cost. Overtime is generally regarded as indirect cost or overhead cost.(41)

2. ***Material/Supplies Cost*** refers to all kinds of material supplies that each intervention required from the disbursement unit during the study period. Materials are defined as those items that are incorporated into and remain part of the feature or structure. Supplies are defined as those items that are used during construction but do not remain a permanent part of the feature or structure Material and supply costs are an integral part of most cost estimates. The primary disbursement units include. The material cost also refers to the maintenance cost and utility cost. Estimating the material cost can be done by using material requisition record if the record is particularly accurate. If the requisition record does not exist, the unit cost of material needs to be calculated by finding the price of the materials and their quantity. (39)

3. ***Capital Cost*** or Equipment costs are defined as machinery such as construction equipment, conveying systems, processing plants, tools, and instruments that are required during construction of the project, but do not remain a permanent part of the project. Capital Cost also refers to annual depreciation costs of equipment and building. This kind of cost generally occurs once in a long while. In accounting viewpoint,

depreciation cost will be calculated by using Straight-line method.(42) This means the depreciation cost will be equally averaged out by their total life. Otherwise it can be calculated by taking the initial cost subtracted by the salvage value (the price when the equipment reach its total life) and divided by the total life of building or equipment. Total life of building and equipment generally equals to 25 years while total life of vehicle equals to 3 to 5 years. The medical equipment's total life equals to 5 to 15 years depending upon the type of equipment.(43)

$$\text{Depreciation Cost} = \frac{\text{Initial Cost (purchasing price)} - \text{Salvage Value (cost remaining)}}{\text{Total Life (Year)}}$$

In addition to the above 3 medical services cost that are provided for cost analysis not include transportation cost for distant location incur into school based dental services. The cost analysis of mobile services will add transportation cost including car driver salary, car depreciation cost, maintenance cost and fuel cost.

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CHAPTER III

RESEARCH METHODOLOGY

3.1 Research Design

A retrospective analysis was conducted to investigate oral health problem in primary school children, to identify factors associated with moderate and severe level of oral health problems, and to estimate cost of oral program of oral health problems.

Data profiles of primary school children were based on Mahidol school oral health program during academic year 2015. The cost of fluoride varnish and sealant in caries prevention is based on Mahidol school oral health program for the year 2015.

Cost analysis: The economic perspective included labor cost, material cost and capital cost from both school-based and course-based program. Extensive information on patterns of resource consumption and unit costs for all preventive programs was obtained from procurement and community department. Other details of the analysis such as the price of academic setting and the use of other utility were reported. The cost estimates were based on retrospective averages.

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3.2 Study Population

The study was conducted among all primary school children grade 1(approximately 6 years old) to grade 6 (approximately 12 year old) who attended school during academic year to 2015 in 4 public primary schools approximately, 509 children.

Inclusion criteria of study samples: children of both gender that completed studied variables and approved by supervisors.

Exclusion criteria of study samples: children that not clear records.

3.3 Study Area

The study area for this research was four public primary schools in Bangkok (Wat Devarajkunchorn School, Wat Sawaswaree Srimaram School, Wat Samananam Borihan School, and Pratumnak Suan Kularb School) that participated in Mahidol oral health program.

3.4 Sampling Technique

The study included total population of school children who were attending school in academic year 2015.

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3.5 Sample & Sample Size

A total of school children grade 1 to grade 6 attending in 4 public primary schools school during academic year to 2015.

3.6 Data Collection

Secondary data were obtained using modified data collection forms from primary data collected by school oral health program, Community Dentistry Department, Faculty of Dentistry, Mahidol University. All data from the primary Oral examination in the program were collected by the fifth-year dental students and confirmed by their supervisors who are dentists. Each child was examined for dental

cavity, history of treatment, gingivitis, food debris and calculus deposit by using a mouth mirror and an explorer. Cavity lesions were diagnosed by a catch of explorer on tooth fissures and a visible caries on tooth surface. The decay, missing and filling teeth were recorded in dental diagram chart. Each sextant of the mouth was examined and recorded for food debris and calculus deposit. Gingivitis was recorded when redness and swollen gum were observed. Basic socio-demographic information including age, gender, weight, height and education level and underlying disease were obtain from school records of each school. Underlying diseases of each children were confirmed by dental students. They have to do history taking; asking questions about child's health like a medical doctor before do any treatment.

The data for cost analysis were obtained from community dentistry department and procurement section, Faculty of Dentistry, Mahidol University that included the estimated cost of Labor Cost, Material Cost, Capital Cost and transportation cost.

Labor Cost: All staffs salaries (dentists/supervisors, dental assistants, car drivers and house keeper) were collected from human resource department (see Annex7) The proportion of their time spent need to be include in the calculation accordingly. The cost of this time was computed initially on the basis of hourly wage rates. Direct labor costs Excluded labor cost for school teachers, Dental students, and other school personnel. Other necessary indirect expenses and time spent in conducting administrative and research activities, such as research staff time, in providing computer data entry are also were not considered in computing direct labor costs.

Material Cost: Estimating the material cost was collected by using material requisition form and historical data records from department in academic year 2015. (See Annex8) Essentially all consumable supplies were purchased centrally in bulk for the study and

then shipped to the program. The costs of these materials were allocated to the preventive procedures and then to regimens in proportion to the number of children who consumed them.

Capital Cost: consisted of heavy equipment and hand instrument cost, was collected by using requisition form and stock record. (See Annex9) This category included the amortized cost of the equipment, such as portable dental chairs and lights that were used to provide the preventive procedures. These costs were allocated to procedures use of this equipment.

Miscellaneous Cost including lease, electricity cost, depreciation cost of car, car maintenance cost and petrol. Data were collected from Facilities & Environment section and Vehicle Unit, respectively.

3.7 Measurement Tools

Data were collected using dental chart of Mahidol University (Annex10) and modified by using ID instead of children's name and checklist of intervention for preventive treatment record. (Annex 11)

Section 1: Personal characteristics including ID, school name, gender, educational level, age, weight, height, nutritional status and underlying disease.

Section 2: Oral hygiene using Simplified Oral Hygiene Index (OHI-S)

Section 3: Oral health problem including caries index and gingivitis status

Section 4: Preventive Dental Prevention including sealant, preventive resin restoration, fluoride varnish, fluoride gel, oral health education preventive scaling and extraction.

For cost estimation, checklist forms were used as follow;

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Labor Cost: All staffs salaries (dentists/supervisor, dental assistants, car driver) use Labor cost for Mahidol dental program form (Annex7)

Material Cost: including dental material (fluoride varnish, sealant material), other disposable accessory materials (cotton roll, pumice powder, articulating paper, disposable saliva ejector, etc.) Office material (paper, pen, pencil, etc.) were classified in group by type of usage. Estimating the material cost can be done by using data source for consumable cost and stationary cost in Materials cost of Mahidol dental program form (Dental Material Record Form and Office Material Record Form (see detail in Annex8)

Capital Cost: including heavy equipment (such as mobile dental unit, dental equipment, portable dental chair, mobile dental light) and hand instrument (such as explorer No.21, mouth mirror, cotton plier, stainless steel tray were classified in group by type of usage. Estimating the capital cost can be done by using data source from capital cost of Mahidol dental program form (equipment and instrumentation lists). (see detail in Annex9)

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3.8 Validity of Oral Examination Measurement Tool

All primary data were recorded by the fifth-year dental students who received similar professional training and used same criteria for screening and recording caries. After dental student examination, results were checked by professional supervisors. Additionally, these data were used for the actual treatment and updated every visit. During the examination of the current year, dental charting records in the previous years are using as references for dental charting to improve the accuracy of the record.

Validity for secondary data study, data entry was done from the original record forms. Most of the data were already validated from primary study. The modified data collection instrument was classify some variables by using standard criterion for convenient to data analysis. Oral hygiene status and caries status were classified into categories by using WHO criteria. For nutritional status, Thai national growth graphs for 5 to 18 years of each gender were used.

3.9 Data Analysis

Analyses were performed using Statistical Program for Social Science program, (SPSS version 16, Chicago, USA).

Descriptive statistics

Categorical variables in personal characteristics (gender, educational level, school of enrollment, nutritional status and underlying disease), status of oral hygiene, gingivitis and Caries level (dmft, DMFT) were presented in frequency and percentage of prevalence. Another continuous variable including age, weight and height were categorized and presented in frequency and percentage of prevalence.

For continuous variable, the dmft and DMFT scores were presented as mean (or median for not normal distributed data) the scores were performed to demonstrate the dental health status, used to measure the average number of tooth decay, missing due to caries, or filling tooth per child. Beside, each sextant of the mouth that had gingivitis and calculus were counted.

Inferential statistics

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The association between studied independent variable and caries status were tested by using binary logistic regression (univariate analysis), each independent variable was assessed separately in relation to each type of prevalence.

After, univariate analysis the multiple logistic regression was used for controlling each independent variable and identifying significantly independent risk factors of dental health problem.

In multiple logistic regressions for deciduous teeth, factors that we entered into the model are significant at $p< 0.05$ in univariate analysis, factors that have p-value less than 0.1 and factors that literature review show associated to caries in deciduous teeth.

Multiple logistic regressions for permanent teeth, factors that we entered into the model are significant at $p< 0.05$ in univariate analysis and factors that literature review show associated to caries in permanent teeth.

Multiple logistic regressions for gingivitis, factors that we put into the model are significant at $p< 0.05$ in univariate analysis and factors that literature review show associated to gingivitis.

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3.10 Ethical Consideration

Ethical approval was sought and obtained from the Chulalongkorn University Ethics Review Committee for Research Involving Human Subjects Health Science Group. The permission for data utilization by the head of community dentistry department was done, and all data were obtained along with anonymous measures to ensure that their data were safeguarded and not utilized for any purpose outside the purpose of this study. The research protocol was reviewed and approved by the Ethics Committee of Chulalongkorn University

The official letter from College of Public Health Sciences, Chulalongkorn University was delivered to obtain permission either from the Head Department of Community Dentistry, Faculty of Dentistry, Mahidol University. After the permission, the data were collected and analyzed.

CHAPTER IV

RESULTS

The secondary data analysis of 585 dental chart records of school children were revised and 76 were discarded for incomplete information. The remaining were analyzed and presented as follows:

4.1 Socio-demographic Characteristics, Nutritional and Oral health situation

This study included 509 children from 4 primary schools, which comprised of 238(46.8%) boys and 271(53.2%) girls. Age of children ranged from 6 to 14 years old, classified by using criteria which dental ages 6-7 years old is primary dentition, 8-11 years old is mixed dentition and over 12 years old is permanent dentition. The majority of children 248 (55%) was in the mixed dentition group. The education level ranged from grade 1 to 6, Educational level were separated into to 2 groups; early primary school (Grade 1-4) and late primary school (Grade 5-6), as seen in details in Table1.

Table 1 Socio-demographic characteristics of the children (n= 509)

Characteristics	No.	%
Age		
6-7 (primary dentition)	183	36.0
8-11(mixed dentition)	248	54.6
12-14 (permanent dentition)	78	9.4
Gender		
Male	238	46.8
Female	271	53.2
Education level		
Grade 1-4 (early primary school)	395	77.6
Grade 5-6 (late primary school)	114	22.4
School of enrolment		
Wat Devarajkunchorn School	77	15.1
Wat Sawaswaree Srimaram School	108	21.2
Wat Samananam Borihan School	151	29.7
Pratumnak Suan Kularb School	173	34.0

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The nutritional status of the children was classified using growth chart of Thai children according to the Thai Ministry of Public Health (MoPH) (annex 1-4). Results showed that most children were with normal nutritional status. According to weight for height and weight for age graphs, almost 75% were normal, and 18% were overweight or obese. Details are presented in Table 2.

Table 2 Nutritional status of the children (n=509)

Nutritional status	No.	%
Weight for height		
Wasting	9	1.7
Quite wasting	34	6.7
Normal	377	74.1
Overweight	59	11.6
Obesity	30	5.9
Weight for age		
Underweight	11	2.1
Quite underweight	27	5.3
Normal	380	74.7
Overweight	30	5.9
Obesity	61	12.0
Height for age		
Stunted	13	2.5
Quite stunted	16	3.1
Normal	427	83.9
Quite tall	31	6.1
Tall	22	4.3

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Table 3 shows the health condition records of the children. Most of them had no underlying diseases. Only 13% presented underlying diseases, such as asthma, allergy, impaired hearing and heart disease.

Table 3 Health conditions of the children (n=509)

Underlying diseases	**No.**	**%**
Not present	443	87.0
Present	66	13.0
Asthma	23	4.5
Allergy	19	3.7
Impaired hearing	11	2.2
Heart disease	4	0.8
Others.	9	1.8

Although only 10.8% of children had poor oral hygiene, gingivitis affected main group of children (76.8%). The dmft index for grade 1 children indicated that caries in primary dentition was very high. More than half of children were high caries status. The prevalence of caries in primary teeth of grade 1 children was 82.6%, only 17.4% of children were caries free. On the contrary, in permanent teeth, high level of caries was only 2.5%. Details are shown in Table 4

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Table 4 Oral health status of the children

Oral status	**No.**	**%**
Oral hygiene by OHI-S level (n=509)		
Good	61	12.0
Fair	393	77.2
Poor	55	10.8
Gingivitis by physical examination (n=509)		
Yes	391	76.8
No	118	23.2
Caries status in decidous teeth (n=149)		
Low (dmft=0)	26	17.5
Moderate (dmft 1-4)	41	27.5
High (dmft >4)	82	55.0
Caries status in permanent teeth (n=360)		
Low (DMFT 0-2.6)	325	90.3
Moderate (DMFT 2.7-4.4)	26	7.2
High (DMFT >4.5)	9	2.5
Caries prevalence at 6-7 years old; (n=149)		
Mean dmft = 6.23 ± 4.9	123	82.6
Caries prevalence at 11-12 years old; (n=100)		
Mean DMFT = 1.28 ± 1.7	51	51.0
Others (n=509)		
Abscess	2	0.4

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4.2 Factors Associated with Oral Health Problems

Binary logistic regression for deciduous teeth

To find factors associated with caries in deciduous teeth (dmft level), we used binary logistic regression. The dmft index was used in primary tooth which was only relevant for grade 1 children, age 6-7 years old. Factors related to dmft are shown in Table 5. School of enrolment only Wat Samananam Borihan school significantly related with dmft level (OR= 4.09; 95% CI = 1.27, 13.23). Height for age could not be calculated due to cell zero number.

