Chapter 4

Results

The results of this study are presented in 4 sections: (1) Normative need assessment and a sociodental of Thai primary school children, (2) Review of number and characteristics of dental manpower in Thailand, (3) Time used in providing treatment by dentists and dental nurses, and (4) Calculation of the necessary number of dental personnel to provide dental care for Thai primary schoolchildren.

4.1 Normative need assessment and a sociodental approach using of Thai primary schoolchildren

4.1.1 Subjects

The subjects comprised 1211 schoolchildren from five provinces across Thailand. Details of the study subjects are shown in Table 14.

Table 14   Number and percentage of subjects in the study distributed by gender

Province	Subjects by gender		
	Male **n (%)**	**Female** **n (%)**	**Total** **n (%)**
Lampang	110 (43.8)	141 (56.2)	251 (100)
Phuket	102 (46.8)	116 (53.2)	218 (100)
Bangkok	81 (40.5)	119 (59.5)	200 (100)
Udonthani	140 (42.4)	190 (57.6)	330 (100)
Cholburi	100 (47.2)	112 (52.8)	212 (100)
Total	**533 (44.0)**	**678 (56.0)**	**1,211 (100)**

There were 1211 subjects from five different provinces in this study. The total numbers of male and female subjects were 533 and 678, respectively. There were 110 male and 141 female subjects in Lampang, 102 male and 116 female in Phuket, 81 male and 119 female in Bangkok, 140 male and 190 female in Udonthani and 100 male and 112 female in Cholburi, respectively.

The ages of subjects by province are shown in Table 15.

Table 15 Numbers and percentage of subjects in the study distribute by age

Province	Number of subjects n(%)		
	6-year-old (%)	12-year-old (%)	Total (%)
Lampang	88 (35.1)	163 (64.9)	251 (100)
Phuket	77 (35.3)	141 (64.7)	218 (100)
Bangkok	84 (42.0)	116 (58.0)	200 (100)
Udonthani	88 (26.7)	242 (73.3)	330 (100)
Cholburi	74 (34.9)	138 (65.1)	212 (100)
Total	**411 (33.9)**	**800 (66.1)**	**1211 (100)**

The number of 6-year-old schoolchildren and 12-year-old schoolchildren were
88 and 163 in Lampang, 77 and 141 in Phuket , 84 and 116 in Bangkok, 88 and 242 in
Udonthani, and 74 and 138 in Cholburi, respectively.

4.1.2 Oral Health Status of Primary Schoolchildren

Tooth statuses of subjects from the five provinces are shown in Table 16.

Table 16 Mean number of primary teeth, permanent teeth, dmft, and DMFT of all subjects

	Mean number of teeth per subjects	
	6-year-old subjects ($\overline{X}$ ± S.D.)	12-year-old subjects ($\overline{X}$ ± S.D.)
Primary teeth		
Total	15.1 ± 2.9	0.9 ± 1.9
Decayed teeth	2.6 ± 2.9	0.2 ± 0.6
Missing	0.3 ± 0.9	0.0 ± 0.2
Filled	0.6 ± 1.4	0.1 ± 0.4
dmft	3.6 ± 3.5	0.3 ± 0.8
Permanent teeth		
Total	7.1 ± 3.5	24.6 ± 3.4
Decayed teeth	0.0 ± 0.2	0.2 ± 0.7
Missing	0.0 ± 0.0	0.1 ± 0.4
Filled	0.1 ± 0.4	0.7 ± 1.5
DMFT	0.1 ± 0.5	1.0 ± 1.7

As presented in the Table, the 6-year-old schoolchildren had an average of 15.1 ± 2.9 primary teeth and 7.1 ± 3.5 permanent teeth existing in the oral cavity. Average decayed, missing, and filled primary and permanent teeth were 2.6 ± 2.9, 0.3 ± 0.9 and 0.6 ± 1.4 for primary teeth and 0.0 ± 0.2, 0.0 ± 0.0 and 0.1 ± 0.4 for permanent teeth, respectively. The 12-year-old group had 0.9 ± 1.9 primary teeth and 24.6 ± 3.4 permanent teeth present in their mouths. The mean decayed, missing and

filled teeth were 0.2 ± 0.6, 0.0 ± 0.2 and 0.1 ± 0.4 for primary teeth and 0.2 ± 0.7, 0.1 ± 0.4 and 0.7 ± 1.5 for permanent teeth, respectively.

Dental status by province is presented in Tables 17-21.

Table 17   Mean number of primary teeth, permanent teeth, dmft, and DMFT of subjects in Lampang province

	Mean number of teeth per subjects	
	6-year-old subjects ($\overline{X}$ ± S.D.)	12-year-old subjects ($\overline{X}$ ± S.D.)
Primary teeth		
Total	15.4 ± 2.6	1.2 ± 2.0
Decayed teeth	2.3 ± 2.6	0.2 ± 0.7
Missing	0.3 ± 0.6	0.0 ± 0.0
Filled	1.0 ± 1.7	0.1 ± 0.4
dmft	3.7 ± 3.4	0.2 ± 0.5
Permanent teeth		
Total	6.6 ± 3.4	24.0 ± 3.6
Decayed teeth	0.0 ± 0.0	0.2 ± 0.7
Missing	0.0 ± 0.0	0.0 ± 0.3
Filled	0.1 ± 0.3	0.7 ± 1.4
DMFT	0.1 ± 0.3	1.0 ± 1.6

As presented in the Table 17, the 6-year-old schoolchildren in Lampang had an average of 15.4 ± 2.6 primary teeth and 6.6 ± 3.4 permanent teeth existing in the oral cavity. Average decayed, missing, and filled primary and permanent teeth were 2.3 ± 2.6, 0.3 ± 0.6 and 1.0 ± 1.7 for primary teeth and 0.0 ± 0.0, 0.0 ± 0.0 and 0.1 ± 0.3. The-12-year old group had 1.2 ± 2.0 primary teeth and 24.0 ± 3.6 permanent teeth present in their mouths. The mean decayed, missing and filled teeth were 0.2 ± 0.7,

0.0 ± 0.0 and 0.1 ± 0.4 for primary teeth and 0.2 ± 0.7, 0.0 ± 0.3 and 0.7 ± 1.4 for permanent teeth, respectively.

Table 18   Mean number of primary teeth, permanent teeth, dmft, and DMFT of subjects in Phuket province

	Mean number of teeth per subjects	
	6-year-old subjects ($\overline{X}$ ± S.D.)	12-year-old subjects ($\overline{X}$ ± S.D.)
Primary teeth		
Total	15.2 ± 2.3	1.0 ± 2.0
Decayed teeth	1.5 ± 2.7	0.1 ± 0.5
Missing	0.3 ± 1.1	0.0 ± 0.1
Filled	0.6 ± 1.5	0.1 ± 0.4
dmft	2.4 ± 2.9	0.3 ± 0.7
Permanent teeth		
Total	6.9 ± 3.3	24.5 ± 3.4
Decayed teeth	0.1 ± 0.2	0.2 ± 0.6
Missing	0.0 ± 0.0	0.0 ± 0.3
Filled	0.0 ± 0.0	0.2 ± 0.7
DMFT	0.1 ± 0.2	0.4 ± 1.0

As presented in the Table 18, the 6-year-old schoolchildren in Phuket had an average of 15.2 ± 2.3 primary teeth and 6.9 ± 3.3 permanent teeth existing in the oral cavity. Average decayed, missing, and filled primary and permanent teeth were 1.5 ± 2.7, 0.3 ± 1.1 and 0.6 ± 1.5 for primary teeth, and 0.1 ± 0.2, 0.0 ± 0.0 and 0.0 ± 0.0 for permanent teeth, respectively. The 12-year-old group had 1.0 ± 2.0 primary teeth and 24.5 ± 3.4 permanent teeth present in their mouths. The mean decayed, missing and

filled teeth were 0.1 ± 0.5, 0.0 ± 0.1 and 0.3 ± 0.7 for primary teeth, and 0.2 ± 0.6, 0.0 ± 0.3 and 0.2 ± 0.7 for permanent teeth, respectively.

Table 19   Mean number of primary teeth, permanent teeth, dmft, and DMFT of subjects in Bangkok metropolitan

	Mean number of teeth per subjects	
	6-year-old subjects ($\overline{X} \pm$ **S.D.**)	**12-year-old subjects** ($\overline{X} \pm$ **S.D.**)
Primary teeth		
Total	15.3 ± 2.8	0.9 ± 2.0
Decayed teeth	2.7 ± 3.0	0.1 ± 0.4
Missing	0.2 ± 0.6	0.0 ± 0.1
Filled	0.4 ± 1.0	0.1 ± 0.4
dmft	3.3 ± 3.4	0.2 ± 0.6
Permanent teeth		
Total	7.1 ± 3.5	24.6 ± 3.3
Decayed teeth	0.0 ± 0.1	0.3 ± 1.0
Missing	0.0 ± 0.0	0.1 ± 0.3
Filled	0.1 ± 0.5	0.2 ± 0.7
DMFT	0.1 ± 0.5	0.6 ± 1.2

As presented in the Table 19, the 6-year-old schoolchildren in Bangkok had an average of 15.3 ± 2.8 primary teeth and 7.1 ± 3.5 permanent teeth existing in the oral cavity. Average decayed, missing, and filled primary and permanent teeth were 2.7 ± 3.0, 0.2 ± 0.6 and 0.4 ± 1.0 for primary teeth, and 0.0 ± 0.1, 0.0 ± 0.0 and 0.1 ± 0.5 for permanent teeth, respectively. The 12-year-old group had 0.9 ± 2.0 primary teeth and 24.6 ± 3.3 permanent teeth present in their mouths. The mean decayed, missing and

filled teeth were 0.1 ± 0.4, 0.0 ± 0.1 and 0.1 ± 0.4 for primary teeth, and 0.3 ± 1.0, 0.1 ± 0.3 and 0.2 ± 0.7 for permanent teeth, respectively.