Multiple logistic regressions for deciduous teeth

After that we do univariate analysis to measure the relationship between the level of dmft and studied factors. The result showed that only School of enrolment (Wat Samananam Borihan) was significantly related with dmft level when compared with Pratumnak Suan Kularb. Then in multiple logistic regression, factors that we entered into the model were significant at $p< 0.05$ in univariate analysis (school of enrolment and height for age), factors that had p-value less than 0.1 (gender) and factors that literature review showed association with caries in deciduous teeth (oral hygiene) Details are shown in Table 6

Multiple logistic regression analysis showed only poor oral hygiene affecting on dmft level with OR=12.04; 95% CI =1.11, 131.28. Children with poor oral hygiene have chance to get high dmft 12.04 times higher than children with good oral hygiene

Table 5 Factors related to dmft of grade1 children (n= 149)

Characteristics	dmft		OR	95%CI	p-value
	Low-Mod.	High			
Personal Characteristics					
Gender					
Female	30	48	1.84	(0.96,3.54)	0.066
Male	37	34			
School of enrolment					
Wat Devarajkunchorn	13	11	0.87	(0.35,2.14)	0.755
Wat Sawaswaree Srimaram	6	12	1.61	(0.57,4.53)	0.369
Wat Samananam Borihan	4	16	4.09	(1.27,13.23)	0.019*
Pratumnak Suan Kularb	44	43			0.089
Nutritional status					
Weight for height					
Not normal	9	8	1.21	(0.33,4.36)	0.775
Normal	58	74			
Weight for age					
Not normal	15	13	0.70	(0.16,3.05)	0.636
Normal	52	69			
Height for age					
Stunted or Quite stunted	0	7	NC	NC	NC
Normal or Quite tall or Tall	67	75			
Underlying diseases					
Yes	10	7	0.55	(0.20,1.53)	0.251
No	57	75			
Oral hygiene					
Poor	1	7	7.64	(0.81,72.41)	0.076
Fair	54	64	1.25	(0.51,3.06)	0.625
Good	12	11			0.207

NC= Not calculated, used crosstab fisher exact's test found significant at $p<0.05$

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.**Table 6 Factors related to dmft of grade1 children (n= 149) by multiple logistic regression**

Characteristics	**dmft**		**Adjusted OR**	**95%CI**	**p-value**
	Low-Mod.	**High**			
Personal Characteristics					
Gender					
Female	30	48	1.84	(0.91,3.71)	0.088
Male	37	34			
School of enrolment					
Wat Devarajkunchorn	13	11	0.65	(0.24,1.76)	0.397
Wat Sawaswaree Srimaram	6	12	2.27	(0.71,7.32)	0.169
Wat Samananam Borihan	4	16	2.73	(0.80,9.34)	0.110
Pratumnak Suan Kularb	44	43			0.125
Nutritional status	0	7	NC	NC	NC
Height for age	67	75			
Stunted or Quite stunted					
Normal or Quite tall or Tall	1	7	12.04	(1.11,131.	0.041*
Oral hygiene	54	64	1.83	28)	0.254
Poor	12	11		(0.65,5.18)	0.117
Fair					
Good					

NC= Not calculated

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Binary logistic regressions for permanent teeth

To study factors related to dental caries in permanent dentition, educational level was separated into to 2 groups; early primary school (Grade 1-4) and late primary school (Grade 5-6). Table 7 and 8 show that age, gender, educational level and underlying diseases are significantly associated with DMFT (95% CI of OR > 1.0).

Table 7 Factors related to DMFT of grade 2 to 6 children (n= 360); Personal Characteristics

Characteristics	DMFT		OR	95%CI	p-value
	Low	Mod.-High			
Age					
12-14	30	18	4.80	(1.46,15.82)	0.010*
8-11	232	44	1.52	(0.51,4.51)	0.453
6-7	32	4			0.002*
Gender					
Female	146	21	2.11	(1.20,3.72)	0.01*
Male	148	45			
Educational level					
Grade 5-6	80	34	2.84	(1.65,4.91)	<0.001*
Grade 1-4	214	32			
School of enrolment	44	9	1.15	(0.45,2.91)	0.77
Wat Devarajkunchorn	77	13	0.95	(0.41,2.18)	0.9
Wat Sawaswaree Srimaram	100	31	1.74	(0.85,3.56)	0.128
Wat Samananam Borihan	73	13			0.262
Pratumnak Suan Kularb					

Table 8 Factors related to DMFT of grade 2 to 6 children (n= 360); nutritional status, underlying disease and oral hygiene.

Characteristics	DMFT		OR	95%CI	p-value
	Very low-Low	Mod.-Very High			
Nutritional status					
Weight for height					
Wasting or Quite wasting	24	9	1.78	(0.78,4.20)	0.168
Normal or Overweight or Obesity	270	57			
Weight for age					
Underweight or Quite underweight	25	5	0.88	(0.33,2. 40)	0.805
Normal or Overweight or Obesity	269	61			
Height for age					
Stunted or Quite stunted	18	4	0.99	(0.32,3.03)	0.985
Normal or Quite tall or Tall	276	62			
Underlying disease					
Yes	30	19	3.56	(1.85,6.84)	<0.001*
No	264	47			
Oral hygiene					
Poor	32	15	1.76	(0.65,4.74)	0.265
Fair	232	43	0.70	(0.30,1.62)	0.399
Good	30	8			

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Multiple logistic regressions for permanent teeth

Then in multiple logistic regression, factors that we entered into the model were significant at $p< 0.05$ in univariate analysis (age, gender, educational level and underlying diseases) and factors that literature reviews showed association with caries in permanent teeth(oral hygiene level)

Table 9, Multiple logistic regression analysis shows age loss significance after put in the model. Gender, educational level and underlying diseases have still significant

association with DMFT level, OR=2.32 (95% CI=1.25, 4.32), OR= 2.05 (95% CI=1.04, 4.06) and OR= 4.09 (95% CI=2.01, 8.32), respectively.

Table 9 Factors related to DMFT of grade 2 to 6 children (n= 360); multiple logistic regression

Characteristics	**DMFT**		**Adjusted OR**	**95%CI**	**p-value**
	Low	**Mod.-High**			
Age					
12-14	30	18	1.86	(0.46,7.54)	0.388
8-11	232	44	1.06	(0.33,3.39)	0.918
6-7	32	4			0.408
Gender					
Female	148	45	2.32	(1.25,4.32)	0.008*
Male	146	21			
Educational level					
Grade 5-6	80	34	2.05	(1.04,4.06)	0.039*
Grade 1-4	214	32			
Underlying disease					
Yes	30	19	4.09	(2.01,8.32)	<0.001*
No	264	47			
Oral hygiene					
Poor	32	15	2.16	(0.73,6.41)	0.164
Fair	232	43	0.85	(0.35,2.10)	0.729
Good	30	8			0.058

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Bivariate logistic regressions for gingivitis

Factor associated with gingivitis are shown in Table 10 and 11. Results found that age, education level, school of enrolment and oral hygiene significantly related to gingivitis. (95% CI of OR >1.0)

Table 10 Factors related to gingivitis problem of the children (n= 509)

Characteristics	Gingivitis		OR	95%CI	p-value
	Yes	No			
Personal Characteristics					
Age					
12-14	5	43	3.06	(1.14,8.17)	0.026*
8-11	65	213	1.17	(0.76,1.79)	0.487
6-7	48	135			0.083
Gender					
Female	206	65	0.91	(0.60,1.37)	0.647
Male	185	53			
Educational level					
Grade 5-6	102	12	3.12	(1.65,5.90)	<0.001*
Grade 1-4	289	106			
School of enrolment					
Wat Devarajkunchorn	69	8	4.13	(1.86,9.17)	<0.001*
Wat Sawaswaree Srimaram	94	14	3.21	(1.69,6.13)	<0.001*
Wat Samananam Borihan	111	40	1.33	(0.82,2.15)	0.248
Pratumnak Suan Kularb	117	56			<0.001*

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Table 11 Factors related to gingivitis problem of children (n= 509); nutritional status, underlying disease and oral hygiene.

Characteristics	Gingivitis		OR	95%CI	p-value
	Yes	No			
Nutritional status					
Weight for height					
Wasting or Quite wasting	25	5	2.43	(0.94,6.33)	0.068
Normal or Overweight or Obesity	366	113			
Weight for age					
Underweight or Quite underweight	33	5	2.08	(0.79,5.46)	0.136
Normal or Overweight or Obesity	358	113			
Height for age					
Stunted or Quite stunted	29	0	NC	NC	0.998
Normal or Quite tall or Tall	362	118			
Underlying diseases					
Yes	57	9	2.07	(0.99,4.31)	0.053
No	334	109			
Oral hygiene					
Poor	52	3	16.7	(4.72,59.58)	<0.001*
Fair	308	85	7	(2.01,6.12)	<0.001*
Good	31	30	3.51		<0.001*

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Multiple logistic regressions for gingivitis

Factors that were significant at $p< 0.05$ in univariate analysis (age, educational level school of enrollment and oral hygiene level) and factors that were nearly significant (underlying diseases) were enrolled into the model.

Multiple logistic regression showed that only school and oral hygiene significantly related to gingivitis with OR= 3.55 (95% CI = 1.71, 7.37) and OR = 19.05 (95 % CI = 5.12, 71.24); Table 12

Table 12 Factors related to gingivitis problem of the children (n= 509)

Characteristics	Gingivitis		Adjusted OR	95%CI	p-value
	Yes	No			
Personal Characteristics					
Age					
12-14	5	43	1.23	(0.34,4.68)	0.761
8-11	65	213	0.90	(0.54,1.54)	0.666
6-7	48	135			0.800
Educational level					
Grade 1-4	102	12	2.20	(0.94,5.13)	0.068
Grade 5-6	289	106			
School of enrolment					
Wat Devarajkunchorn	69	8	3.55	(1.71,7.37)	0.013*
Wat Sawaswaree Srimaram	94	14	1.17	(0.66,2.05)	0.001*
Wat Samananam Borihan	111	40	2.90	(1.25,6.70)	0.596
Pratumnak Suan Kularb	117	56			0.001*
Underlying disease					
Yes	57	9	2.05	(0.95,4.45)	0.069
No	334	109			
Oral hygiene					
Poor	52	3	19.09	(5.12,71.24)	<0.001*
Fair	308	85	4.35	(2.35,8.06)	<0.001*
Good	31	30			<0.001*

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4.3 Cost Analysis of Program Implementation

In academic year 2015, 585 children had oral examination. 280 children received sealants for 858 teeth (which 767 were permanent molar). Preventive resin restoration for 90 children, 156 teeth. Prophylaxis fluoride treatment (fluoride varnish and fluoride gel), preventive scaling, oral hygiene instruction and extraction were done and distributed by studied school (Table 13).

Table 13 Number of preventive dental programs in academic year 2015

Program	unit	Wat Devaraj kunchorn	Wat Sawas waree Srimaram	Wat Samananam Borihan	Pratumnak Suan Kularb	Total
Oral Exam.	child	150	112	153	170	585
Sealant	tooth	189	188	159	322	858
	child	53	68	50	109	280
PRR	tooth	47	26	43	40	156
	child	23	17	20	30	90
Filling	tooth	22	17	29	25	93
F gel	child	17	39	30	1	87
Fluoride varnish	child	63	66	85	168	382
Scaling	child	32	39	50	22	143
OHI	child	150	108	153	168	579
Ext.	tooth	0	3	4	6	13

OHI = Oral hygiene instruction Ext. = Extraction

Estimated costs of school oral health program, Faculty of Dentistry, Mahidol University

The estimated costs of school oral program were collected from 3 main parts; labor cost, material cost and capital (with annual depreciation) material/operational/running cost. Moreover, miscellaneous costs, such as electricity

cost and maintenance cost were collected. Accordingly, the proportion of the program spend needed to be included in the calculation.

Labor cost

Labor cost for this program included academic staff and clinical staff. There are 8 supervisors, 3 dental assistants, 3 car drivers and 1 house keeper (not shown). We excluded labor cost for school teachers, dental students, and other school personnel. Other necessary indirect expenses and time spent in conducting administrative and research activities, such as research staff time, in providing computer data entry were not considered in computing direct labor costs. The total labor cost for dental prevention program per year collected from Human Resource Section, Employee Data Unit, equaled 294,759.40 baht. (Table 14) The cost for supervisors was a majority part of labor costs. It equals 144,967.7 baht (49.18%), calculated from each personnel monthly remuneration for academic year 2015 divided by total work hours per year (8 hrs.× 20 days × 12 months =1,920 hrs.), it called personnel pay per hour and then multiplied by working hours for school program. (See detail in Annex 9) For dental assistants and car drivers, we use the same method. So, we can get personnel labor cost for this program. To calculate personnel labor cost for house keeper, we used monthly remuneration of one year divided by area of responsibility and then multiplied by areas of community department. Labor cost of each type of personnel are shown in Table 14.

Table 14 Labor cost for dental prevention program

Type of personnel	Labor Cost per year	%
Supervisors	144,967.70	49.18
Dental assistants	77,364.00	26.25
Car drivers	64,116.00	21.75
House keeper	8,311.74	2.82
Total	**294,759.40**	100.00

Material cost

Material cost for dental prevention program were collected from Procurement Section (consist of Purchasing unit, Stock control unit and Material & Facilities Record unit). Basically, all consumable supplies were purchased centrally in bulk for the study and then shipped to the program. The costs of these materials were allocated to the preventive procedures. Material cost for this program was separated into 5 groups due to types of procedure as follow; materials for oral hygiene instruction, basic materials for fluoride prophylaxis, sealant, PRR and filling, protective barrier, sterilization and stationary cost (Table 21). The total cost of materials for dental prevention program was 116,036.54 baht, Table 15.

Table 15 Material Cost for dental prevention program

Type of materials	Cost per year	%
Basic material and oral hygiene instruction	3,577.60	3.08
For fluoride prophylaxis	9,403.22	8.10
For Sealant, PRR and filling	65,040.15	56.05
Protective barrier	7,910.15	6.82
Sterilization	18,668.07	16.09
Emergency drug, analgesic	303.34	0.26
Stationary cost	11,134.01	9.60
total	**116,036.54**	100.00

Capital cost

Capital cost: This category included the amortized cost of the equipment, such as dental mobile units and lights that were used to provide the preventive procedures. These costs were allocated to procedures and then method of valuing dental equipment is to use a straight-line depreciation over a given period of years. The depreciation rate used in this study come from the revenue department of Thailand. Total life of equipment generally equals to 3-5 years. The medical equipment's total life equals to 5 to 15 years depending upon the type of equipment.(43)

The initial cost were also collected from Procurement Section and then subtracted by the salvage value (the price when the equipment reach its total life) and divided by the total life of equipment.

$$\text{Depreciation Cost} = \frac{\text{Initial Cost (purchasing price)} - \text{Salvage Value (cost remaining)}}{\text{Total Life (Year)}}$$

The total capital cost was 587,028.15 bath. (Table 16)

Table 16 Capital cost for dental prevention program

Type of equipment	capital cost	%
Department equipment	25,850.62	4.40
Basic equipment	84,626.71	14.42
For scaling	7,185.07	1.22
For sealant, PRR and filling	373,236.60	63.92
For extraction	690.22	0.12
For Sterilization	93,438.92	15.92
Total	**587,028.15**	100.00

Miscellaneous costs

Other costs for dental prevention program such as lease, leasehold improvement, electricity, car, car maintenance (or repair) and petrol are not direct total cost, shown in miscellaneous (Table 17)

The lease for the program was calculated in term of opportunity cost or rent cost. We calculate only lease for community dentistry department, not included lease for the primary schools. The rent costs for department area come from rate that the faculty used for rentals multiply by square meters of community department (436.2 sq.m.). The rental price was 600-800 bath/sq.m. Consequently the calculation is 436.2×600 = 261,720 baht.

For electricity costs, the data were collected from Facilities and Environment Section. Community dentistry department has separated miter. Electricity cost for academic year 2015 equal to 38,094.8 baht.

The car depreciation was calculated by using straight-line method. There are 3 cars used in this program. These cars have been used for 27, 23 and 9 years and the total life of vehicle equals to 3 to 5 years.[43] Nonetheless, the data of initial cost

(purchasing price) of the cars were not available. The Vehicle Unit gave the data of the maintenance cost of cars was 58,127.08 baht and for petrol was 26,300.4 baht.

Details are shown in Table 17.

Table 17 Miscellaneous costs

Miscellaneous	Cost
Lease	261,720.00
Electricity	38,094.8
Car depreciation	-Not available
Car maintenance	58,127.08
Petrol	26,300.4
Total	**384,242**

Total estimated costs for dental program are comprised of labor cost (20.85%), material cost (8.45%), capital cost (42.73%) and miscellaneous (27.97%) as mention above. It is 1,373,754.39 baht. Capitation of this program calculated from overall cost of the program for the year 2015 divided by number of pupils receiving this preventive program (1,373,754.39 ÷ 585 = 2,348.30 baht per child) which comprise of capital costs 1,003.47 baths and the operating costs 688.00 baths. Operating costs consist of labor costs 489.65 baht and material costs 198.35 baht, Table 18.

Table 18 Total estimated cost for dental program and Capitation

	Cost Per year	%	Capitation
Labor cost	286,447.7	20.85	489.65
Material cost	116,036.54	8.45	198.35
Capital cost	587,028.15	42.73	1003.47
Miscellaneous	384,242	27.97	656.82
Total	**1,373,754.39**	100	**2348.29**

As mention before, this research studied the cost of school prevention program which include both academic and clinical parts which 112 Dental students practice oral examination and prevention treatments. This gave dental students experiences and made them confidence to do dental implementation in the future after they graduate from Mahidol dental school.

Capitation of this program for academic year 2015 was 2,348.30 baht per child. Not only dental students have chance to practice preventive treatment, but also each child would receive dental prevention procedure that included oral examination before and after program, 1.5 sealants, 0.3 preventive resin restoration, 0.2 filling, 0.8 fluoride treatment, 0.2 scaling and oral hygiene instruction as average, Table 19.

Table 19 Total estimated treatment tasks in dental program

Program	**Oral Exam.**	**Sealant**	**PRR**	**Filling**	**Fluoride treatment**	**Scaling**	**OHI**
unit	child	tooth	tooth	tooth	child	child	child
Total	585	858	156	93	469	143	579
Per capita	1	1.5	0.3	0.2	0.8	0.2	0.9

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Capitation of this program for academic year 2015 was included car driver salary, stationary cost, department equipment, car maintenance and petrol cost. The cost per capita (not include academic part and transportation cost) was 2,041.95 baht. Table 20.

Table 20 Capitation of this program for academic year 2015 not include academic part

	Cost Per year	**Cost not include academic part**	**Capitation not include academic part**
Labor cost	286,447.70	230,643.44	394.26
Material cost	116,036.54	104,902.53	179.3206
Capital cost	587,028.15	559,177.52	955.859
Miscellaneous	384,242	299,814.80	512.5
Total	**1,373,754.39**	**1,194,538.29**	**2,041.946**

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CHAPTER V

DISSCUSSION

The secondary data analysis of 585 dental chart records of school children were conducted and 76 were discarded due to incomplete information. The remaining were analyzed.

5.1 Nutritional Status

Results showed that almost 75% were normal nutritional status. By weight-for-height and weight-for-age graphs, and 18% were overweight or obese. The nutritional status of the studied children were corresponded with studies of obesity prevalence in children aged 6 to 12 years from a National Health Examination Survey using weight-for-height criteria that revealed overweight and obese children rise nationally from 5.8% in 1997 to 6.7% in 2001 and 8.7% in 2010, with the highest regional prevalence (14.8%) in Bangkok. The trend of overweight and obese in children became substantially increase every year. (44) Results from a previous study revealed a further increase in obesity up to 16.3% in urban children aged 6.0–12.9 years.(45) Over-nutrition is mainly detected in urban populations from all the reviewed regions(46). From the global trend, in Africa, Asia and the Eastern Mediterranean, the prevalence of overweight and obesity together was generally below 15 %.(46)

The study found that the quite underweight to underweight and quite wasting to wasting child were about 8%. Height-for-age graph showed that 84% of children were normal height, 10.4% were quite tall to tall and only 5.7% of children were quite stunt to stunt. In Thailand, underweight and stunting were still problems in this group

of children, lower in urban than rural, with 11.0% and 4.3% respectively. (45) Underweight and thinness are most prominent in populations in Southeast Asia and Africa. In school-aged children in Latin America, the prevalence of underweight and thinness was generally lower and less than 10 %. (46)

Both under-nutrition and over-nutrition during the school-age years have detrimental impacts on the development and health of children. Stunting was associated with long-term consequences, including impaired intellectual achievement and school performance (47, 48) and small body size in adulthood(48). The underlying causes of under-nutrition might be the poor child feeding practice and low food intake (49).

5.2 Health Conditions

From recorded health conditions of the children, most of them had no underlying diseases. Only 13% of children presented underlying diseases, mainly asthma (4.5%) or allergy (3.7%). An impaired hearing found 2.16% of children and others were systemic diseases.

Within the past three decades, there has been a rising trend for prevalences of asthma and allergic diseases worldwide, particularly from developed and industrializing countries(50) (51). Asthma, a disease characterized by recurrent attacks of breathlessness and wheezing, affects between 100 million and 150 million people worldwide. The disease causes over 180,000 deaths every year, including 25,000 children's deaths.(50) Worldwide rates of asthma have risen by 50 percent every 10 years since 1980; urbanization and increased time spent indoors are strongly associated with this increase. According to WHO, prevalence

of asthma symptoms in children in Brazil, Costa Rica, Panama, Peru, and Uruguay varied from 20 percent to 30 percent; in Kenya, it approaches 20 percent.(50) (51)

In Thailand, limited studies on epidemiology of atopic diseases have indicated relatively low prevalences of these conditions among the Thais. Allergic conditions are very common among children residing in Bangkok. Compared to the last survey in 1990, the period prevalence of wheezing has increased 4 folds, allergic rhinitis has increased nearly 3 folds whereas. A large number of children in Bangkok are suffering from rhinitis symptoms. Results from International Study for Asthma and Allergy in Children (ISAAC) showed that allergic diseases were perhaps the most common childhood diseases in Thailand and could lead to a substantial economical loss for the country.(52)

For impaired hearing, this study found 2.16% of impaired hearing children due to a special program at Pratumnak Suan Kularb School that accept children with this condition to study with normal children in school. In Thailand, a survey by the National Statistics Office in 2007 found that 389,402 people were hearing impaired, which was approximately 21% of persons with disabilities aged ≥7 years .(53)

5.3 Oral Health Problems

Although only 10.8% of studied children had poor oral hygiene, gingivitis had affected main group of children (76.8%). The dmft index for grade 1 children indicated that caries in primary dentition was very high, more than a half of all children had high caries status. The prevalence of caries in primary teeth of grade 1 children was 82.6%, only 17.4% of children were caries free. Moreover, 2 children had abscess on gum; the sign of severe infection. On the contrary, in children with grade 2-6, high level of caries

in permanent teeth was only 2.5%. Main group of this children have low caries level in permanent teeth (90.3%).

The oral health statuses of studied children with 6-7 years old and 11-12 years old were 17.4% and 49.0% caries free, with mean dmft 6.23 and mean DMFT 1.28, similar with the 7th National Oral Health Survey in 2012 that found 21.5% of 5-6-year children and 47.7% of 12-year children with caries free.(4), with mean dmft 4.4 and mean DMFT 1.3 respectively.(4) The difference of the caries prevalence in deciduous teeth found in our study and the National Health Survey might be due to the differences in the age of the study populations, 6-7–year children in the study and 5-6-year children in the national survey. In 5-6 age group, many more children have deciduous teeth compared to 6-7-year children, therefore, it was more likely to detect caries.

The negligence of dental caries in school-age population can be explained as a belief that young children do not need to visit the dentist because the primary dentition are not permanent, and dental caries on primary teeth is a natural part of development in children. This would be resolved as the eruption of permanent teeth.(54) Any intervention in the oral health of a child usually begins with seeking help to relief pain. In addition, the limited public dental health services are available in Thailand especially in suburban and rural areas. This might be another major explanation for this problem which was also found in other low income countries.(55)

In the United States, over 50% of 5-9-year children had at least one cavity or restoration.(1, 56) Reports from a National Oral Health Survey in the Philippines reported urgent needs with 97.1% of 6 years old with dental caries and 84.7% with symptoms of dental infection. About 20% of 6 years old and 16% of 12 years old were reported pain or discomfort in their mouths.(1) Another recent study in the Philippines

among schoolchildren aged 6 to 12 years found that overall prevalence of caries was 92.3%. The primary dentition showed 71.7% prevalence while the permanent dentition had 68.2%. Untreated decayed teeth dominated the scores reflecting the high level of unmet treatment needs.(57) Another study in the Northern Philippines, using World Health Organization (WHO) criteria to identify caries found that only obvious frank cavitation was recorded as caries. The authors stated that caries rates were similar to those of developing countries with untreated lesions dominating all ages.(58)

A World Health Organization (WHO) estimation of global DMFT for 12-year-old children reported that in the 188 countries included in their database, that on a global basis, 200,335,280 teeth were either decayed, filled or missing among just that age group. This was based on the data available in 2004 from the WHO Oral Health Database, Country/Area Profile Program (CAPP). Therefore, WHO continues to advocate that efforts to improve the overall situation are still highly indicated.(1)

The prevalence of gingivitis in this study was 76.8% consistent with previous studies in Thailand. Sutthavong S, *et al* found that 95.5% of children aged 2-12 years had gingivitis(54) whereas National Oral Health Survey in 2012 found that only 50.3% in 12-year-old children have gingivitis.(59) The difference prevalence between prevalence of gingivitis in study population and National Oral Health Survey might be due to the different age and different area of studied children. The National Oral Health Survey studied gingivitis in only 12-year-old children all over country.(4) Moreover, the difference could come from criteria on classifying disease. National Oral Health Surveys use WHO guidelines(60), For gingival conditions, its status recorded using the Community Periodontal Index (CPI)(61) but in our study, we use clinical signs and symptoms of gum to classify gingivitis.