Table 20   Mean number of primary teeth, permanent teeth, dmft, and DMFT of subjects in Udonthani province

	Mean number of teeth per subjects	
	6-year-old subjects ($\overline{X}$ ± S.D.)	12-year-old subjects ($\overline{X}$ ± S.D.)
Primary teeth		
Total	14.2 ± 3.0	0.7 ± 1.8
Decayed teeth	3.9 ± 3.2	0.2 ± 0.7
Missing	0.5 ± 0.9	0.1 ± 0.4
Filled	0.5 ± 1.1	0.0 ± 0.2
dmft	4.9 ± 3.6	0.3 ± 1.0
Permanent teeth		
Total	8.2 ± 3.4	24.9 ± 3.5
Decayed teeth	0.1 ± 0.3	0.2 ± 0.5
Missing	0.0 ± 0.0	0.1 ± 0.4
Filled	0.2 ± 0.7	1.3 ± 2.0
DMFT	0.2 ± 0.7	1.6 ± 2.2

As presented in the Table 20, the 6-year-old schoolchildren had an average of 14.2 ± 3.0 primary teeth and 8.2 ± 3.4 permanent teeth existing in the oral cavity. Average decayed, missing, and filled primary and permanent teeth were 3.9 ± 3.2, 0.5 ± 0.9 and 0.5 ± 1.1 for primary teeth and 0.1 ± 0.3, 0.0 ± 0.0 and 0.2 ± 0.7 for permanent teeth, respectively. The 12-year-old group had 0.7 ± 1.8 primary teeth and 24.9 ± 3.5 permanent teeth present in their mouths. The mean decayed, missing and

filled teeth were 0.2 ± 0.7, 0.1 ± 0.4 and 0.0 ± 0.2 for primary teeth and 0.2 ± 0.5, 0.1 ± 0.4, and 1.3 ± 2.0 for permanent teeth, respectively.

Table 21   Mean number of primary teeth, permanent teeth, dmft, and DMFT of subjects in Cholburi province

	Mean number of teeth per subjects	
	6-year-old subjects ($\overline{X}$ ± S.D.)	12-year-old subjects ($\overline{X}$ ± S.D.)
Primary teeth		
Total	15.4 ± 3.4	0.9 ± 1.9
Decayed teeth	2.6 ± 3.0	0.1 ± 0.4
Missing	0.3 ± 1.0	0.0 ± 0.0
Filled	0.8 ± 1.6	0.1 ± 0.3
dmft	3.6 ± 3.4	0.2 ± 0.5
Permanent teeth		
Total	6.6 ± 3.9	24.6 ± 3.4
Decayed teeth	0.0 ± 0.2	0.3 ± 0.9
Missing	0.0 ± 0.0	0.0 ± 0.2
Filled	0.0 ± 0.2	0.6 ± 1.2
DMFT	0.1 ± 0.3	0.9 ± 1.5

As presented in the Table 21, the 6-year-old schoolchildren had an average of 15.4 ± 3.4 primary teeth and 6.6 ± 3.9 permanent teeth existing in the oral cavity. Average decayed, missing, and filled primary and permanent teeth were 2.6 ± 3.0, 0.3 ± 1.0 and 0.8 ± 1.6 for primary teeth and 0.0 ± 0.2, 0.0 ± 0.0 and 0.0 ± 0.2 for permanent teeth, respectively. The 12-year-old group had 0.9 ± 1.9 primary teeth and

24.6 ± 3.4 permanent teeth present in their mouths. The mean decayed, missing and filled teeth were 0.1 ± 0.4, 0.0 ± 0.0 and 0.1 ± 0.3 for primary teeth and 0.3 ± 0.9, 0.0 ± 0.2 and 0.6 ± 1.2 for permanent teeth, respectively.

Periodontal status was examined in the 12-year-old group only as suggested in WHO guideline of dental health status survey (WHO, 1997). The Community Periodontal Index (CPI) of the study subjects is presented in Table 22.

Table 22 Number of sextant with various CPI in 12-year-old subjects

	Mean number of sextants		
	Healthy (CPI=0) ($\overline{X}$ ± SD)	Bleeding (CPI=1) ($\overline{X}$ ± SD)	Calculus (CPI=2) ($\overline{X}$ ± SD)
Lampang	5.1 ± 1.3	0.5 ± 0.8	0.5 ± 1.0
Phuket	4.9 ± 1.3	0.4 ± 0.9	0.7 ± 1.0
Bangkok	4.6 ± 1.4	0.6 ± 0.9	0.9 ± 1.0
Udonthani	4.5 ± 1.6	0.5 ± 09	1.0 ± 1.3
Cholburi	4.4 ± 1.6	0.9 ± 1.2	0.7 ± 1.0
Total	**4.7 ± 1.5**	**0.6 ± 1.0**	**0.8 ± 1.1**

The mean number of sextants with healthy gingiva of subjects in Lampang, Phuket, Bangkok, Udonthani, and Cholburi were 5.1 ± 1.3, 4.9 ± 1.3, 4.6 ± 1.4, 4.5 ± 1.6, and 4.4 ± 1.6, respectively. The corresponding number of sextants with bleeding gingiva were 0.5 ± 0.8, 0.4 ± 0.9, 0.6 ± 0.9, and 0.5 ± 0.9, respectively. The mean number of sextants of the five groups were 0.5 ± 1.0, 0.7 ± 1.0, 0.9 ± 1.0, 1.0 ± 1.3, and 0.7 ± 1.0, respectively. For the total subjects in this study, the mean number of

sextants with healthy gingiva, bleeding gingiva, and calculus were 4.7 ± 1.5, 0.6 ± 1.0, and 0.8 ± 1.1, respectively.

When grouping subjects by their maximum CPI score, the percentage of those who fell in each group are shown in Table 23.

Table 23 **Number and percentage of 12-year-old subjects distributed by the maximum CPI score**

	Number and percentage of subjects with different maximum CPI		
	Max CPI=0 n (%)	Max CPI =1 n (%)	Max CPI =2 n (%)
Lampang	86 (52.8)	29 (17.8)	48 (29.4)
Phuket	56 (39.7)	16 (11.3)	69 (48.9)
Bangkok	29 (25.0)	20 (17.2)	67 (57.8)
Udonthani	72 (29.8)	33 (13.6)	137 (56.6)
Cholburi	42 (30.4)	28 (20.3)	68 (49.3)
Total	**285 (35.6)**	**126 (15.8)**	**389 (48.6)**

The percentages of subjects with a maximum CPI score of 0 in Lampang, Phuket, Bangkok, Udonthani, and Cholburi were 52.8, 39.7, 25.0, 29.8, and 30.4, respectively. The corresponding numbers of subjects with a maximum CPI score of 1 were 17.8, 11.3, 17.2, 13.6, and 20.3, respectively. The percentages of subjects with a maximum CPI of 2 were 29.4, 48.9, 57.8, 56.6, and 49.3, respectively.

The prevalence of dental trauma is shown in Table 24.

Table 24 Number and percentage of subjects with trauma teeth

	Number and percentage of subjects, n (%)		
	No dental trauma	Trauma on 1 tooth	Trauma on 2 teeth
6-year-old subjects	411 (100)	0 (0)	0(0)
12-year-old subjects	786 (98.3)	12 (1.5)	2 (0.3)

There was no reporting of dental trauma in children in the 6-year-old group. The 12-year-old group demonstrated 98.3% without trauma. A few (1.5%) showed dental trauma on one tooth. The other 0.3% had trauma on two teeth.

4.1.3 Treatment Need

Treatment needs of those grouped by province are shown in Table 25.

Table 25 Number and percentage of subjects and treatment needs in primary school children grouped by province

	Number and percentage of subjects with Treatment needs	
	6-year-old subjects **n (%)**	**12-year-old subjects** **n (%)**
Primary Teeth		
One-surface filling	99 (24.1)	17 (2.1)
Two-surface	195 (47.4)	35 (4.4)
Crown	51 (12.4)	0 (0.0)
Pulp care	20 (4.9)	2 (0.3)
Extraction	122 (29.7)	25 (3.1)
Permanent Teeth		
One-surface	6 (1.5)	62 (7.8)
Two-surface	1 (0.2)	41 (5.1)
Crown	0 (0.0)	30 (3.8)
Pulp care	0 (0.0)	38 (4.8)
Extraction	3 (0.7)	28 (3.5)
Sealant	321 (78.1)	725 (90.6)

The percentages of 6-year-old subjects who needed one-surface restorations, two-surface restorations, crowns, pulp care, and extractions were 24.1, 47.4, 12.4, 4.9 and 29.7, respectively. The corresponding percentages of 12-year-old subjects were 2.1, 4.4, 0.0, 0.0, 0.3 and 3.1, respectively. Considering the treatment need for permanent teeth, the percentage of subjects who needed one-surface restorations, two-surface restorations, crowns, pulp care, extractions, and sealants were 1.5, 0.2, 0.0, 0.0, 0.7 and 78.1, respectively. The corresponding percentages of 12-year-old subjects were 7.8, 5.1, 3.8, 4.8, 3.5 and 90.6, respectively.

The mean numbers of teeth needing various kind of treatment are shown in Table 26.