5.4 Factors Associated with Oral Health Problems

The multiple logistic regression showed that poor oral hygiene was significantly related to dental caries in primary dentition (dmft level) with 95%CI of OR more than 1.0 (1.105, 131.277). For factors related to dental caries in permanent dentition, the result showed that gender, educational level and underlying diseases were significantly associated with DMFT.

It is obviously that poor oral hygiene can lead to tooth decay.(11, 62) Oral hygiene was significantly associated with dmft. It could be explained with etiology of caries. Poor oral hygiene have more dental plaque and bacteria that cause caries.(12) In this study, we used OHI-S index to represent of dental plaque which contained cariogenic bacteria causing dental caries and found association with caries in primary dentition. Study about Dental caries and oral hygiene status among 6-8 years old schoolchildren in Vietnam by Hein loc., found schoolchildren with poor and fair oral hygiene had caries twice more than schoolchildren with good oral hygiene.(63) The Shabani LF., *et al.* found that there was a strong correlation between DMFT and OHI-S index in children 10-15 years old.(64) However, we did not find the relationship between oral hygiene and caries in mixed dentition (DMFT level).

For nutritional status aspect, our study did not find any association between nutritional status and dental caries in both primary and mixed dentition. However, there are some studies mentioning about dental caries and growth in school age children. (65) (66) Indeed in this study if we analyze the data by Fisher's Exact test, we also found a significant association between height-for-age in nutritional status and caries in deciduous teeth (dmft level) at $p<0.05$. Same as Heba A. studied about height and weight in 6-8-year Saudi children with high caries prevalence and found association

between untreated caries and poorer growth. Children with higher level of caries had significantly lower height and weight outcome.(65) Stunted children have high dmft score and most of scores come from decay not filling. On the other hand, Mostafa A., *et al*. found stunted growth children with lower caries in permanent teeth (DMFT). They gave a hypothesis that chronic malnutrition affected on delay tooth eruption, the teeth that emerged at a later time are less exposed to oral cavity environment.(66) Furthermore, some studies did not find any association between height and dental caries, they found only weight was related to caries.(67, 68)

This study found factors related to dmft is poor oral hygiene. While, gender, educational level and underlying disease are significantly associated with DMFT. Female Gender has influence with dental caries in permanent teeth, some studies found the same association.(69-73) According to Mohammed, *et al*. found the prevalence of caries was higher in female students compared to their male counterparts.(70, 71) Same with Babu, M.M study, found that dental caries prevalence was higher in female children with good oral hygiene. (72) The study in dental caries rates among the Guanches (Tenerife, Canary Islands) found higher caries prevalence among females than male. It can explained by earlier eruption of teeth in girls, hence longer exposure of girls' teeth to the cariogenic oral environment and behavior of girls that frequent took snack and sugary diet.(73)

Age and educational level were significantly related with caries in permanent teeth due to the exposure time in oral environment found in this present study. Epidemiologic surveys of caries showed an increase in caries prevalence with age. (69) The dependent factor we used is DMFT index, this index refered to caries experience, consequently the old age children have more time to develop caries.

A history of underlying diseases was significant association with DMFT but not dmft due to the characteristics of the studied children. Most of grade 1 children' underlying diseases were hearing impairment which was not a systemic disease and perhaps not related to caries. According to a study of Vichayanrat, *et al*., hearing impairment did not appear to affect the prevalence of dental caries compared to those with normal hearing.(53) Asthma was the most common underlying disease that found in this study population and the result showed the significant association with DMFT level. Solís M. have done a review literature from 27 studies described in 29 articles and found that researchers have investigated the hypothesized relationship between asthma and caries by means of diverse strategies and found no strong evidence suggesting that a causal link exists.(74)

Other underlying diseases, such as cardiac problem or heart disease, it found only 0.78% in study population. Franco's study found that children with severe congenital cardiac disease have moderately high levels of dental caries with a significantly greater amount of untreated diseases.(75)

Factors associated with gingivitis were school of enrolment and oral hygiene level. The public primary schools in this study belong to Bangkok metropolitan administration (BMA) and Thai Ministry of Education (MOE). Wat Devarajkunchorn School, Wat Sawaswaree Srimaram School and Wat Samananam Borihan School are belong to BMA but Pratumnak Suan Kularb School is belong to MOE. Therefore, there are difference in school programs and socio-demographic characteristics of children. For school aspect, teachers of each school seemed to be an important factor that affected oral health of children. School with well motivating practice for oral health care could have better result in OHI level and less number of children who have gingivitis. (54)

The relationship between gingivitis and oral hygiene had been found in many studies. K. Jensen, *et al*. studied about dental caries, gingivitis, and oral hygiene among schoolchildren in Kampala, Uganda and found that mild gingivitis and moderate amounts of soft debris were found uniformly throughout all groups.(76) A high sucrose intake was associated with increased plaque volume due to the production of extracellular glucans, and there is a strong association between plaque volume and gingivitis(25) Improving in oral hygiene can effectively reduce clinical signs of gingivitis and caries. It was also observed that oral hygiene instruction and practice in proper tooth cleaning techniques reduced plaque and gingivitis in children.(77) Baelum Vi's do the cross-sectional findings on dental plaque, calculus, gingivitis, loss of attachment, periodontal pockets and tooth loss in a population of adult Tanzanians (78) The main factor in the etiology of periodontal disease is the presence of plaque, and prevention measures should focus on oral hygiene.

Our study did not find any association between nutritional status and gingivitis. However, there is some evidence to suggest that periodontal disease progresses more rapidly in undernourished populations and the important role of nutrition in maintaining an adequate host immune response(79). This may explain this observation. Overgrowth of bacteria that cause periodontal diseases and yeasts has been observed in malnourished African children.(80)

5.5 Cost Analysis

For cost analysis, this research found the total cost of school oral health prevention program consist of labor cost (20.85%), material cost (8.45%), capital cost (42.73%) and miscellaneous (27.97%). Salaries of supervisor, costs of material and

equipment for sealant, PRR and filling were a majority part of labor costs, material costs and capital costs respectively. Particularly, in capital cost and material costs were accountable for more than half of total costs. Consistent with Khositkaseam N.(81) also found the main part of program was capital cost. Her research studied about cost effectiveness of dental prevention program in primary school in Bangkok in 2005 but not include academic part which our research take account of this part a lot. The cost per capita of her study was much lower compare to my study due to her study calculated only clinical part and cost of money in that period was much higher than nowadays.

Cost-analysis of an oral health outreach program for preschool children in Sweden(82) found main part of budget was contribute to labor, and they mention that the costs of manpower constituted 45% of the total costs. Other studies of cost analysis focus on only direct medical cost that include labor cost and material cost(83)

LIMITATION

The first limitation of this study was no radiographic images taken during examination. So, we could not detect initial proximal caries. For data records of dental caries, we recorded dentine caries which could be detected by simple oral examination. In general dentists can identify caries by oral examination, and they will take radiographic images to check proximal caries in high risk patients. Furthermore, the program cannot provide dental radiograph protocol due to expense of program cost.

Secondly, we did not study some other known variables which might be associated with dental caries, such as salivary *Streptococcus mutans*, saliva pH or

salivary flow. These were not investigated because these factors have to use special kit to collect data.

Food and drink behaviors and socio-economic status might be also have association with oral health problem but we did not study due to un-available data in the primary data base.

Lastly, some costs in cost analysis could not be calculated or could not be completely calculated due to academic situation and database system of hospital not provided.

STRENGTH

This research investigated oral health problems, especially caries and gingivitis and significantly associated factors among primary school-age children. Additionally, this study estimated about cost of dental health prevention program in an academic setting in Thailand that was a limited study in this aspect. The study findings should be used as a reference data for improving the school oral health program of Faculty Dentistry, Mahidol University. Our findings probably give information about the estimated cost of the program that is useful for program evaluation efficiency of the procedure.

RECOMMENDATION

For future research

Future researches should study about socioeconomic status, oral health behavior and frequency of sugary diet consumption of the children which might be associated with oral health problems.

The use of caries index in this study are dmft for primary dentition and DMFT for mixed dentition which are caries experience. These may not show the exact number of decay teeth because this index includes missing and filling teeth. Using WHO criteria to classify oral hygiene of children make it difficult to analyze with statistic method. Future studies should use percentile of their study population to classify level of variable of the children.

For both parts, identifying the factors associated with oral health problems part and cost analysis of dental program part, the primary data with complete design should be conducted. Further investigation should use prospective cohort studies to complete associated variables and estimated costs of oral treatment and prevention program for more accuracy in details.

For school program

The study findings can be used as a reference data for improving the school oral program of Mahidol Dental Faculty. The caries status in deciduous teeth was very high, while caries status in permanent teeth was quite good. It indicates that early detection and prevention program is worth to do for school children, since the primary prevention before the onset of dental caries seems to be the best possibility in these circumstances.

This research project gives information about the estimated cost of the program that may be useful for program evaluation efficiency of the procedure. Some findings may be useful to other dental faculties in Bangkok which provide oral health school program and help to anticipate the favorable decision in the future.

Furthermore, policy maker from government or school can use the data findings to develop policies; planning, implementation and evaluation of the preventive dental program.

CONCLUSION

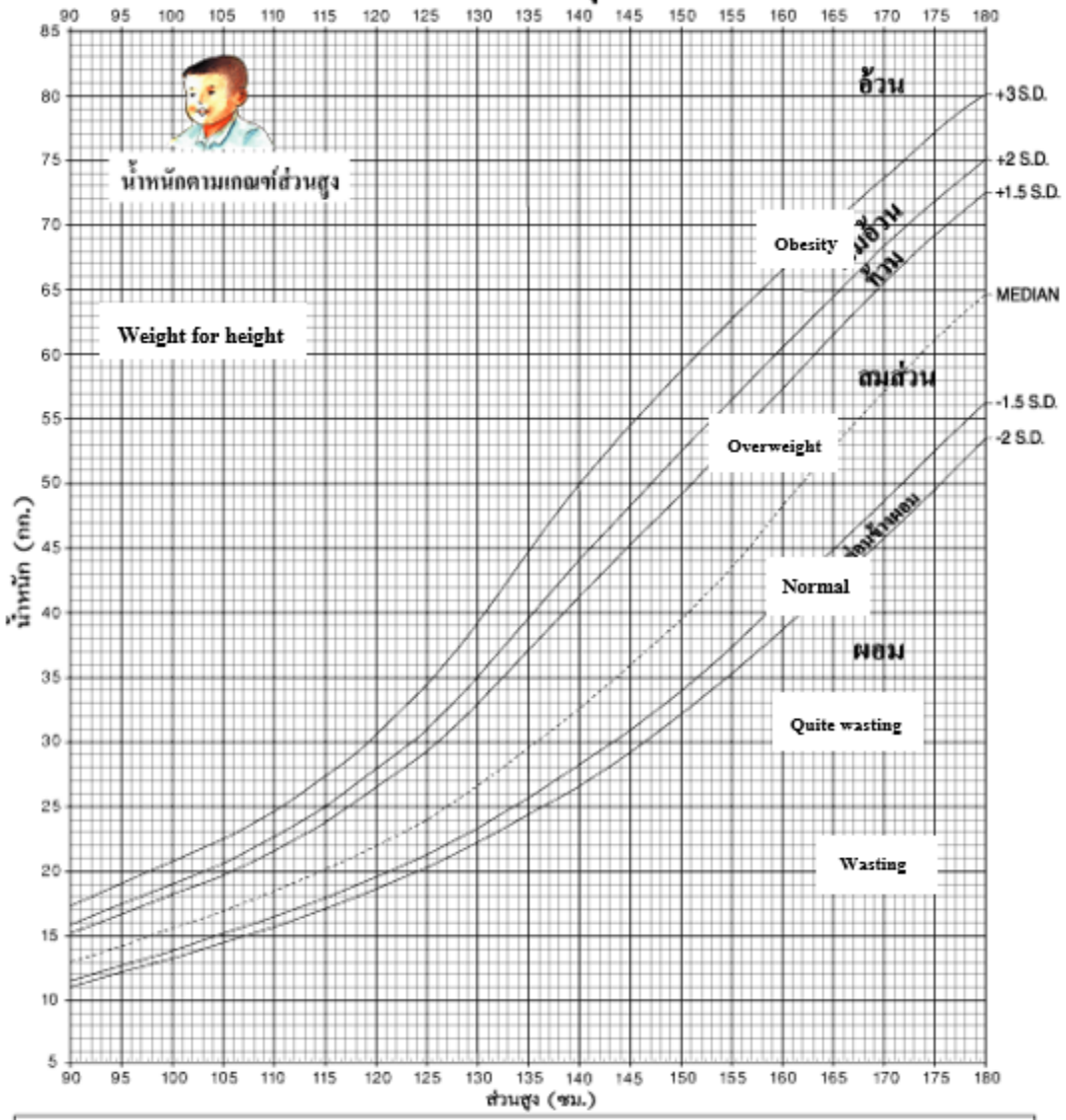
The results of this study demonstrated oral health problems of 4 primary school children in Bangkok. High prevalence of gingivitis were reported of 76.8% and caries in primary teeth of grade 1 children were 82.6%. These still be the oral health problem in this target group. School and oral hygiene significantly related to gingivitis with OR= 3.55 (95% CI = 1.71, 7.37) and OR = 19.05 (95 % CI = 5.12, 71.24). For caries in deciduous teeth, only poor oral hygiene effecting on dmft level with OR=12.04; 95% CI =1.11, 131.28. While, gender, educational level and underlying diseases have significant association with DMFT level, OR=2.32 (95% CI=1.25, 4.32), OR= 2.05 (95% CI=1.04, 4.06) and OR= 4.09 (95% CI=2.01, 8.32), respectively.