Table 26 **Mean number of teeth that needed dental treatment per subject in 6- and 12-year-old subjects**

	Mean and S.D. of teeth per subjects	
	6-year-old subjects ($\overline{X} \pm$ S.D.)	12-year-old subjects ($\overline{X} \pm$ S.D.)
Primary Teeth		
One-surface filling	0.4 ± 0.9	0.0 ± 0.2
Two-surface filling	1.0 ± 1.4	0.1 ± 0.3
Crown	0.2 ± 0.7	0.0 ± 0.0
Pulp care	0.1 ± 0.5	0.0 ± 0.1
Extraction	0.6 ± 1.2	0.0 ± 0.2
Permanent Teeth		
One-surface filling	0.0 ± 0.1	0.1 ± 0.4
Two-surface filling	0.0 ± 0.1	0.1 ± 0.3
Crown	0.0 ± 0.0	0.1 ± 0.2
Pulp care	0.0 ± 0.0	0.1 ± 0.2
Extraction	0.0 ± 0.1	0.1 ± 0.2
Sealant	2.0 ± 1.4	3.6 ± 2.2

The mean numbers of primary teeth per subject needing one-surface restorations, two-surface restorations, crowns, pulp care, and extractions in the 6-year-old subjects were 0.4 ± 0.9, 1.0 ± 1.4, 0.2 ± 0.7, 0.1 ± 0.5 and 0.6 ± 1.2, respectively.

The corresponding numbers of primary teeth that needed treatment in those who were 12 years old were 0.0 ± 0.2, 0.1 ± 0.3, 0.0 ± 0.0, 0.0 ± 0.1 and 0.0 ± 0.2, respectively. The mean numbers of permanent teeth per subject needing one-surface restorations, two-surface restorations, crowns, pulp care, extractions, and sealants in 6-year-old subjects were 0.0 ± 0.1, 0.0 ± 0.1, 0.0 ± 0.0, 0.0 ± 0.0, 0.0 ± 0.1 and 2.0 ± 1.4, respectively. The corresponding numbers of permanent teeth that needed treatment in those who were 12 years old were 0.1 ± 0.4, 0.1 ± 0.3, 0.1 ± 0.2, 0.1 ± 0.2, 0.1 ± 0.2 and 3.6 ± 2.2, respectively.

4.1.4 Oral health related quality of life

Oral health related quality of life in this study was measured by the Child-Oral Impact on Daily Life Performance index (Child-OIDP). The Child-OIDP was performed in the 12-year-old group only. Demographic data of subjects are presented in Table 27.

Table 27   Number and percentage of subjects who attended the child-OIDP

index assessment distributed by gender

Province	Number of subjects by gender		
	Male n(%)	Female n(%)	Total n(%)
Lampang	71 (43.6)	92 (56.4)	163 (100)
Phuket	71 (50.4)	70 (49.6)	141 (100)
Bangkok	50 (43.1)	66 (56.9)	116 (100)
Udonthani	95 (39.3)	147 (60.7)	242 (100)
Cholburi	67 (48.6)	71 (51.4)	138 (100)
Total	**354 (44.3)**	**446 (55.8)**	**800 (100)**

Of 800 12-year-old schoolchildren, the Lampang group comprised 71 male and 92 female students. The Phuket, Bangkok, Udonthani, and Cholburi groups comprised 71 and 70, 50 and 66, 95 and 147, and 67 and 71 male and female students, respectively.

The severity and frequency of oral impacts in the 12-year-old group are presented in Table 28.

Table 28 Self-reported severity and frequency of oral impacts in the 12-year-old

children

	Severity of impact on daily living activity					Frequency per month				
	No n(%)	little n(%)	moderate n(%)	severe n(%)	Quartile n(%)	never n(%)	1-2 n(%)	3-4 n(%)	5+ n(%)	Quartile n(%)
Eating	266 (33.3)	268 (33.5)	248 (31.0)	18 (2.3)	0,1,2	266 (33.3)	263 (32.9)	230 (28.8)	41 (5.1)	0,1,2
Speaking	734 (91.8)	43 (5.4)	21 (2.6)	2 (0.3)	0,0,0	734 (91.8)	32 (4.0)	30 (3.8)	4 (0.5)	0,0,0
Teeth Cleaning	440 (55.0)	234 (29.3)	108 (13.5)	18 (2.3)	0,0,1	440 (55.0)	197 (24.6)	124 (15.5)	39 (4.9)	0,0,1
Resting	769 (96.1)	18 (2.3)	13 (1.6)	0 (0.0)	0,0,0	769 (96.1)	22 (2.8)	8 (1.0)	1 (0.1)	0,0,0
Emotional change	341 (42.6)	228 (28.5)	205 (25.6)	26 (3.3)	0,1,2	341 (42.6)	261 (32.6)	158 (9.8)	40 (5.0)	0,1,1
Smiling	449 (56.1)	174 (21.8)	141 (17.6)	36 (4.5)	0,0,1	449 (56.1)	192 (24.0)	120 (15.0)	39 (4.9)	0,0,1
Studying	782 (97.8)	11 (1.4)	7 (0.9)	0 (0.0)	0,0,0	782 (97.8)	13 (1.6)	1 (0.1)	4 (0.5)	0,0,0
Communication	780 (97.5)	12 (1.5)	6 (0.8)	2 (0.3)	0,0,0	780 (97.5)	13 (1.6)	3 (0.4)	4 (0.5)	0,0,0

The percentage of participants who reported they experienced different degrees of impact on eating that were the consequences of oral health were 33.3, 33.5, 31.0, and 2.3 for those who had no effect at all, little effect, moderate effect, and severe effect, respectively. The corresponding proportions for impact on speaking were 91.8, 54, 2.6, and 0.3, respectively. Those on teeth cleaning were 55.0, 29.3, 13.5, and 2.3, respectively. Those on resting were 96.1, 2.3, 1.6, and 0.0, respectively. Those on emotional change were 42.6, 28.5, 25.6, and 3.3, respectively. Those on smiling were 56.1, 21.8, 17.6, and 4.5, respectively. Those on studying were 97.8, 1.4, 0.9, and 0.0, respectively. And those on communication were 97.5, 1.5, 0.8, and 0.3,

respectively. When asked about the frequency of having oral impacts, most respondents' replies were "never". Eating was the most frequent impact on daily life that was of oral origin.

The products of severity and frequency of each performance impacts were defined as performance scores. The performance score can be classified into six levels of intensity. Performance score and intensity for each performance are demonstrated in Table 29.
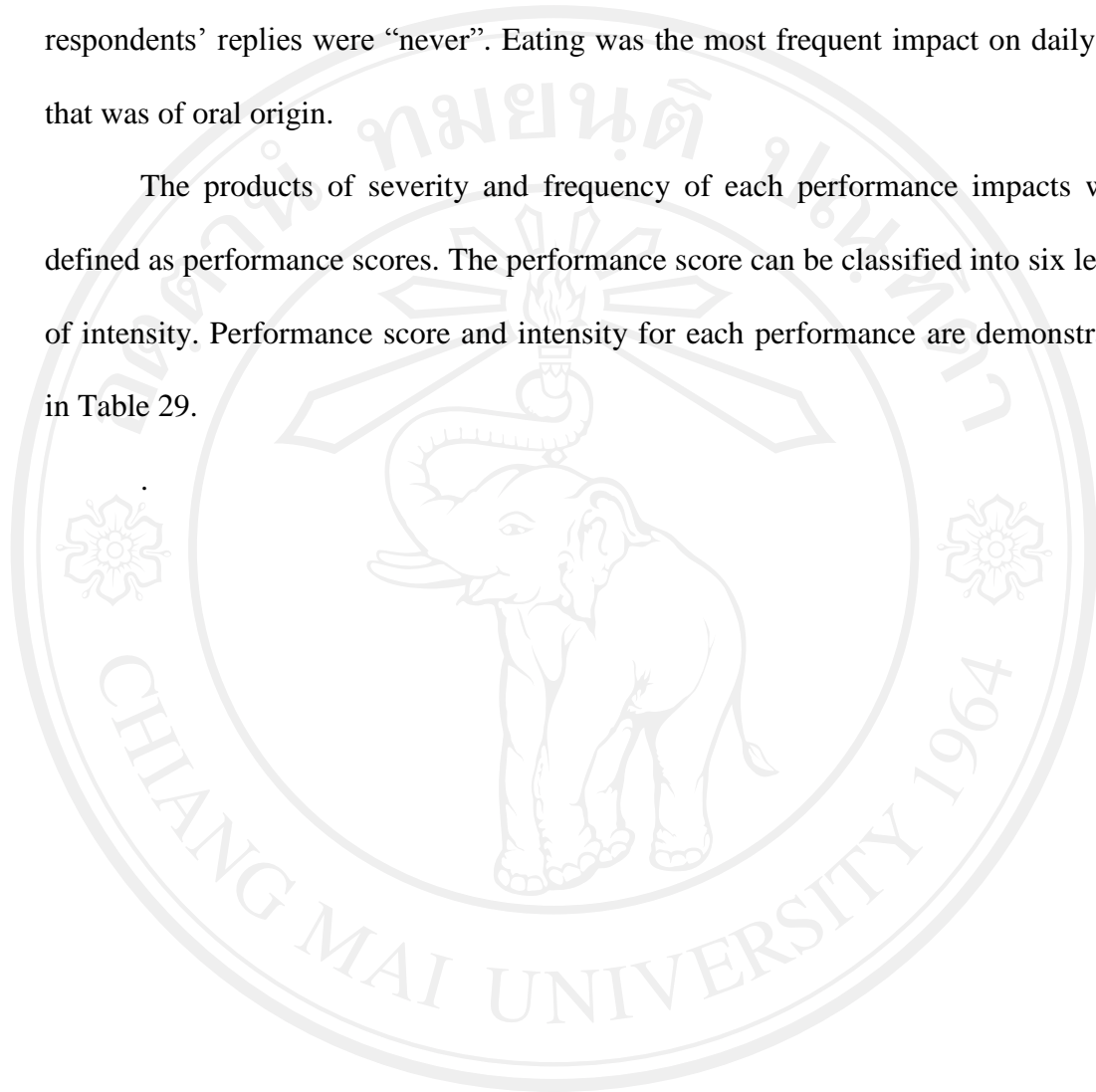
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Table 29 Prevalence, performance score and intensity of oral impacts reported by 12-year-old participants