Additionally, the estimated costs of school oral health program, Faculty of Dentistry, Mahidol University in academic year 2015 was 1,373,754.39 baht comprised of labor cost (20.85%), material cost (8.45%), capital cost (42.73%) and miscellaneous (27.97%). Capitation of this program equal to 2,348.298 baht per child. Salaries of supervisor, costs of equipment and material for sealant, PRR and filling were a majority part of labor costs, capital costs and material costs respectively. Particularly, in capital cost and material costs were accountable for more than half of total costs.

APPENDIX

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

กราฟแสดงเกณฑ์อ้างอิงการเจริญเติบโต
ของเพศชาย อายุ 5–18 ปี



วิธีการอ่านกราฟ

น้ำหนักตามเกณฑ์ส่วนสูง แสดงความอ้วน–ผอม

ดูส่วนสูงตามแนวนอนว่าอยู่ที่จุดใด แล้วไล่ขึ้นตามแนวตั้งว่าตรงกับน้ำหนักที่จุดใด อ่านผลตามเกณฑ์นั้น : อ้วน เริ่มอ้วน ท้วม สมส่วน ค่อนข้างผอม ผอม

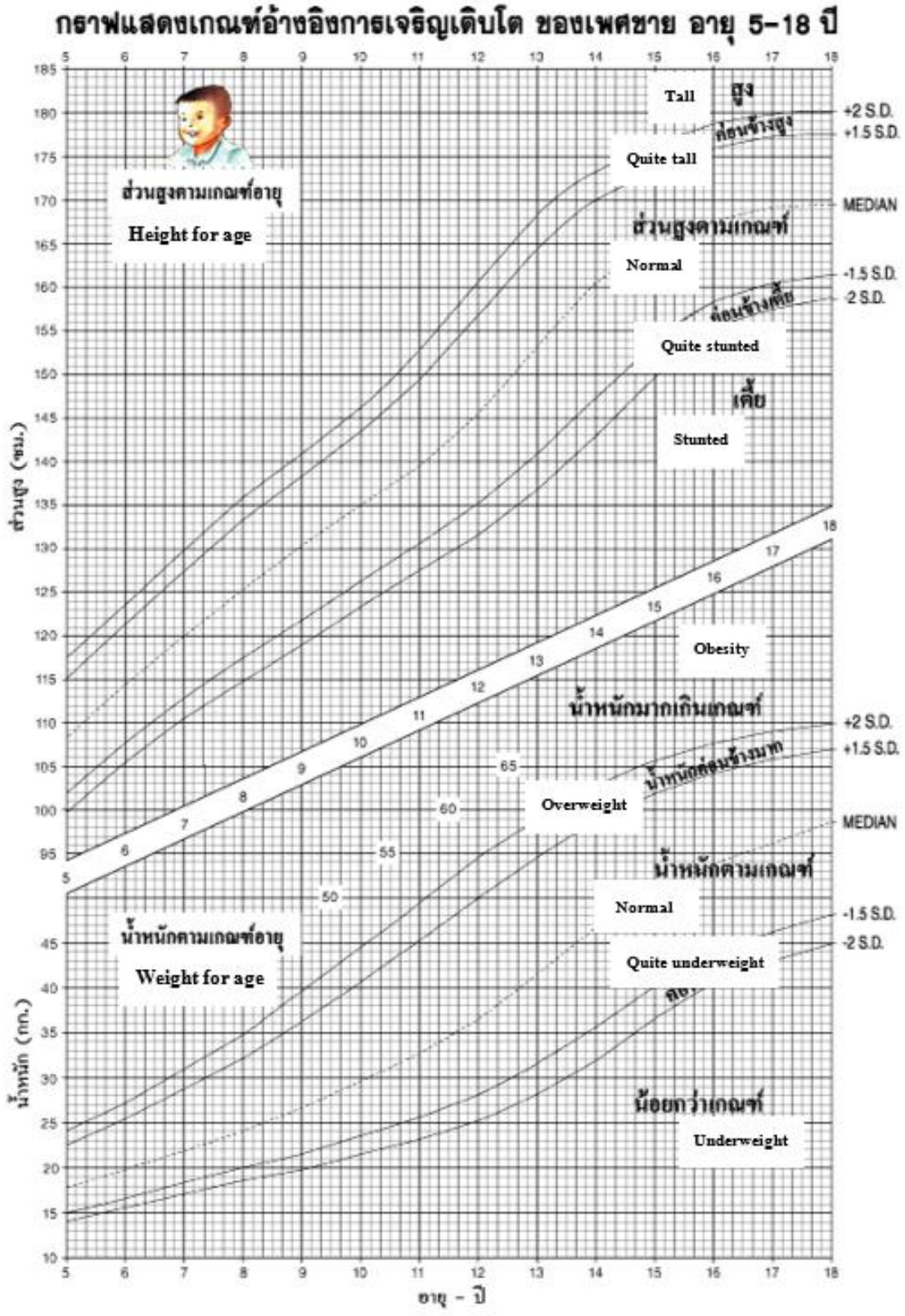
ส่วนสูงตามเกณฑ์อายุ แสดงการเจริญเติบโตด้านความสูง

ดูอายุตามแนวนอนว่าอยู่ที่จุดใด แล้วไล่ขึ้นตามแนวตั้งว่าตรงกับส่วนสูงที่จุดใด อ่านผลตามเกณฑ์ส่วนสูงนั้น : สูง ค่อนข้างสูง ส่วนสูงตามเกณฑ์ ค่อนข้างเตี้ย เตี้ย

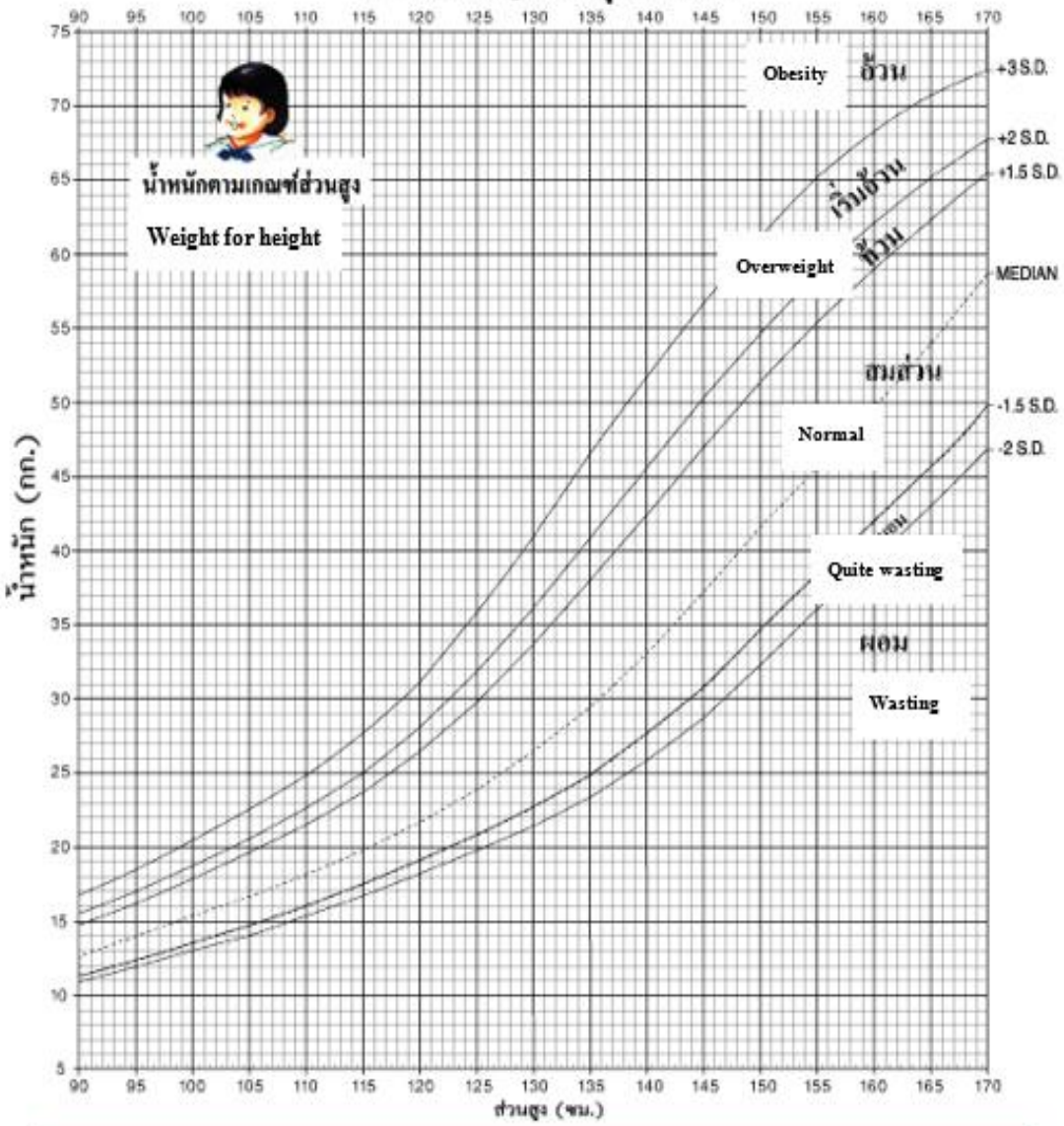
น้ำหนักตามเกณฑ์อายุ แสดงการเจริญเติบโตด้านน้ำหนัก

ดูอายุตามแนวนอนว่าอยู่ที่จุดใด แล้วไล่ขึ้นตามแนวตั้งว่าตรงกับน้ำหนักที่จุดใด อ่านผลตามเกณฑ์น้ำหนักนั้น : น้ำหนักมากเกินเกณฑ์ น้ำหนักค่อนข้างมาก น้ำหนักตามเกณฑ์ ค่อนข้างน้อย น้อยกว่าเกณฑ์

ข้อมูล : กรมอนามัย กระทรวงสาธารณสุข พ.ศ. 2542 เกณฑ์อ้างอิง น้ำหนัก ส่วนสูง และเครื่องชี้วัดภาวะโภชนาการของประชาชนไทย อายุ 1 วัน – 19 ปี


กราฟแสดงเกณฑ์อ้างอิงการเจริญเติบโต ของเพศชาย อายุ 5-18 ปี
ส่วนสูงตามเกณฑ์อายุ
Height for age
น้ำหนักตามเกณฑ์อายุ
Weight for age
Tall
สูง
+2 S.D.
ค่อนข้างสูง
+1.5 S.D.
Quite tall
MEDIAN
ส่วนสูงตามเกณฑ์
Normal
-1.5 S.D.
ค่อนข้างเตี้ย
-2 S.D.
Quite stunted
เตี้ย
Stunted
Obesity
น้ำหนักมากเกินเกณฑ์
+2 S.D.
น้ำหนักค่อนข้างมาก
+1.5 S.D.
Overweight
MEDIAN
น้ำหนักตามเกณฑ์
Normal
-1.5 S.D.
Quite underweight
-2 S.D.
น้อยกว่าเกณฑ์
Underweight
ส่วนสูง (ซม.)
น้ำหนัก (กก.)
อายุ - ปี

กราฟแสดงเกณฑ์อ้างอิงการเจริญเติบโต
ของเพศหญิง อายุ 5–18 ปี



การแปลผลจากกราฟ

น้ำหนักตามเกณฑ์ส่วนสูง

เป็นดัชนีบ่งชี้น้ำหนักตามระดับส่วนสูงหรือไม่ สามารถนำผลการวินิจฉัยได้โดยไม่ต้องทราบอายุ หรือ ถ้าร่างกายแข็งแรงดีแต่ผอมลงจากเดิมเล็กน้อย ร่างกายแข็งแรง น้ำหนักตามเกณฑ์ส่วนสูงจะมีค่าน้อยกว่าปกติ แต่ก็ให้ผลการตัดสินที่ตรงกับความต้องการของร่างกาย น้ำหนักตามเกณฑ์ส่วนสูงจะเป็นดัชนีบ่งชี้ภาวะขาดอาหารเฉียบพลัน หรือผอมได้ดีที่สุด

ส่วนสูงตามเกณฑ์อายุ

เป็นดัชนีบ่งชี้ภาวะโภชนาการระยะยาวที่ผ่านมาว่าส่วนสูงตามระดับอายุหรือไม่ ถ้าร่างกายมีการขาดสารอาหารมาเป็นเวลานานจะมีผลทำให้การเจริญเติบโตทางกระดูกช้าลง ทำให้ส่งผลต่อการเจริญเติบโตทางสติปัญญาด้วย

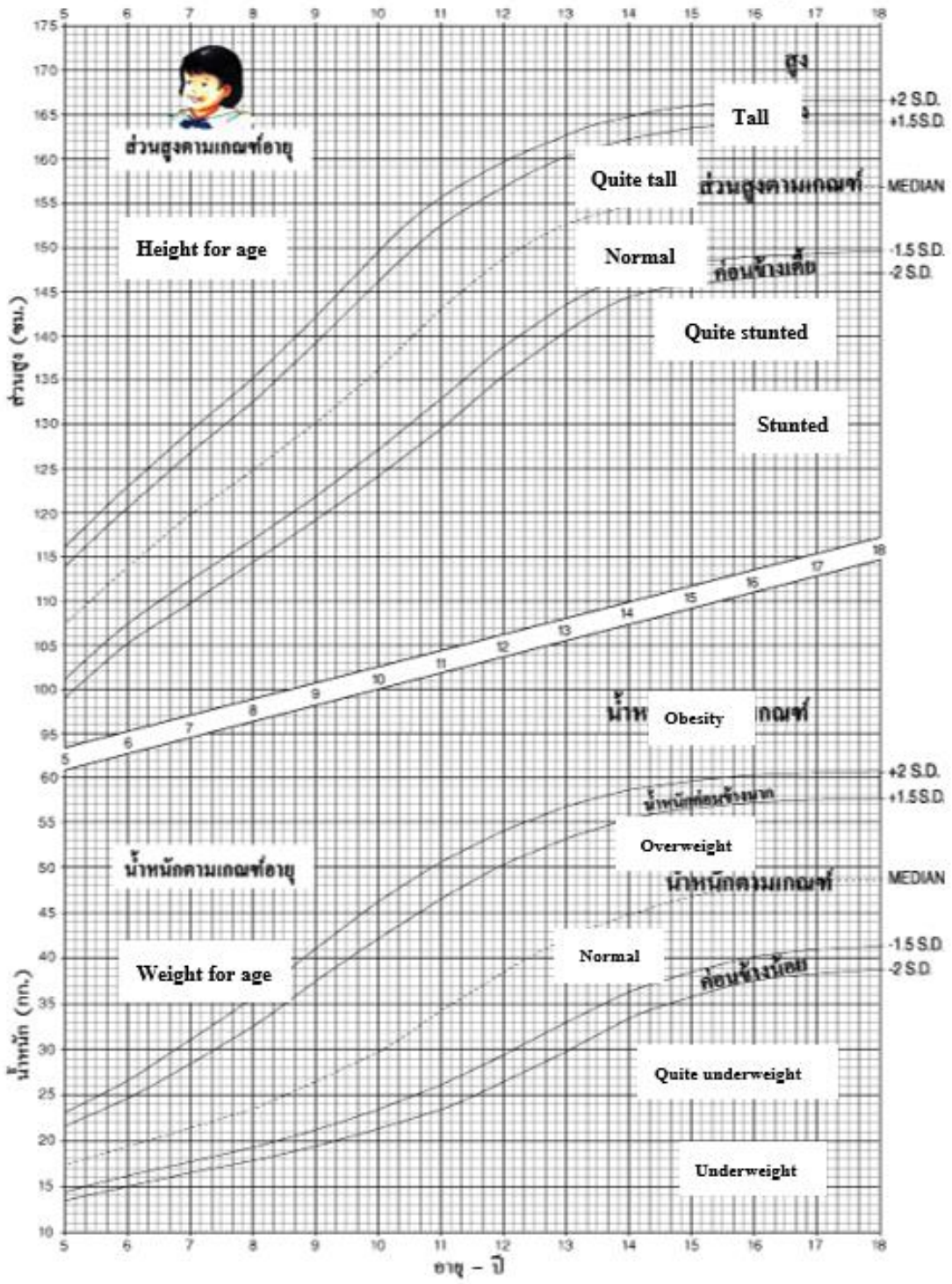
น้ำหนักตามเกณฑ์อายุ

เป็นดัชนีบ่งชี้น้ำหนักตามระดับอายุหรือไม่ ถ้าร่างกายขาดอาหารหรือเจ็บป่วยจะมีผลกระทบต่อขนาดของร่างกายทำให้น้ำหนักลดลง และถ้าขาดอาหารระยะยาวติดจะผอมลงด้วย ดังนั้นน้ำหนักน้อยโดยอาจผอมหรือไม่ จะบ่งชี้การขาดสารอาหารโดยรวม และสามารถใช้ในการติดตามการเติบโตของเด็กได้

หมายเหตุ : เกณฑ์การประเมินการเจริญเติบโตของเด็กวัยเรียนที่เหมาะสม ควรใช้ดัชนีส่วนสูงตามเกณฑ์อายุ น้ำหนักตามเกณฑ์ส่วนสูง ร่วมกับน้ำหนักตามเกณฑ์อายุ

ข้อมูล : กรมอนามัย กระทรวงสาธารณสุข พ.ศ. 2542 เกณฑ์อ้างอิง น้ำหนัก ส่วนสูง และเครื่องชี้วัดภาวะโภชนาการของประชาชนไทย อายุ 1 วัน – 19 ปี

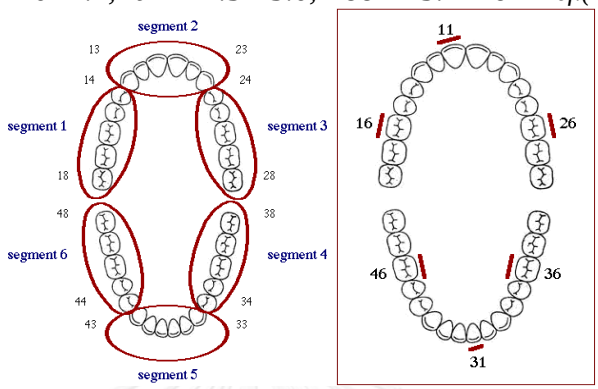
กราฟแสดงเกณฑ์อ้างอิงการเจริญเติบโต ของเพศหญิง อายุ 5–18 ปี



Simplified Oral Hygiene Index: calculated from two components: OHI-S = DI-S + CI-S

The six representative teeth that are selected for this index consists of 4 posterior teeth which are the first completely erupted molars. Buccal surfaces are used for scoring on the maxilla and lingual surface on mandible. Other two are labial surfaces of the maxillary right central incisor and mandibular left central incisor, if one of these teeth are missing, the next tooth in the same segment would be used for the index.(10)

The level are: Good = 0 -1.2, fair = 1.3 - 3.0, Poor = 3.1 – 6 *Ref.(24)*



Simplified Debris Index (DI-S)

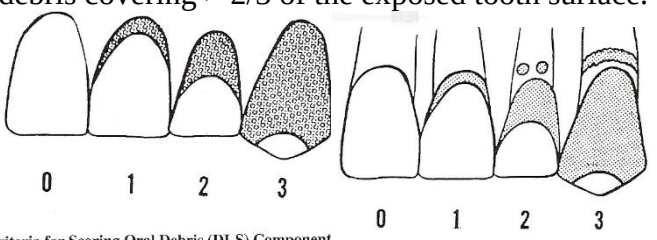
The criteria for the DI-S assigning scores of 0-3

0 = No present debris or stain.

1 = Soft debris not cover > 1/3 of the tooth surface being examined or the presence of extrinsic stains without debris of covered surface area.

2 = Soft debris cover > 1/3 but not > 2/3 of the exposed tooth surface.

3 = Soft debris covering > 2/3 of the exposed tooth surface.



Criteria for Scoring Oral Debris (DI-S) Component of the Simplified Oral Hygiene Index (OHI-S)

Criteria for Scoring Calculus (CI-S) Component of the Simplified Oral Hygiene Index (OHI-S).

Simplified Calculus Index (CI-S)

0 = No calculus present

1 = Supra gingival calculus not cover > 1/3 of the exposed tooth surface.

2 = Supra gingival calculus cover > 1/3 but not > 2/3 of the exposed tooth surface or the presence of individual flecks of sub gingival calculus around the cervical portion of the tooth or both.

3= Supra gingival calculus cover > 2/3 of the exposed tooth surface or a continuous heavy band of sub gingival calculus around the cervical portion of the tooth or both.

Caries Index

Caries Index: use DMFT and DMFS present the number of dental cavity in each individual. DMFT and DMFS are means to numerically definite the prevalence of caries, obtained by calculating the number of Decayed (D), Missing (M), and Filled (F)

DMFT and DMFS = D+M+F teeth (T) or surfaces (S).

D: Decayed teeth which include: Carious tooth, Filled tooth with recurrent decay or other surface decayed, retained root, Defect filling with caries and Temporary filling

M: Missing teeth due to caries other cases should be excluded.

F: Filled teeth due to caries. Teeth were considered filled without decay when one or more permanent restorations were present and there was no secondary (recurrent) caries or other area of the tooth with primary caries. A tooth with a crown placed because of previous decay was recorded in this category. Teeth stored for reason other than dental caries should be excluded.

A tooth is considered to be erupted when just the cusp tip of the chewing surface or incisor edge is exposed. The excluded teeth in the DMF index are: Supernumerary teeth and the third molar according to Klein, Palmer and Knutson.

DMFS

Retained root, Missing tooth and tooth with crown, each tooth was recorded scored as 4 surfaces for anterior teeth and 5 surfaces for posterior teeth.

The same way for primary teeth dmft(s).

Calculation of DMFT \ DMFS:

For individual: DMF = D + M + F

For population: Mean DMF = Total DMF ⁄ Total No. of the subjects examined

WHO generated a scale to classify caries severity: DMFT values between 0.0 and 1.1 were very low; 1.2–2.6 were low; 2.7–4.4 were moderate, 4.5–6.5 were high, and values exceeding 6.6 were very high.(14, 18)

For primary dentition, caries risk was based on baseline dmft index: low (dmft=0), moderate (dmft=1-4), high (dmft >4), with almost half of the teeth belonging to the high-risk group.(22)

Labor cost for Mahidol dental program

Type of personnel	Personnel monthly Remuneration	Total hours work /year	Personnel pay/hour	Working hrs. for school program	Personnel Labor Cost
Supervisor A B C D E F G		1920		Depend	144,967.69
Dental assistant A B C		1920		288	77,364.00
Car driver A B C		1920		288	64,116.00
Type of personnel	**Personnel monthly Remuneration**	**Total area work (sq.m.)**	**Personnel pay/sq.m.**	**Working area for program**	**Personnel Labor Cost**
House keeper		4723.2		436.2	8,311.74
Total					**294,759.40**

Material Cost lists

รายการ	used	unit	Price/unit	Total amount
Dental floss	2		159.00	318.00
Pumice 0.5 KG	1		118.86	118.86
Saliva suction	5		68.00	340.00
Cotton Roll 450 g	1		95.34	95.34
Gauze 36” x100yd	1		900.00	900.00
Mandrel ,rubber cup 1:12	6	PAC	290.38	1742.28
Erythrosine	1		45.62	45.62
แก้วพลาสติกใช้แล้วทิ้ง	50		0.35	17.50
				3577.60
Fluoride gel	1		751.22	751.22
Fluoride paste	2		1050.00	2100.00
Fluoride varnish	3		1284.00	3852.00
Fluoride tray	60		45.00	2700.00
				9403.22
Vitrebond Plus	1		3600.00	3600.00
IRM standard pack ivary	1		1182.00	1182.00
Composite Z350 A3D	2		898.80	1797.60
Composite Z 250 A305	0		898.80	0.00
Composite Flowable	3		1502.72	4508.16
Bonding single bond	2		2610.00	5220.00
Sealant	3		1412.00	4236.00
Etching solution	1		26616.82	26616.82
GI Fuji VII	1		1813.08	1813.08
GI Fuji II LC	2		3925.23	7850.46
GI Fuji IX	1		2411.21	2411.21
Calcium hydroxide 24gm	1		580.00	580.00
Micro Applicators.microbrush	4		130.38	521.52
Micro Applicators.ultrabrush	3		280.00	840.00

รายการ	used	unit	Price/unit	Total amount
Diamond bur 009	24		84.11	2018.64
Steel bur 008 Round ก้านสั้น	36		16.82	605.52
Steel bur 010 Round ก้านสั้น	0		17.98	0.00
Steel bur 012 Round ก้านสั้น	0		16.37	0.00
Stone bur short shank,flame white	18		23.36	420.48
Stone bur airotor, flame white	24		23.36	560.64
Articulating paper	1		258.02	258.02
				65040.15
Mask surgical	18		51.55	927.90
Cover head (1/50)	17		34.25	582.25
Glove Disposable ,non-powder no.xs	12		120.00	1440.00
Glove Disposable ,non-powder no.s	10		120.00	1200.00
Glove Disposable ,non-powder no.m	8		120.00	960.00
Glove Disposable ,powder no.xs	2		100.00	200.00
Glove Disposable ,powder no.s	18		100.00	1800.00
Glove Disposable ,powder no.m	8		100.00	800.00
				7910.15
Para 500mg	6		0.50	3.00
Benzocaine	1		300.34	300.34
				303.34
Autoclave Tape ¾”	1		221.49	221.49
Dry heat Indicatorlabel	1		150.00	150.00
Eo Indicator Tape	1		385.00	385.00
Hydrex surgical scrup 5l	2		800.00	1600.00
Gobble plus 2l	2		860.00	1720.00
ซองใส่เครื่องมือsterileขนาด 5cm.	1		480.00	480.00
ซองใส่เครื่องมือsterileขนาด 7.5cm.	1		640.00	640.00
ซองใส่เครื่องมือsterileขนาด 10cm.	0		800.00	0.00
ซองใส่เครื่องมือsterileขยายข้าง	2		1448.60	2897.20

รายการ	used	unit	Price/unit	Total amount
Code ring แดง	1		346.11	346.11
Caviwipes	4		238.00	952.00
Rapidmalti enzyme cleaner	1		2746.33	2746.33
Alcohol 70 %	1		255.00	255.00
Alcohol hand gel(1:1000 ml)	1		85.00	85.00
Disinfection towe lettes 11b.130Oz.	12	can	238.00	2856.00
Napkin 45x30cm	1	bag	693.36	693.36
กระดาษอเนกประสงค์1:24ม้วน	2	pac	639.36	1278.72
Sterile water 1,000 ml	14		29.00	406.00
ซองพลาสติกเอนกประสงค์	1	PAC	305.47	305.47
เสื้อพลาสติกกันเปื้อน 28 x25 นิ้ว	1	PAC	48.00	48.00
ถุงมือล้างเครื่องมือ	2		35.00	70.00
กระดาษฟอยด์	2		40.00	80.00
ถุงผ้าสวมหัวกรอ	7		2.72	19.04
ถุงขยะดำ 20x20 นิ้ว	6		48.15	288.90
ถุงขยะดำ 24x28 นิ้ว	1		48.15	48.15
ถุงขยะแดง 24x28 นิ้ว	1		48.15	48.15
ถุงหูหิ้ว6X14 นิ้ว	1		48.15	48.15
Total				**18668.07**