Oral Impact	Overall	Eating	Speaking	Teeth	Resting	Emotion	Smiling	Studying	Communication
Prevalence, n (%)	717 (89.6)	534 (66.8)	66 (8.3)	360 (45.0)	31 (3.9)	459 (57.4)	351 (43.9)	18 (2.3)	20 (2.5)
Intensity, n(%)									
Very little	171 (21.4)	182 (22.8)	26 (3.3)	165 (20.6)	15 (1.9)	184 (23.0)	142 (17.8)	8 (1.0)	8 (1.0)
Little	184 (23.0)	158 (19.8)	21 (2.6)	89 (11.1)	10 (1.3)	113 (14.1)	74 (9.3)	5 (0.6)	6 (0.8)
Moderate	223 (27.9)	153 (19.1)	15 (1.9)	67 (8.4)	5 (0.6)	114 (14.3)	81 (10.1)	4 (0.5)	4 (0.5)
Severe	102 (12.8)	32 (4.0)	4 (0.5)	33 (4.1)	1 (0.1)	38 (4.8)	41 (5.1)	1 (0.1)	1 (0.1)
Very severe	37 (4.6)	9 (1.1)	0 (0.0)	6 (0.8)	0 (0.0)	10 (1.3)	13 (1.6)	0 (0.0)	1 (0.1)
Performance Score									
Range	0-41.7	0-9	0-6	0-9	0-6	0-9	0-9	0-6	0-9
Mean	8.1	1.72	0.19	1.06	0.08	1.47	1.21	0.05	0.06
SD	7.6	1.85	0.76	1.69	0.46	1.89	1.95	0.36	0.49
Quartile	2.8,5.6,1	0,1,2	0,0,0	0,0,1	0,0,0	0,1,2	0,0,2	0,0,0	0,0,0

From Table 29, the prevalence of participants who reported oral conditions effecting their daily living on eating, speaking, tooth cleaning, resting, emotional stability, smiling, studying, and communication were 66.8 8.3, 45.0, 3.9, 57.4, 43.9, 2.3, and 2,5 per cent, respectively. The percentage of subjects who had very little, little, moderate, severe and very severe intensity of impact on eating were 22.8, 19.8, 19.1, 4.0, and 1.1, respectively. Corresponding numbers of subjects who had various degree of intensity on speaking, tooth cleaning, resting, emotional stability, smiling, studying, and communication were 3.3, 2.6, 1.9, 0.5, and 0.0; 20.6, 11.1, 8.4, 4.1, and 0.8; 1.9, 1.3, 0.6, 0.1, and 0.0; 23.0, 14.1, 14.3, 4.8, and 1.3; 17.8, 9.3, 10.1, 5.1, and 1.6; 2.3, 1.0, 0.6, 0.5, 0.1, and 0.0; 2.5, 1.0, 0.8, 0.5, 0.1, and 0.1, respectively.

Considering performance scores of the participants, mean and S.D. of scores on eating speaking, teeth cleaning, resting, emotional stability, smiling, studying, and communication were 1.72 ± 1.85, 0.19 ± 0.76, 1.06 ± 1.69, 0.08 ± 0.46, 1.47 ± 1.89, 1.21 ± 1.95, 0.05 ± 0.36, and 0.06 ± 0.49 respectively.

The numbers of daily life activities that were affected by subjects' own oral health are presented in Table 30.

Table 30 Numbers of daily life activities that were affected by subjects' own oral health

Number of Affected Activities	Number of Subjects	Percent
0	83	10.4
1	148	18.5
2	221	27.6
3	190	23.8
4	120	15.0
5	31	3.9
6	6	0.8
8	1	0.1
Total	**800**	**100.0**

Most subjects reported that they had 1-4 daily life performances affected by their own oral health. Approximately one tenth (10.4%) of participants reported no problem affected their activities. The percentages of subjects who reported that their oral health affected one, two, three, four, five, six, and eight daily life activities were 18.5, 27.6, 23.8, 15.0, 3.9, 0.8 and 0.1 per cent, respectively.

Activities that promoted the oral hygiene of participants were assessed by questionnaire. Details from respondents' interviews are demonstrated in Table 31. Subjects' behaviour would be considered as propensity for sociodental approach of health need.

Table 31 Number and percentage of 12-year-old schoolchildren who report their own oral hygiene promoting behaviour

	Number and percentage of subjects, n(%)				
	Always	**usually**	**sometimes**	**never**	**Total**
How often do you forget brushing before bedtime?	65 (8.1)	245 (30.6)	203 (25.4)	287 (35.9)	800 (100.0)
How often do you have soda drinks?	222 (27.8)	331 (41.4)	228 (28.5)	19 (2.4)	800 (100.0)
How often do you have snacks?	279 (34.9)	339 (42.4)	173 (21.6)	9 (1.1)	800 (100.0)
How often do you brush?	738 (92.3)	61 (7.6)	1 (0.1)	0 (0.0)	800 (100.0)

Of 800 participants in the 12-year-old group there were 8.1%, 30.6%, 25.4%, and 35.9% who always, usually, sometimes, and never forget brushing their teeth before bedtime, respectively. Percentages of participants who drank soda water always, usually, sometimes, and never were 27.8, 41.4, 28.5, and 2.4, respectively. For snack behavior, 34.9, 42.4, 21.6, and 1.1 reported the frequency of always, usually, sometime, and never respectively. Almost all of the 800 respondents (92.3%) reported that they brushed their teeth every day. The remaining 7.6 and 0.1 percent brushed their teeth usually and sometimes, respectively.

4.2 Characteristics of dental manpower in Thailand

The literature review showed numbers and some demographic data for the year 2010 as presented in Tables 32 to 34 as follows:

Table 32* Number of dentists in Thailand distributed by organization

Organization	Number of Dentists	Percentage
Public Sector		
Ministry of Public Health	3,212	32.36
Ministry of Interior	50	0.50
Ministry of Defense	223	2.25
Ministry of Education	895	9.02
Bangkok Municipality	146	1.47
Other	34	0.34
State Enterprise	45	0.45
Private Sector	5,221	52.60
Total	9,926	100.00

*Dental Public Health Bureau, Department of Health, Ministry of Public Health, 2009

As shown in Table 32, about half of the dentists (5,221 dentists) in Thailand worked in the private sector. Another one third (3,212) worked in the Ministry of Public Health. The remainder worked in other ministries and state enterprise organizations.

Table 33 Dentist to population ratio of Thailand in the year 2010

Region	Dentist	Population	Ratio
Bangkok	4,886	5,702,595	1:1,167
Central	1,760	15,742,529	1:8,945
South	869	8,813,880	1:10,143
North	1,194	11,770,233	1:9,858
Northeast	1,217	21,495,825	1:17,663
Country	**9,926**	**63,525,062**	**1:6,400**

The dentist to population ratio in Thailand varied depending on region. The overall ratio was 1:6,400. The highest ratio was in Bangkok, where it was about 1:1,167. The ratios in the central, northern, southern, and northeastern regions were 1:8945, 1:9,858, 1:10.143 and 1:17,663, respectively.

Table 34 Age and gender proportion of dentists in Thailand

Gender	N	Average Age	Minimum	Maximum
Male	3394	39.3 ± 9.4	23	69
Female	6317	35.8 ± 8.0	23	62

As shown in Table 34, there were 3,394 male and 6,317 female dentists who were active dental practitioners in Thailand in the year 2010. Average ages of those dentists were 39.3 ± 9.4 for males and 35.8 ± 8.0 years for females.
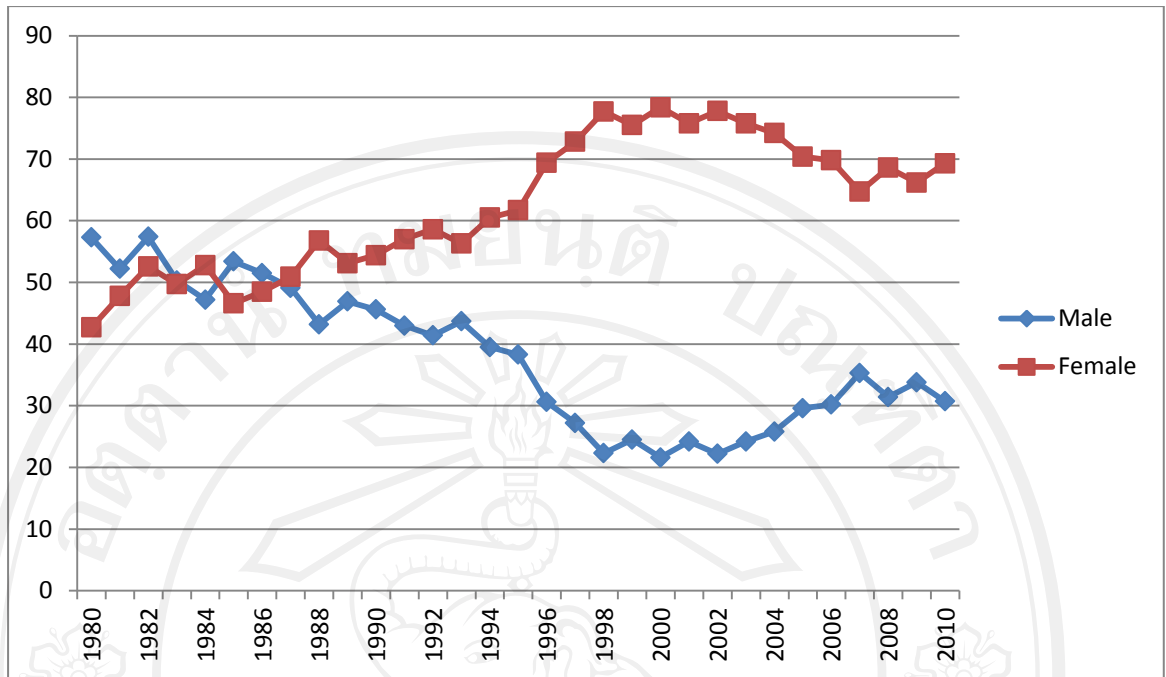
Figure 1 Gender proportion trends of dentists in Thailand

Figure 1 shows that male and female dentist proportions were nearly equal to each other from 1980 to 1990. After 1990 the female dentist proportion increased continuously until 1998, and then stabilized at almost 80% until 2002, when the two lines in the graph again began to approach each other until 2007 when the proportion stabilized at 70:30, where it remained in the year 2010

4.3 Time used in providing treatment by dentists and dental nurses

Thai dentists' and dental nurses' working time were assessed by questionnaire. The numbers and demographic data of respondents are presented in Table 36.

Table 35   Demographic data of dentists and dental nurses who responded to

the questionnaire

	Number n(%)			Age ($\overline{X}$ ± S.D.)		
	male	**female**	**No answer**	**male**	**female**	**No answer**
Dentists	107 (36.1%)	188 (63.5%)	1 (0.3%)	34.9 ± 9.6	33.5 ± 6.5	28 ± 0
Dental Nurses	0 (0.0%)	126 (100%)	0 (0%)	N/A	37.0 ±13.2	N/A

One hundred and seven male dentists (36.1%) and 188 female dentists (63.5%) responded to the questionnaire. The mean age of male dentists was 34.9 ± 9.6. The mean age of female dentists was 33.5 ± 6.5. One respondent did not reveal his or her gender. One hundred and twenty six dental nurses replied to the questionnaire. All of them were female with a mean age of 37.0 ± 13.2.

Asked about time per treatment by each dentist for one patient, respondents' answers are shown in Table 36.

Table 36 Average time per patient used by dentist for particular treatments

Treatment	Time used per patient per treatment	
	Mean (minutes)	**S.D.**
Diagnosis	13.2	9.7
One-surface restoration (primary tooth)	20.9	16.5
Two-surface restoration (primary tooth)	30.7	21.5
One-surface restoration (permanent tooth)	22.3	17.6
Two-surface restoration (permanent tooth)	36.9	34.6
Stainless steel crown (primary tooth)	52.9	27.8
Crown (permanent tooth)	163.3	96.7
Pulp care (primary tooth)	66.3	38.4
Root canal treatment (permanent tooth)	163.8	113.1
Extraction (primary tooth)	13.7	8.2
Extraction (permanent tooth)	19.4	12.2
Scaling (for 6-12-year-old schoolchildren)	22.8	12.0
Removable orthodontic treatment	59.5	49.0

As shown in Table 36, the time in minutes that dentists used per patient per treatment was 13.2 ± 9.7 for diagnosis, 20.9 ± 16.5 for a primary tooth one-surface restoration, 30.7 ± 21.5 for a primary tooth two-surface restoration, 22.3 ± 17.6 for a permanent tooth one-surface restoration, 36.8 ± 34.6 for a permanent tooth two-surface restoration, 52.9 ± 27.8 for a primary tooth stainless steel crown, 163.3 ± 96.7 for a permanent tooth crown, 66.3 ± 38.4 for a primary tooth pulp treatment, 163.8 ± 113.1 for a permanent tooth root canal treatment, 13.7 ± 8.2 for a primary

tooth extraction, 19.4 ± 12.2 for a permanent tooth extraction, 22.8 ± 12.0 for scaling, and 59.5 ± 49.0 for removable orthodontic treatment.

Table 37 Average time per patient used by dental nurses for particular treatments

Treatment	Time used per patient per treatment	
	Mean (minutes)	S.D.
Diagnosis	5.6	5.0
One-surface restoration (primary tooth)	18.5	20.2
Two-surface restoration (Primary tooth)	31.7	31.1
One-surface restoration (permanent tooth)	16.4	9.4
Two-surface restoration (permanent tooth)	27.7	20.8
Extraction (primary tooth)	8.9	7.5
Extraction (permanent tooth)	15.0	6.7
Scaling (for 6-12-year-old schoolchildren)	13.8	9.3

As shown in Table 37, the time in minutes that dental nurses used per patient per treatment was 5.6 ± 5.0 for diagnosis, 18.5 ± 20.2 for a primary tooth one-surface restoration, 31.7 ± 31.1 for a primary tooth two-surface restoration, 16.4 ± 9.4 for a permanent tooth one-surface restoration, 27.7 ± 20.8 for a permanent tooth two-surface restoration, 8.9 ± 7.5 for a primary tooth extraction, 15.0 ± 6.7 for a permanent tooth extraction, and 13.8 ± 9.3 for scaling.

The self-reported time dentists were absent from work in the most recent year are presented in Table 38.

Table 38   Time absent from work reported by all dentists

Cause of Absence	n	Time absent from work by dentists (days per year)			
		Minimum	**Maximum**	**Mean**	**S.D.**
Illness	296	0	40	2.6	4.4
Business	296	0	42	3.0	4.6
Labour	296	0	240	2.9	20.8
Religion	296	0	100	1.2	9.1
Recreation	296	0	50	8.2	6.9
Traveling	296	0	60	7.5	9.4
Other	296	0	22	0.9	2.9
Total	**296**	**0**	**280**	**26.4**	**28.3**

Considering both male and female dentists, respondents reported a mean of 2.6 days in the last year absent from work due to illness, 3.0 days absent due to personal business, 2.9 days absent due to child delivery, 1.2 days absent for religious reasons, 8.2 days absent due to recreation, 7.5 days absent due to traveling, and 0.9 days absent for other reasons. Respondents reported an average number of days' absence from work of 26.4 ± 28.3.

Table 39 Time absent from work reported by male dentists.

Cause of Absence	n	Time absent from work (days per year)			
		Minimum	**Maximum**	**Mean**	**S.D.**
Illness	107	0	10	2.2	2.6
Business	107	0	42	3.6	5.9
Religion	107	0	100	3.1	15.0
Recreation	107	0	50	8.0	7.3
Traveling	107	0	50	7.4	8.6
Other	107	0	22	1.4	3.8
Total	**107**	**0**	**145**	**25.7**	**24.4**

Considering male dentists only, respondents reported a mean of 2.2 days in the last year absent from work due to illness, 3.6 days absent due to personal business, 3.1 days absent for religious reasons, 8.0 days absent due to recreation, 7.4 days absent due to traveling, and 1.4 days absent for other reasons. Respondents reported an average number of days' absence from work of 25.7 ± 24.4.

Table 40 Time absent from work reported by female dentists

Cause of Absence	n	Time absent from work (days per year)			
		Minimum	**Maximum**	**Mean**	**S.D.**
Illness	188	0	40	2.9	5.2
Business	188	0	30	2.7	3.6
Maternity leave	188	0	240	4.6	26.0
Religion	188	0	10	0.2	1.3
Recreation	188	0	50	8.3	6.6
Traveling	188	0	60	7.5	9.8
Other	188	0	20	0.7	2.2
Total	**188**	**0**	**280**	**26.8**	**30.5**

Considering female dentists only, respondents reported a mean of 2.9 days in the last year absent from work due to illness, 2.7 days absent due to personal business, 4.6 days absent due to child delivery, 0.2 days absent for religious reasons, 8.3 days absent due to recreation, 7.5 days absent due to traveling, and 0.7 days absent for other reasons. Respondents reported an average number of days' absence from work of 26.8 ± 30.5.

Table 41 Time in hours per day used for particular purposes by all dentists

Purposes	N	Time in hours per day			
		Minimum	Maximum	Mean	S.D.
Dental treatment	296	0	12	6.9	2.2
Administration	296	0	12	1.4	1.9
Other dental-related assignments	296	0	7	0.6	1.2
Recreation	296	0	18	8.7	2.9
Family	296	0	16	5.1	2.9

As shown in Table 41, times used per day reported by all dentists were as follows: 6.9 ± 2.2 for dental treatment, 1.4 ± 1.9 for administration, 0.6 ± 1.2 for other dental-related assignments, 8.7 ± 2.9 for recreation, and 5.1 ± 2.9 for family.

Table 42 Time per day used for particular purposes by male dentists

Purposes	N	Time used for dental treatment (min)			
		Minimum	Maximum	Mean	S.D.
Dental treatment	107	2	12	6.9	2.2
Administration	107	0	10	1.5	1.8
Other dental-related assignments	107	0	6	0.4	1.1
Recreation	107	0	16	8.6	2.7
Family	107	0	16	4.8	2.8

As shown in Table 42, times used per day reported by male dentists were as follows: 6.9 ± 2.2 for dental treatment, 1.5 ± 1.8 for administration, 0.4 ± 1.1 for other dental-related assignments, 8.6 ± 2.8 for recreation, and 4.8 ± 2.8 for family.

Table 43 Time per day used for particular purposes by female dentists

Purposes	N	Time used for dental treatment (min)			
		Minimum	Maximum	Mean	S.D.
Dental treatment	188	0	12	6.8	2.3
Administration	188	0	12	1.4	1.9
Other dental-related assignments	188	0	7	0.7	1.2
Recreation	188	0	18	8.7	2.9
Family	188	0	16	5.3	2.9

As shown in Table 43, times used per day reported by female dentists were as follows: 6.8 ± 2.3 for dental treatment, 1.4 ± 1.9 for administration, 0.7 ± 1.2 for other dental-related assignments, 8.7 ± 2.9 for recreation, and 5.3 ± 2.9 for family reasons.