Capital cost for preventive clinic

Asset description	∑Curr.acq .value	Quantity	Total amount	ปีงบที่ได้มา	Used year	depreciation cost
เครื่องมือตรวจ	200.00	15	3,000.00	2518	40	75.00
ถาดสแตนเลสพร้อมฝาปิดขนาด 8"x12"	300.00	6	1,800.00	2519	39	46.15
ชุดนอนสนาม	1,200.00	1	1,200.00	2526	32	37.50
เครื่องกำเนิดไฟฟ้า	6,500.00	1	6,500.00	2527	31	209.68
เครื่องกำเนิดไฟฟ้า	9,000.00	2	18,000.00	2529	29	620.69
เครื่องวัดความดัน	1,400.00	1	1,400.00	2529	29	48.28
เครื่องดูดน้ำลายแรงสุง ชนิดเคลื่อนที่ได้	15,000.00	2	30,000.00	2532	26	1153.85
โคมไฟให้แสงสว่าง ชนิดหลอดฮาโลเจน ยี่ห้อ Frasago สีขาว	14,500.00	1	14,500.00	2534	24	604.17
โคมไฟส่องปากชนิดเคลื่อนที่ได้	3,500.00	4	14,000.00	2534	24	583.33
ชุดโคมไฟส่องปากชนิดเคลื่อนที่ ยี่ห้อ Frasago	16,000.00	1	16,000.00	2535	23	695.65
ชุดโคมไฟส่องปากชนิดเคลื่อนที่	18,000.00	6	108,000.00	2537	21	5142.86
เครื่องทำลม ขนาด 1.5 แรงม้า ระบบ Oilless ยี่ห้อ ฟินิ รุ่น Corsair 150 Oilless	48,150.00	2	96,300.00	2538	20	4815.00
เครื่องเทปชิงโครไนซ์ แบบ Dissolves ยี่ห้อ Califone รุ่น 5275 AV	22,000.00	1	22,000.00	2538	20	1100.00
วัสดุ	45,750.00	1	45,750.00	2539	19	2407.9
เก้าอี้สนาม	9,000.00	1	9,000.00	2540	18	500.00
โคมไฟส่องปากสนาม	7,000.00	1	7,000.00	2540	18	388.88
เครื่องอัดอากาศ ขนาด 1.5 แรงม้า	29,960.00	3	89,880.00	2544	14	6420.00
หมอนรองศีรษะผู้ป่วยชนิดปรับองศาได้	4,500.00	6	27,000.00	2546	12	2250.00
เครื่องอัดอากาศ ขนาด 1.5 แรงม้า	27,500.00	1	27,500.00	2548	10	2750.00
เครื่องอัดอากาศขนาด 1.5 HP	25,000.00	1	25,000.00	2549	9	2777.78
โคมไฟส่องปากสำหรับปฏิบัติการนอกสถานที่ ยี่ห้อ Waldmann	28,000.00	8	224,000.00	2550	8	28000.00
โคมไฟส่องปากสำหรับปฏิบัติงานนอกสถานที่ ยี่ห้อ Waldmann รุ่น HI 20	28,000.00	6	168,000.00	2551	7	24000.00
						84,626.71
ตู้เก็บเครื่องมือ (Carbinet)	19,191.52	1	19,191.52	2536	22	872.34
เครื่องนึ่งชนิดตลับ แบบ ข. ยี่ห้อ Stalim	100,000.00	1	100,000.00	2537	21	4761.90
หม้อต้มเครื่องมือไฟฟ้า	9,000.00	1	9,000.00	2539	19	473.68

Asset description	∑Curr.acq .value	Quantity	Total amount	ปีงบที่ได้มา	Used year	depreciation cost
เครื่องปิดผนึกถุงใส่เครื่องมือฆ่าเชื้อ	19,500.00	1	19,500.00	2540	18	1083.33
เครื่องล้างและหล่อลื่นหัวกรอ ยี่ห้อ W&H	45,000.00	1	45,000.00	2541	17	2647.06
รถเข็นสเตนเลส	4,600.00	2	9,200.00	2545	13	707.69
เครื่องอบฆ่าเชื้อความร้อนแห้ง ยี่ห้อ Memert รุ่น UM 500	41,730.00	1	41,730.00	2546	12	3477.50
เครื่องนึ่งไอน้ำแบบตลับ ยี่ห้อ Scican รุ่น Statim 2000	198,000.00	1	198,000.00	2551	7	28285.71
รถเข็นใส่ผ้าเปื้อน	18,000.00	1	18,000.00	2556	2	9000.00
รถเข็นชุดห่อเครื่องมือส่งอบนึ่งฆ่าเชื้อ	24,259.38	1	24,259.38	2556	2	12,129.69
เครื่องปิดผนึกซองพลาสติก ยี่ห้อ B.A.INTERNATIONALรุ่น ULTIMATE SEAL BASE700	30,000.00	1	30,000.00	2557	1	30,000.00
						93,438.92
เครื่องมือขูดหินปูน	1,440.00	2	2,880.00	2522	36	80.00
เครื่องขูดหินน้ำลาย ชนิดเคลื่อนที่ ยี่ห้อ Autotrac	37,985.00	1	37,985.00	2535	23	1651.52
หัวต่อขัดฟันชนิดหักมุม	790.00	6	4,740.00	2536	22	215.45
เครื่องขูดหินน้ำลาย ชนิดเคลื่อนที่ ยี่ห้อ EMS	55,000.00	2	110,000.00	2537	21	5238.09
						7,185.07
เครื่องมืออุดฟัน	1,800.00	2	3,600.00	2522	36	100.00
เครื่องกรอฟันไฟฟ้า	8,250.00	2	16,500.00	2525	33	500.00
เครื่องฉายแสงอุดฟัน	17,000.00	1	17,000.00	2530	28	607.14
หัวแอร์โรเตอร์ ยี่ห้อ Kavo รุ่น 634 A	6,500.00	2	13,000.00	2533	25	520.00
หัวคอนทราแองเกิล (Contra Angle)	4,000.00	2	8,000.00	2533	25	320.00
ชุดเครื่องกรอฟันความเร็วสูง ชนิดเคลื่อนที่ ยี่ห้อ J.Morita รุ่น Portacare	43,000.00	1	43,000.00	2535	23	1,869.57
ชุดเครื่องกรอฟันความเร็วสูง ชนิดเคลื่อนที่ ยี่ห้อ J. MORITA รุ่น portacare 21	515,000.00	2	#########	2536	22	46818.18
เครื่องกรอฟันความเร็วสูง (Airotor) ยี่ห้อ W&H แบบ topair 798	10,500.00	2	21,000.00	2537	21	1,000.00
ข้อต่อเครื่องกรอความเร็วสูง (Coupling Joint)	3,500.00	2	7,000.00	2537	21	333.33
เครื่องขัดฟันความเร็วต่ำ (AR-ES)	2,250.00	2	4,500.00	2537	21	214.29

Asset description	∑Curr.acq .value	Quantity	Total amount	ปีงบที่ได้มา	Used year	depreciation cost
ชุดเครื่องกรอฟันชนิดเคลื่อนที่	118,000.00	6	708,000.00	2538	20	35,400.00
หัวกรอความเร็วสูง ชนิด Ball Bearing ยี่ห้อ J.Morita รุ่น PAR-S-O	35,000.00	1	35,000.00	2539	19	1,842.11
หัวกรอความเร็วสูง ชนิด Air Bearing ยี่ห้อ J.Morita รุ่น PAT-C-O	45,750.00	1	45,750.00	2539	19	2,407.90
เครื่องปั่นอมัลกัม ยี่ห้อ Vivadent	22,000.00	1	22,000.00	2540	18	1,222.22
ชุดเครื่องกรอฟัน ยี่ห้อ T.D.P. รุ่น Portable Dental Unit	161,000.00	4	644,000.00	2544	14	46,000.00
เครื่องฉายแสง	17,073.50	2	34,147.00	2544	14	2,439.07
เครื่องฉายแสงวัสดุอุดฟัน ยี่ห้อ 3 M รุ่น XL 2500	17,173.50	2	34,347.00	2544	14	2,453.36
เครื่องฉายแสงวัสดุอุดฟัน พร้อมกระเป๋า ยี่ห้อ 3MESPE รุ่น Elipar Trilight	26,599.13	3	79,797.39	2546	12	6649.783
เครื่องฉายแสง Elipar FreeLight	44,940.00	3	134,820.00	2547	11	12,256.36
เครื่องกรอฟันเคลื่อนที่ ยี่ห้อ T.D.P.	193,250.00	2	386,500.00	2548	10	38,650.00
เครื่องฉายแสง	15,000.00	2	30,000.00	2548	10	3,000.00
เครื่องฉายแสง	16,000.00	2	32,000.00	2549	9	3,555.56
เครื่องกรอฟันเคลื่อนที่	201,500.00	2	403,000.00	2549	9	44,777.78
เครื่องกรอฟันเคลื่อนที่พร้อมเครื่องอัดอากาศ	240,000.00	1	240,000.00	2552	6	40,000.00
เครื่องปั่นและผสมสารอุดฟัน ยี่ห้อ Silamat S6	23,500.00	1	23,500.00	2553	5	4,700.00
ชุดปฏิบัติการทางทันตกรรมเคลื่อนที่ พร้อมเครื่องอัดอากาศและเครื่องฉายแสงวัสดุอุดฟัน	230,000.00	1	230,000.00	2553	5	46,000.00
เครื่องฉายแสงชนิดไร้สาย ยี่ห้อ Ivoclar vivadent รุ่น Bluephasenew	37,000.00	4	148,000.00	2553	5	29,600.00
Dycal carrier	50.00	40	2,000	2559	1	2,000.00
						375,236.60
เครื่องมือ Simple Extractiong	2,500.00	6	15,000.00	2518	40	375
เครื่องมือถอนฟัน	5,000.00	1	5,000.00	2526	32	156.25
ชุดแคะรากฟัน	450.00	4	1,800.00	2519	39	46.15385
ชุดเข็มฉีดยา	550.00	8	4,400.00	2519	39	112.8205
						690.2244
			Total			**561,177.5**

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

Capital cost of department

	Asset description 1 ชื่อ /รายละเอียดสินทรัพย์	Quantity จำนวน	∑Curr.acq.value ราคาที่ได้มา(บาท)	total amount	ปีงบที่ได้มา	used years	cost
1	โซฟา	1	920.00	920.00	2517	41	22.44
2	ตู้เหล็กบานเปิด	1	850.00	850.00	2520	38	22.37
3	ตู้เหล็กเก็บเอกสาร 4 ลิ้นชัก	1	850.00	850.00	2521	37	22.97
4	ตู้เก็บของพร้อมตู้ลอยติดผนังกำแพง	1	5,000.00	5,000.00	2524	34	147.06
5	ตู้เหล็กเก็บหนังสือ	1	3,690.00	3,690.00	2527	31	119.03
6	ตู้เหล็กบานเลื่อน	1	3,400.00	3,400.00	2527	31	109.68
7	ตู้ไม้บุฟอไมก้าเคลื่อนที่ได้	1	1,500.00	1,500.00	2529	29	51.72
8	ตู้เหล็กเก็บเอกสาร 2 บานเปิด	1	1,800.00	1,800.00	2532	26	69.23
9	โต๊ะวางคอมพิวเตอร์	1	3,846.00	3,846.00	2533	25	153.84
10	เครื่องรับโทรทัศน์สี ขนาด 14 นิ้ว	1	9,250.00	9,250.00	2533	25	370.00
11	โทรศัพท์	1	1,337.50	1,337.50	2537	21	63.69
12	เก้าอี้ ระดับ 7-9	8	1,300.00	10,400.00	2537	21	495.24
20	เก้าอี้	3	1,300.00	3,900.00	2537	21	185.71
23	โต๊ะตรงขนาด 2 ที่นั่ง	1	3,063.82	3,063.82	2537	21	145.90
24	ตู้เก็บเครื่องมือ (Carbinet)	3	19,191.52	57,574.56	2537	21	2,741.65
27	ตู้เหล็กบานเลื่อน 2 ตอน	1	4,280.00	4,280.00	2538	20	214.00
28	ตู้เก็บแบบฟอร์ม 15 ลิ้นชัก	1	1,900.00	1,900.00	2538	20	95.00
29	ตู้เก็บแบบฟร์อม 15 ลิ้นชัก	1	2,300.00	2,300.00	2539	19	121.05
31	โต๊ะวางคอมพิวเตอร์	1	45,381.78	45,381.78	2541	17	2,669.52
33	โต๊ะวางเครื่องคอมพิวเตอร์	2	1,765.50	3,531.00	2543	15	235.40
35	ตู้เหล็กบานเลื่อนทึบ	1	2,108.76	2,108.76	2543	15	140.58

	Asset description 1 ชื่อ /รายละเอียดสินทรัพย์	Quantity จำนวน	∑Curr.acq.value ราคาที่ได้มา(บาท)	total amount	ปีงบที่ได้มา	used years	cost
36	ตู้เหล็ก 2 บาน	1	2,100.00	2,100.00	2543	15	140.00
37	เครื่องฉายภาพและแสดงผล	1	162,000.00	162,000.00	2544	14	11,571.43
38	จอรับภาพขนาด 100 นิ้ว (60"*80") ควบคุมด้วยมอเตอร์	1	55,000.00	55,000.00	2544	14	3,928.57
39	เครื่องเล่นและบันทึกวิดีโอเทป	1	7,500.00	7,500.00	2544	14	535.71
40	เครื่องผสมสัญญาณเสียง ขนาด 12 ช่อง	1	26,000.00	26,000.00	2544	14	1,857.14
41	เครื่องปรับแต่งเสียง ชนิด 31 ช่อง	1	27,000.00	27,000.00	2544	14	1,928.57
42	เครื่องเลือกสัญญาณภาพ	1	14,000.00	14,000.00	2544	14	1,000.00
43	เครื่องขยายเสียง ขนาด 160W + 160W	1	26,000.00	26,000.00	2544	14	1,857.14
44	ลำโพง 2 ทาง ขนาด 160 วัตต์	4	11,000.00	44,000.00	2544	14	3,142.86
48	เครื่องเล่นและบันทึกเทปคลับคู่	1	12,650.00	12,650.00	2544	14	903.57
49	ขายึดลำโพงติดผนัง (Local)	4	1,000.00	4,000.00	2544	14	285.71
53	เครื่องบันทึกแผ่น CD	1	11,513.20	11,513.20	2544	14	822.37
54	เครื่องพิมพ์เลเซอร์	1	16,966.15	16,966.15	2545	13	1,305.09
55	เครื่องสแกนเนอร์ (Scanner)	1	5,500.00	5,500.00	2545	13	423.08
56	ตู้บานเลื่อนกระจก 2 ตอนพร้อมแผ่นไม้หลังตู้	1	10,374.00	10,374.00	2546	12	864.50
57	กล้องถ่ายรูประบบดิจิตอล	1	38,948.00	38,948.00	2546	12	3,245.67
58	ตู้บานเลื่อนกระจกพร้อมแผ่นไม้หลังตู้	3	3,000.00	9,000.00	2546	12	750.00
61	ตู้บานเลื่อนกระจกพร้อมแผ่นไม้หลังตู้และขารองตู้	4	3,200.00	12,800.00	2547	11	1,163.64
65	โต๊ะวางเครื่องคอมพิวเตอร์ ขนาด 80x60x75 ซม.	1	1,960.00	1,960.00	2547	11	178.18
66	เครื่องไมโครคอมพิวเตอร์ ชุด ก.	1	33,405.00	33,405.00	2548	10	3,340.50
67	เครื่องไมโครคอมพิวเตอร์	1	35,096.00	35,096.00	2548	10	3,509.60
68	โต๊ะวางเครื่องคอมพิวเตอร์	1	1,284.00	1,284.00	2548	10	128.40

	Asset description 1 ชื่อ /รายละเอียดสินทรัพย์	Quantity จำนวน	∑Curr.acq.value ราคาที่ได้มา(บาท)	total amount	ปีงบที่ได้มา	used years	cost
69	รถเข็นของสแตนเลส 2 ชั้น	1	4,000.00	4,000.00	2548	10	400.00
70	ตู้บานเลื่อนกระจกพร้อมฐานรอง	1	2,835.00	2,835.00	2549	9	315.00
71	ตู้บานเลื่อนกระจกพร้อมฐานรอง	5	2,663.00	13,315.00	2549	9	1,479.44
76	ตู้บานเลื่อนทึบพร้อมขารอง	1	2,628.00	2,628.00	2549	9	292.00
77	ตู้บานเลื่อนกระจกพร้อมฐานรอง	1	2,835.00	2,835.00	2549	9	315.00
78	จอรับภาพแบบเคลื่อนที่	1	5,992.00	5,992.00	2550	8	749.00
79	เครื่องคอมพิวเตอร์แบบพกพา (Note Book)	1	36,380.00	36,380.00	2550	8	4,547.50
80	เครื่องไมโครคอมพิวเตอร์ ประมวลผลทั่วไป	1	33,705.00	33,705.00	2550	8	4,213.13
81	เครื่องไมโครคอมพิวเตอร์ ประมวลผลทั่วไป	1	33,705.00	33,705.00	2550	8	4,213.13
82	เครื่องมัลติมีเดียโปรเจคเตอร์	1	44,940.00	44,940.00	2551	7	6,420.00
83	เครื่องพิมพ์เลเซอร์	1	11,235.00	11,235.00	2551	7	1,605.00
84	โทรทัศน์สี ขนาด 21 นิ้ว	1	4,990.00	4,990.00	2551	7	712.86
85	เครื่องคอมพิวเตอร์แบบพกพา	1	21,507.00	21,507.00	2552	6	3,584.50
86	เครื่องเข้าเล่มสันกาวระบบความร้อน	1	5,760.00	5,760.00	2553	5	1,152.00
87	เครื่องไมโครคอมพิวเตอร์	1	34,989.00	34,989.00	2553	5	6,997.80
88	เครื่องไมโครคอมพิวเตอร์	1	19,999.99	19,999.99	2553	5	4,000.00
141	เก้าอี้ Visitor พนักพิงขนาดเล็ก หุ้มหนังเทียม	2	4,405.77	8,811.54	2554	4	2,202.89
143	PARTITION แผงทึบรวม อุปกรณ์ปิดริม	6	4,615.57	27,693.42	2554	4	6,923.36
149	โต๊ะครึ่งวงกลมต่อข้างปิดผิว MELAMINE	1	3,146.98	3,146.98	2554	4	786.75
150	อุปกรณ์ PARTITION เสา 3 ทาง-ต่างระดับ	2	629.40	1,258.80	2554	4	314.70
152	อุปกรณ์ PARTITION เสา 4 ทาง-ต่างระดับ	2	734.30	1,468.60	2554	4	367.15
154	PARTITION แผงทึบ	38	4,405.77	167,419.26	2554	4	41,854.82

	Asset description 1 ชื่อ /รายละเอียดสินทรัพย์	Quantity จำนวน	∑Curr.acq.value ราคาที่ได้มา(บาท)	total amount	ปีงบที่ได้มา	used years	cost
193	อุปกรณ์ PARTITION เสา 2 ทาง-ต่างระดับ	7	629.40	4,405.80	2554	4	1,101.45
200	อุปกรณ์PARTITION ขาที (STABILIZER)	25	419.60	10,490.00	2554	4	2,622.50
225	โต๊ะทำงาน TD-5	6	5,018.30	30,109.80	2555	3	10,036.60
231	โต๊ะประชุมมีล้อเลื่อน	2	6,548.40	13,096.80	2555	3	4,365.60
233	โต๊ะประชุมมีล้อเลื่อน	10	6,066.90	60,669.00	2555	3	20,223.00
243	เก้าอี้พักคอย (SF-COF1)	8	5,756.60	46,052.80	2555	3	15,350.93
251	ตู้เอกสารสูง (บน 2 บานกระจกล่าง 2 บานเปิดไม้)	2	11,131.21	22,262.42	2555	3	7,420.81
253	เครื่องไมโครคอมพิวเตอร์	1	33,344.74	33,344.74	2555	3	11,114.91
254	เครื่องพิมพ์เลเซอร์	1	19,900.00	19,900.00	2555	3	6,633.33
255	เครื่องปริ้นเตอร์	1	16,990.00	16,990.00	2555	3	5,663.33
256	เก้าอี้ CH-1	9	4,012.50	36,112.50	2555	3	12,037.50
265	เก้าอี้ CH-5	24	4,012.50	96,300.00	2555	3	32,100.00
289	ตู้เอกสาร บานโล่ง	13	2,744.55	35,679.15	2555	3	11,893.05
302	ตู้เอกสาร 2 บานเลื่อน	13	4,370.95	56,822.35	2555	3	18,940.78
315	Harddisk External	4	4,390.00	17,560.00	2555	3	5,853.33
319	เครื่องถ่ายเอกสาร	1	16,900.00	16,900.00	2556	2	8,450.00
321	ค่าเชื่อมต่อและทดสอบระบบโทรศัพท์ตู้สาขาอัตโนมัติ	1	2,833.32	2,833.32	2556	2	1,416.66
322	เครื่องไมโครคอมพิวเตอร์	1	24,990.00	24,990.00	2556	2	12,495.00
323	เครื่องพิมพ์ผล	1	9,650.00	9,650.00	2556	2	4,825.00
324	เครื่องไมโครคอมพิวเตอร์	1	23,212.00	23,212.00	2556	2	11,606.00
325	เครื่องโทรศัพท์	1	1,500.00	1,500.00	2556	2	750.00
326	เครื่องโทรศัพท์	24	500.00	12,000.00	2556	2	6,000.00

	Asset description 1 ชื่อ /รายละเอียดสินทรัพย์	Quantity จำนวน	∑Curr.acq.value ราคาที่ได้มา(บาท)	total amount	ปีงบที่ได้มา	used years	cost
350	ระบบตอบรับและโอนสายอัตโนมัติแบบ 3 ข้อความ	1	2,000.00	2,000.00	2556	2	1,000.00
351	ชุดแบตเตอรี่สำรองไฟ	1	1,500.00	1,500.00	2556	2	750.00
352	จอคอมพิวเตอร์	1	3,690.00	3,690.00	2556	2	1,845.00
353	Western My Passport	1	2,890.00	2,890.00	2556	2	1,445.00
354	Western My Passport	1	2,890.00	2,890.00	2556	2	1,445.00
	Total						361,908.61

For 14 subjects → for 1 subject around 25,850.62 bath

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

Faculty of Dentistry, Mahidol University

Department of Community Dentistry

School Name

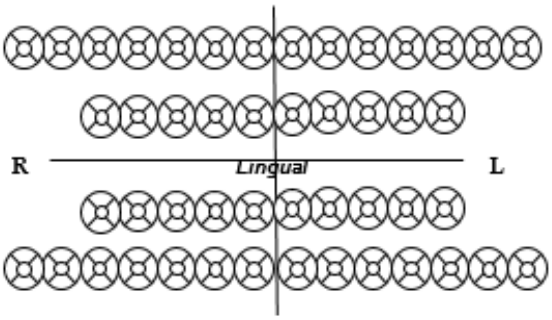
Name.....**Date of Birth** ..... **Gender**.....

BLACK : Restoration Present RED CROSS : Exfoliated / Extracted Tooth BLUE : Caries Present , Fracture BLUE P : Need PRR

BLACK CIRCLE : Unerupted Tooth BLACK S : Sealant Present BLUE S : Need Sealant

Grade ..... Examination date ..... Examiner ..... Supervisor .....

Weight ..... Height .....Congenital disease.....



DI-S =.....

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

CI-S =.....

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

OHI - S = _____

Gingivitis ☐ Yes ☐ No

dt =_____ mt =_____ft =_____dmft =_____(ให้อ่านจนลงทะเบ. 1)

B =_____Li =_____M =_____D =_____Occ =_____ (นับ caries experience จะเห็นแต่ทุกซี่)

DS =_____MS =_____FS =_____DMFS =_____

DT =_____MT =_____FT =_____DMFT =_____

Others .....

Treatment Record

Date	Tooth	Surfaces	Record	Student	Instructor
.....	....	....	....	.....	.....
.....	....	....	....	.....	.....

Date	Tooth	Surfaces	Record	Student	Instructor
.....	....	....	....	.....	.....
.....	....	....	....	.....	.....
.....	....	....	....	.....	.....

Evauation Sealant , PRR. and OHI -S

Tooth	Treatment		Sealant condition			Caries present	Mat	F/L
	Sealant	PRR	C	PL	TL			
16								
26								
56								
46								
.....								
.....								
.....								
.....								

DI-S =..... **CI-S =.....**

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

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

OHI - S = _____

Gingivitis ☐ Yes ☐ No

Examiner .....Date .....

C = Sealant with Completed retention

PL = Partial loss sealant

TL = Total loss sealant

Caries = Dentine caries

Mat = - Sealant : Resin Sealant = 0 GI Sealant = 1

- PRR : fill with resin composite = 0 Filling with GI = 1

F/U = Follow up period after operation

Modified dental chart record from Faculty of Dentistry, Mahidol University

Department of Community Dentistry

1. Personal Characteristics **ID**.....

School ☐ Wat Devarajkunchorn ☐ Wat Sawaswaree ☐ Wat Samananam ☐ *Pratumnak Suan Kularb*

Gender ☐ male ☐ female **Educational level**

Grade..... **Age**..... **Weight**……..kg. **Height** ……cm.

Nutritional status

Weight for height

☐ Wasting ☐ Quite wasting ☐ Normal ☐ Overweight ☐ Obesity

Weight for age

☐ Underweight ☐ Quite underweight ☐ Normal ☐ Overweight ☐ Obesity

Height for age

☐ Stunted ☐ Quite stunted ☐ Normal ☐ Quite tall ☐ Tall

Underlying disease ☐ Not present ☐ Present (……..)

2. Oral hygiene

OHI - S = …….. ☐ Good ☐ Fair ☐ Poor

3. Oral health problem

Caries status : Decayed (D), Missing (M), and Filled (F)

dt =_____ mt =_____ft =_____dmft =_____ (primary teeth)

DT =_____MT =_____FT =_____DMFT =_____ (permanent teeth)

☐low ☐Moderate ☐High

Gingivitis ☐ Yes ☐ No

4. Previous Dental Prevention

Sealant	☐ Yes	(Tooth No ……..)	☐ No
Preventive Resin Restoration	☐ Yes	(Tooth No ……...)	☐ No
Filling	☐ Yes	(Tooth No ……..…...)	☐ No
Fluoride varnish	☐ Yes		☐ No
Fluoride gel	☐ Yes		☐ No
Oral health education	☐ Yes		☐ No
Preventive scaling	☐ Yes		☐ No
Extraction	☐ Yes	(Tooth No…….)	☐ No

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

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