Table 44   Time absent from work reported by dental nurses

Cause of Absence	n	Time absent from work (days per year)			
		Minimum	**Maximum**	**Mean**	**S.D.**
Illness	126	0	10	2.4	5.2
Business	126	0	6	2.2	3.6
Maternity leave	126	0	0	0	0
Religion	126	0	0	0	0
Recreation	126	0	10	5.6	6.6
Other	126	0	5	1.6	2.3
Total	**126**	**0**	**10**	**10.7**	**7.6**

As shown in Table 44 considering dental nurses, respondents reported a mean of 2.4 days in the last year absent from work due to illness, 2.2 days absent due to personal business, 5.6 days absent due to recreation, and 1.6 days absent for other reasons. Respondents reported an average number of days' absence from work of 10.7 ± 7.6.

Table 45 Time per day used for particular purposes by dental nurses

Purposes	N	Time used for dental treatment (min)			
		Minimum	Maximum	Mean	S.D.
Dental treatment	126	3	6	4.4	1.1
Administration	126	0.5	4	2.3	1.5
Other dental-related assignment	126	0	4	1.0	1.6
Recreation	126	0	16	5.9	4.9
Family	126	0	10	6.3	4.5

As shown in Table 45, times used per day reported by dental nurses were as follows: 4.4 ± 1.1 for dental treatment, 2.3 ± 1.5 for administration, 1.0 ± 1.6 for other dental-related assignments, 5.9 ± 4.9 for recreation, and 6.3 ± 4.5 for family reasons.

4.4 Calculation of dental manpower

4.4.1 Three models for estimating dental manpower

The three models for estimating dental manpower needs to treat schoolchildren in the year 2030 are shown later in this chapter. As mentioned before, Model 1 for manpower estimation was calculated using normative need alone. For Model 2, which incorporated the entire normative need with sociodental approach, three scenarios were applied according to various levels of dental caries prevalence. In the last model, Model 3, the annual incremental normative need incorporated with the sociodental approach was used for estimating manpower.

4.4.2 The three scenarios of Model 2

The three scenarios based on the entire normative need incorporated with the sociodental approach in Model 2 were created based on background prevalence of dental caries and periodontal disease of schoolchildren in each region.

From the Thailand National Oral Health Survey in the years 1984, 1989, 1994, 2001, and 2007, and from reports from selected provinces during 1989 to 2007, the oral status of 6- and 12-year-old group used as scenario building input can be presented in Tables 46-48.

Table 46   Mean dmft of primary teeth in 6-year-old group by region from National Oral Health Survey

Year	National	Metropolitann	Central	North	Northeastt	South
1984	5.6					
1991			7.7	6.5	4.4	7.4
1996			8.1	6.5	6.7	8.2
2001	5.97	4.92	5.80	5.72	6.20	6.85
2007	5.43	3.18	6.00	4.84	5.21	6.80

Table 47 Mean DMFT of permanent teeth in 12-year-old group by region from

National Oral Health Survey

Year	National	Metropolitan	Central	North	Northeast	South
1984	1.5	3.0	2.3	1.4	0.5	2.3
1989	1.5	3.0	1.8	1.5	0.8	1.9
1994	1.6	2.9	1.9	1.3	1.3	2.1
2001	1.6	2.0	1.6	1.7	1.4	2.1
2007	1.55	1.28	1.97	1.78	1.27	1.45

Table 48 Mean sextants of various periodontal status of 12-year-old group

from National Oral Health Survey

Year	Percentage of subjects with gingivitis	Mean sextants per person		
		CPI 0	CPI 1	CPI 2
1989	60.1	1.4	0.8	3.6
1994	75.3	1.4	1.1	3.5
2001	76.9	1.9	1.5	2.5
2007	58.94	2.8	1.6	1.98

From epidemiologic data presented above, scenarios for primary tooth caries, permanent tooth caries, and periodontal status of the schoolchildren in the year 2030 were created as shown in Tables 49-51.

4.4.2.1 Scenarios for primary tooth dental caries in 6-year-old schoolchildren

(1) Scenario 1: This scenario assumed that there was a slowly increasing dmft rate in the Metropolitan and Central regions. The assumption of a low prevalence in the Northern, Northeastern and Southern regions was based on a prediction of dmft by the year 2030 if the dmft increased more slowly than in the last 20 years.

(2) Scenario 2: The moderate DMFT scenario was based on a prediction of dmft by the year 2030 if the rate of change in dmft from 1996-2007 remained constant until 2030.

(3) Scenario 3: The scenario assumed that dmft was similar to those found in the latest survey in all regions.

Scenarios for primary tooth caries prevalence in 6-year-old schoolchildren are presented in Table 49.

Table 49 Scenario for primary tooth caries prevalence in 6-year-old schoolchildren in the year 2030

	Mean dmft in primary teeth				
	Metropolitan	Central	North	Northeast	South
Scenario 1 Low dmf trajectory	1.0	4.0	3.0	4.0	5.0
Scenario 2 Medium dmf trajectory	2.0	4.0	4.0	5.0	7.0
Scenario 3 High dmf trajectory	3.0	6.0	5.0	5.0	7.0

4.4.2.2 Scenario for permanent tooth dental caries in 12-year-old schoolchildren

(1) Scenario 1: This scenario assumed that there was a very low DMFT prevalence in the Metropolitan and Central regions. The assumption of a low prevalence in the Northern, Northeastern and Southern regions was based on a prediction of DMFT by the year 2030 if the DMFT were equal to the present DMFT for those regions.

(2) Scenario 2: The moderate DMFT scenario was based on a prediction of DMFT by the year 2030 if the rate of change in DMFT from 1984-2007 remained constant until 2030.

(3) Scenario 3: The scenario assumed that there was a moderate DMFT prevalence in the Metropolitan and Central regions, and a high prevalence in the Northern, Northeastern and Southern regions.

Scenarios for permanent tooth caries prevalence in 12-year-old schoolchildren are presented in Table 50.

Table 50   Scenarios for permanent tooth caries prevalence in 12-year-old

schoolchildren in the year 2030

	Mean DMFT in permanent teeth				
	Metropolitan	Central	North	Northeast	South
Scenario 1 Low DMF trajectory	0.2	0.8	1.8	1.3	0.5
Scenario 2 Medium DMF trajectory	0.5	1.4	2.1	2.2	1.0
Scenario 3 High DMF trajectory	0.8	2.0	2.4	3.1	1.5

4.4.2.3 Scenarios for periodontal status in 12-year-old schoolchildren

(1)   Scenario 1: This scenario assumed a low prevalence of periodontal disease in the 12-year-old age group. Both prevalence and severity of the disease were assumed to be better than the rate of improvement during the last 20 years.

(2)   Scenario 2: The moderate prevalence scenario was based on a prediction of prevalence and severity of the disease that improved by the same rate as in the past 20 years.

(3)   Scenario 3: The high prevalence scenario assumed that prevalence and severity of periodontal disease in this group were equal to that at present.

Scenarios for periodontal disease prevalence of 12-year-old schoolchildren are presented in Table 51.

Table 51 Scenarios for periodontal status in 12-year-old schoolchildren in the year 2030

	Prevalence and number of sextants with various CPI			
	Prevalence	CPI 0	CPI 1	CPI 2
Scenario 1 Low Prevalence trajectory	40%	4	1.5	0.5
Scenario 2 Medium Prevalence trajectory	50%	4	1	1
Scenario 3 High Prevalence trajectory	60%	3	1	2

4.4.3 Annual caries increment estimated in Model 3

The assumption of incremental caries increase per year was based on a series of previous national and regional surveys conducted in Thailand during the previous 30 years. In those studies the dental caries prevalence of primary and permanent teeth was 1.0 and 0.1, respectively (Department of Health, 2000; 2002; 2008).

4.5 Breakdown Diagram

To illustrate the number of subjects whose quality of life was affected by factors of oral origin, breakdown diagrams were used to elaborate the number of participants in each categories.

Diagrams 4.5.1 to 4.5.4 explain steps for calculating the number of minutes used for each type of treatment per 1,000 population derived from data examined in 6-year-old schoolchildren. Because this age group was not assessed by using the Child-OIDP index, all steps in the diagrams were cascaded by professional decisions alone. The end product of the diagram, the number of minutes used per 1,000

population for each treatment, was used to calculate the fulltime equivalent number

and the actual number of dental personnel in part 4.6 of this chapter.

4.5.1 Primary teeth of 6-year-old schoolchildren diagnosed with dental caries

Primary teeth of 6-year-old schoolchildren
6203

Teeth diagnosed as dental caries
987

Teeth without dental caries
5216

Need uncomplicated filling
175

Need complicated filling
421

Need Crown
93

Need RCT
37

Need Extraction
261

Calculate minutes used/1000 population
8,899

Calculate minutes used/1000 population
31,416

Calculate minutes used/1000 population
11,963

Calculate minutes used/1000 population
5,970

Calculate minutes used/1000 population
8,732

4.5.2 Primary teeth of 6-year-old schoolchildren without dental caries

```
┌─────────────────────────────────────────┐
│ Primary teeth of 6-year-old schoolchildren │
│                  6203                      │
└─────────────────────────────────────────┘
        │
   ┌────┴────────────────┐
┌──────────┐      ┌──────────────┐
│  Teeth   │      │Teeth without │
│diagnosed as│    │dental caries │
│dental caries│   │    5216      │
│   987    │      └──────────────┘
└──────────┘            │
              ┌─────────┴─────────┐
        ┌──────────┐      ┌──────────────┐
        │Need sealant│    │No normative  │
        │   1287   │      │    need      │
        └──────────┘      │    3929      │
              │           └──────────────┘
        ┌──────────┐
        │ Calculate │
        │ minutes   │
        │ used/1000 │
        │population │
        │  31,940   │
        └──────────┘
```

4.5.3 Permanent teeth of 6-year-old schoolchildren diagnosed with dental caries
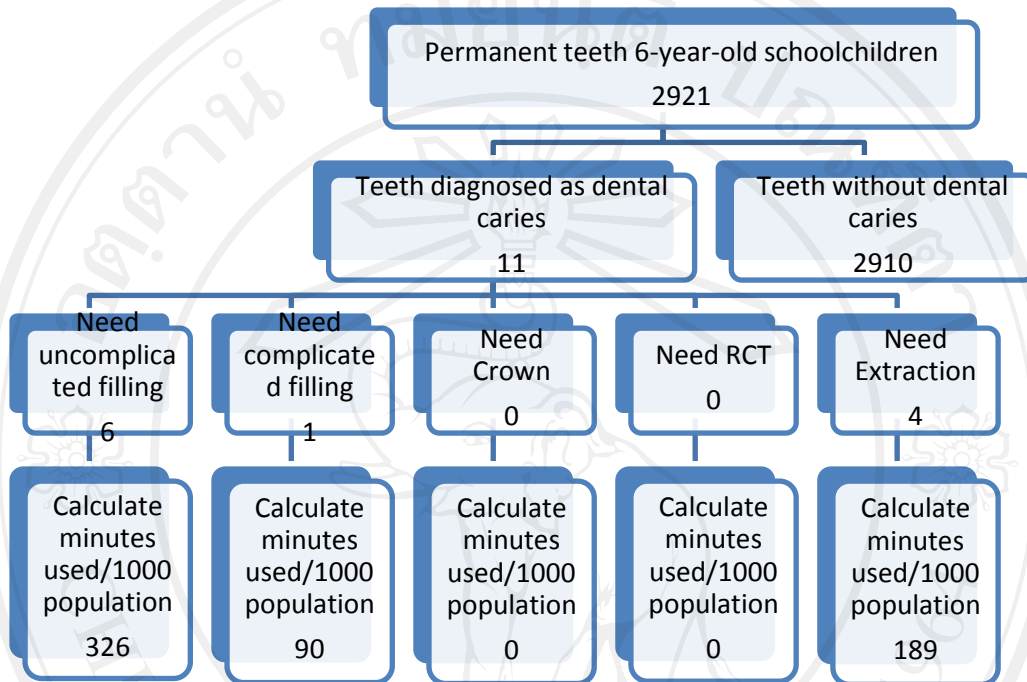
4.5.4   Permanent teeth of 6-year-old schoolchildren without dental caries
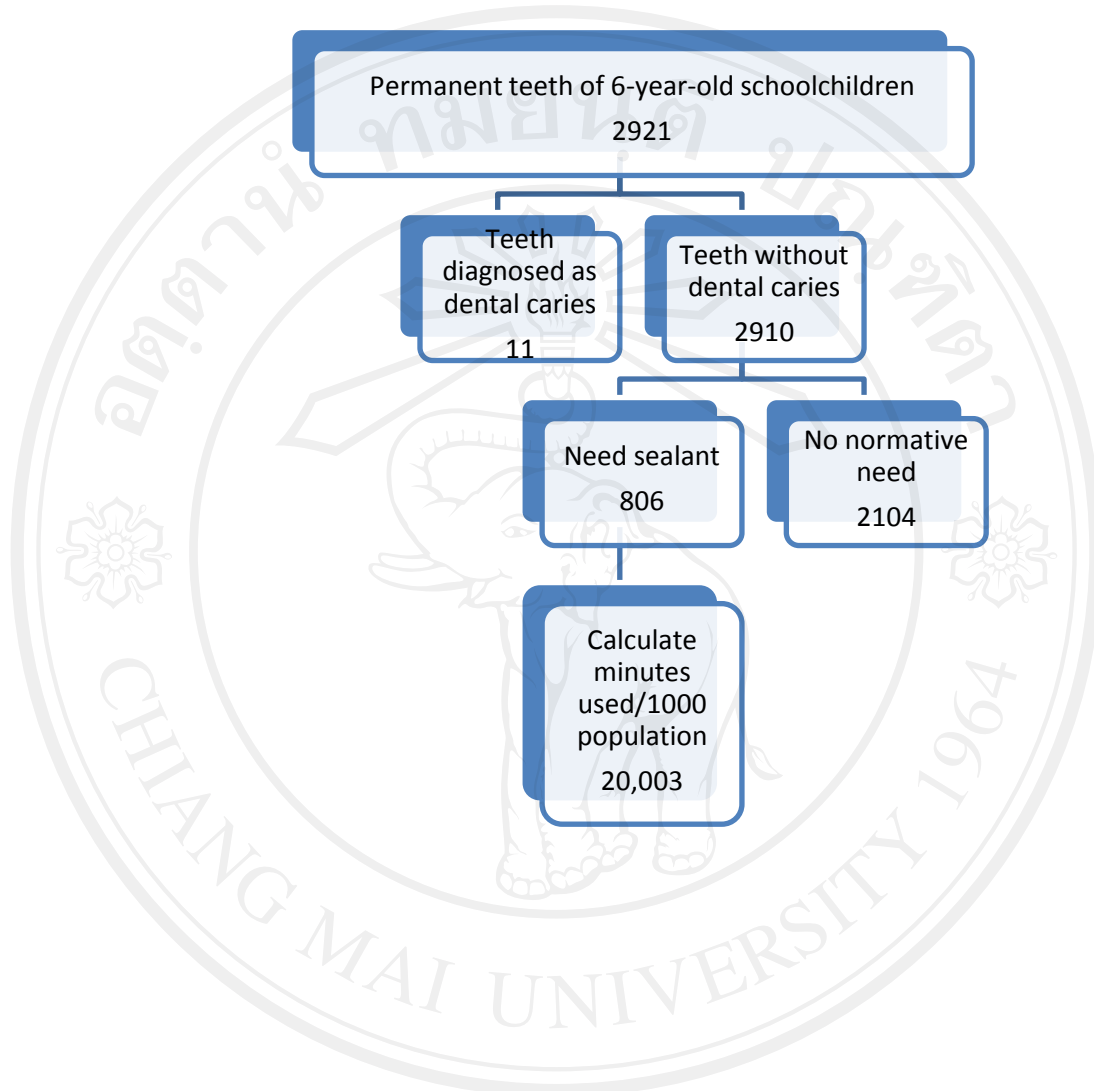
In diagram 4.5.5 to 4.5.8, the steps for calculating the number of minutes used per 1,000 population for each treatment in 12-year-old schoolchildren are shown. Sociodental approach was applied in this group. In subjects with disease of a progressive or life-threatening nature, such as dental caries, only normative need was applied. In the other remaining subjects for whom professional judgment indicated that dental treatments were needed, the Child-OIDP index and behavior propensity were incorporated. Subjects with impacts on daily life assessed by the Child-OIDP index, or subjects labeled as Condition Specific OIDP (CS-OIDP), scores greater than 0 were considered as subjects in the Impact-Related Need "IRN" group. Subjects who had a normative need but no CS-OIDP score were categorised in the "no-IRN" group. So, the IRN group consisted of subjects who perceived their oral impacts. The number of subjects in the IRN group was assessed to calculate dental manpower needs in the next step.

Children with good health behaviours, assessed by interview, were classified as being ready to receive treatment. On the other hand, children with undesired behaviours needed to modify their daily activities before receiving treatment to maximize the effectiveness of the treatment outcome. In this study, children who need crown, extraction, and root canal treatment with good propensity (good PRN) were those who drink soda and snack not more than sometimes. Children with periodontal treatment need with good PRN were those who brushed their teeth twice or more daily. Behavioural data of schoolchildren were present in Table 31 of this chapter. Only children with good propensity were included in the manpower estimations as they would normally be provided with restorative treatments.

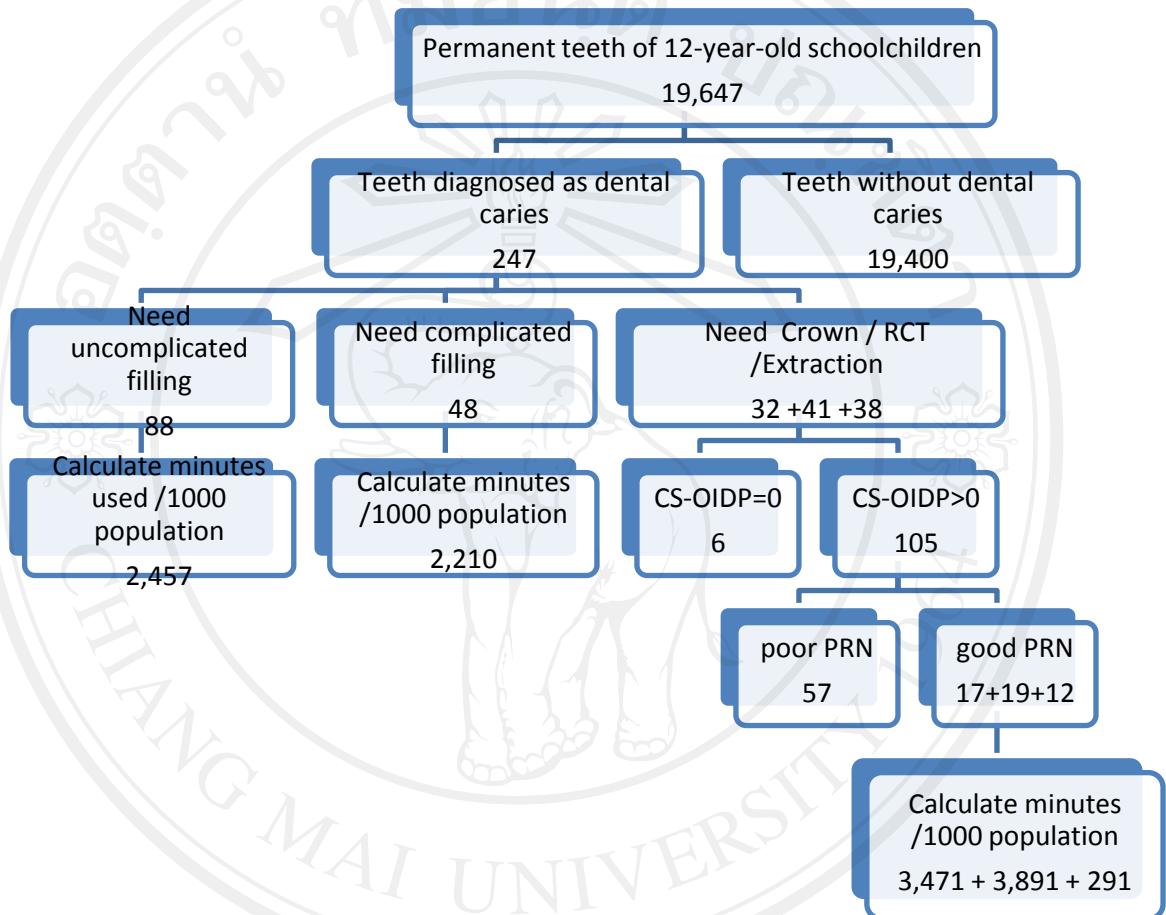### 4.5.5 Permanent teeth of 12-year-old schoolchildren diagnosed with dental caries

```
                    Permanent teeth of 12-year-old schoolchildren
                                      19,647
                                         |
                    ┌────────────────────┴────────────────────┐
          Teeth diagnosed as dental                  Teeth without dental
                   caries                                   caries
                    247                                     19,400
                     |
     ┌───────────────┼────────────────────────┐
   Need                    Need complicated          Need  Crown / RCT
uncomplicated                  filling                  /Extraction
   filling                       48                     32 +41 +38
     88                                                      |
Calculate minutes         Calculate minutes        ┌─────────┴─────────┐
used /1000                 /1000 population      CS-OIDP=0      CS-OIDP>0
population                     2,210                  6              105
  2,457                                                              |
                                                          ┌──────────┴──────────┐
                                                       poor PRN           good PRN
                                                         57               17+19+12
                                                                              |
                                                                    Calculate minutes
                                                                     /1000 population
                                                                 3,471 + 3,891 + 291
```
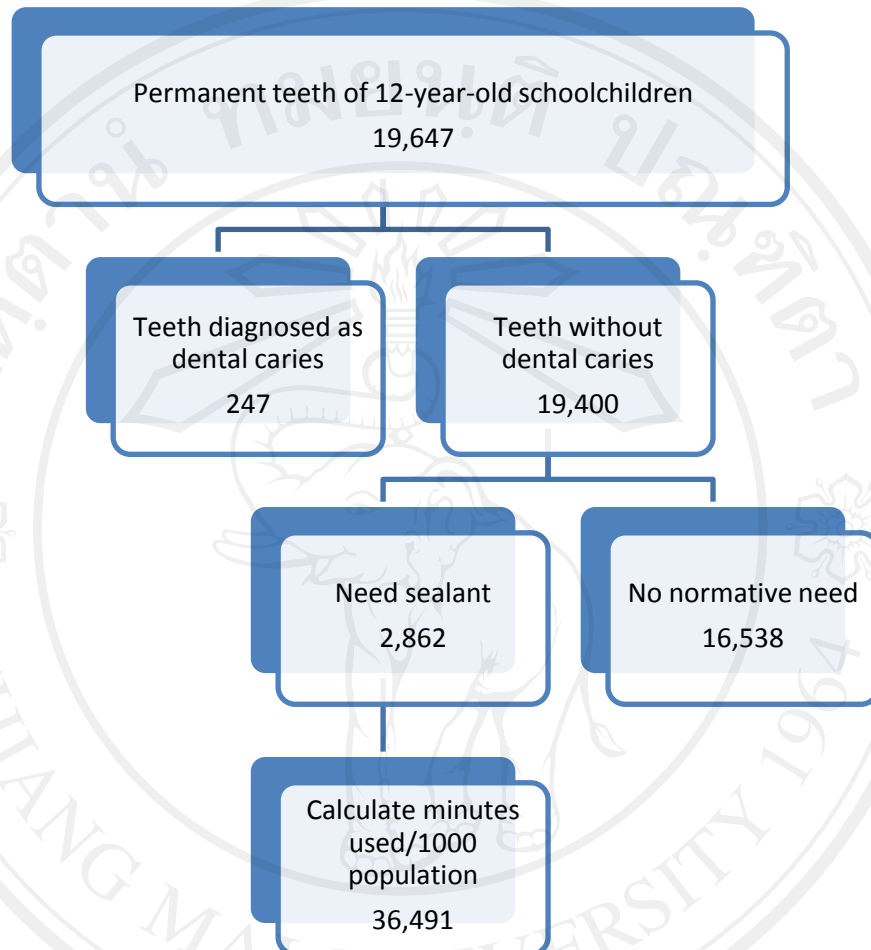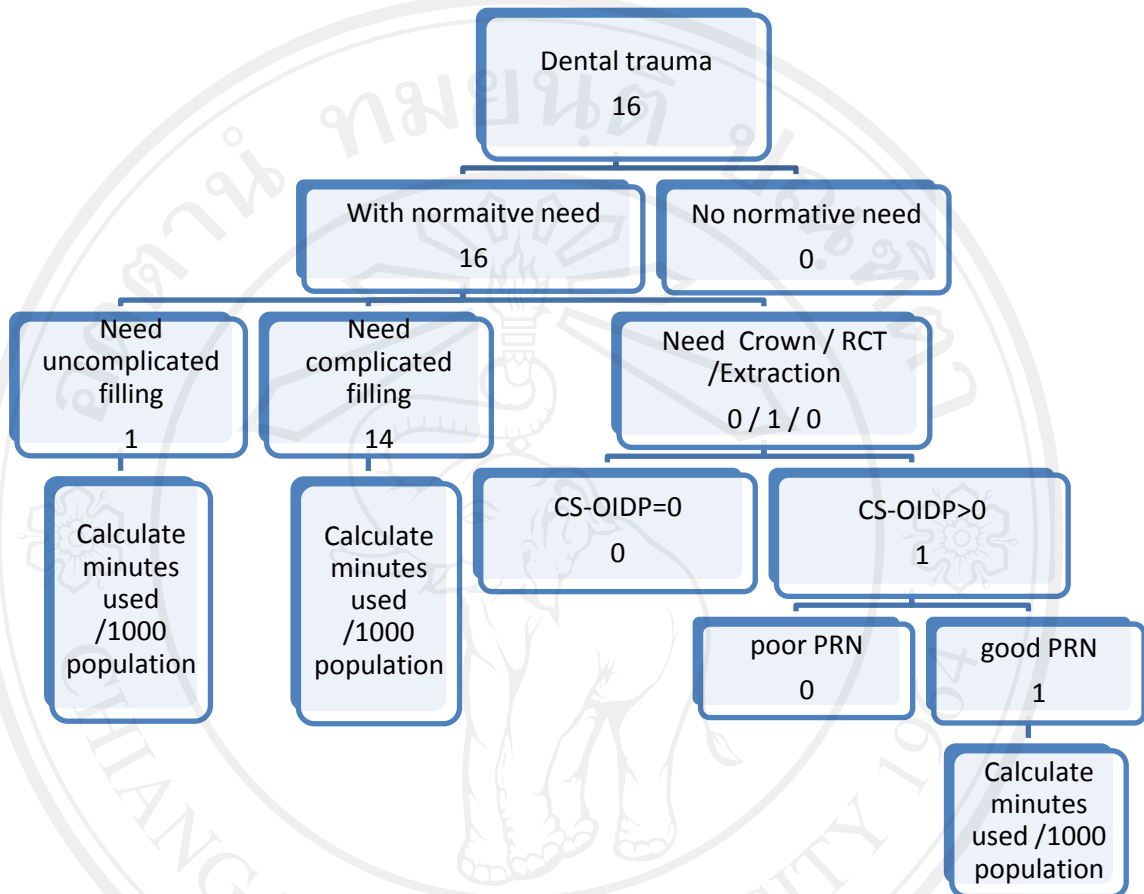
4.5.6 Permanent teeth of 12-year-old schoolchildren without dental caries

Permanent teeth of 12-year-old schoolchildren
19,647

Teeth diagnosed as dental caries
247

Teeth without dental caries
19,400

Need sealant
2,862

No normative need
16,538

Calculate minutes used/1000 population
36,491

4.5.7 Periodontal disease of 12-year-old schoolchildren

```
┌─────────────────────────────────────────────────┐
│ Number of 12-year-old schoolchildren with        │
│ Periodontal disease                               │
│ 800                                               │
└─────────────────────────────────────────────────┘
        │
   ┌────┴──────────────────┐
┌──────────────────┐  ┌──────────────────┐
│ Subjects with    │  │ Subjects with    │
│ maxCPI = 0, 1    │  │ maxCPI = 2       │
│ 285, 126         │  │ 389              │
└──────────────────┘  └──────────────────┘
                           │
                    ┌──────┴──────────┐
              ┌──────────────┐  ┌──────────────┐
              │ CS-OIDP=0    │  │ CS-OIDP>0    │
              │ 90           │  │ 299          │
              └──────────────┘  └──────────────┘
                                     │
                              ┌──────┴──────┐
                       ┌──────────────┐  ┌──────────────┐
                       │ poor PRN     │  │ good PRN     │
                       │ 156          │  │ 143          │
                       └──────────────┘  └──────────────┘
                                              │
                              ┌───────────────────────────────┐
                              │ Calculate minutes used /1000   │
                              │ population                     │
                              │ 4,077                          │
                              └───────────────────────────────┘
```
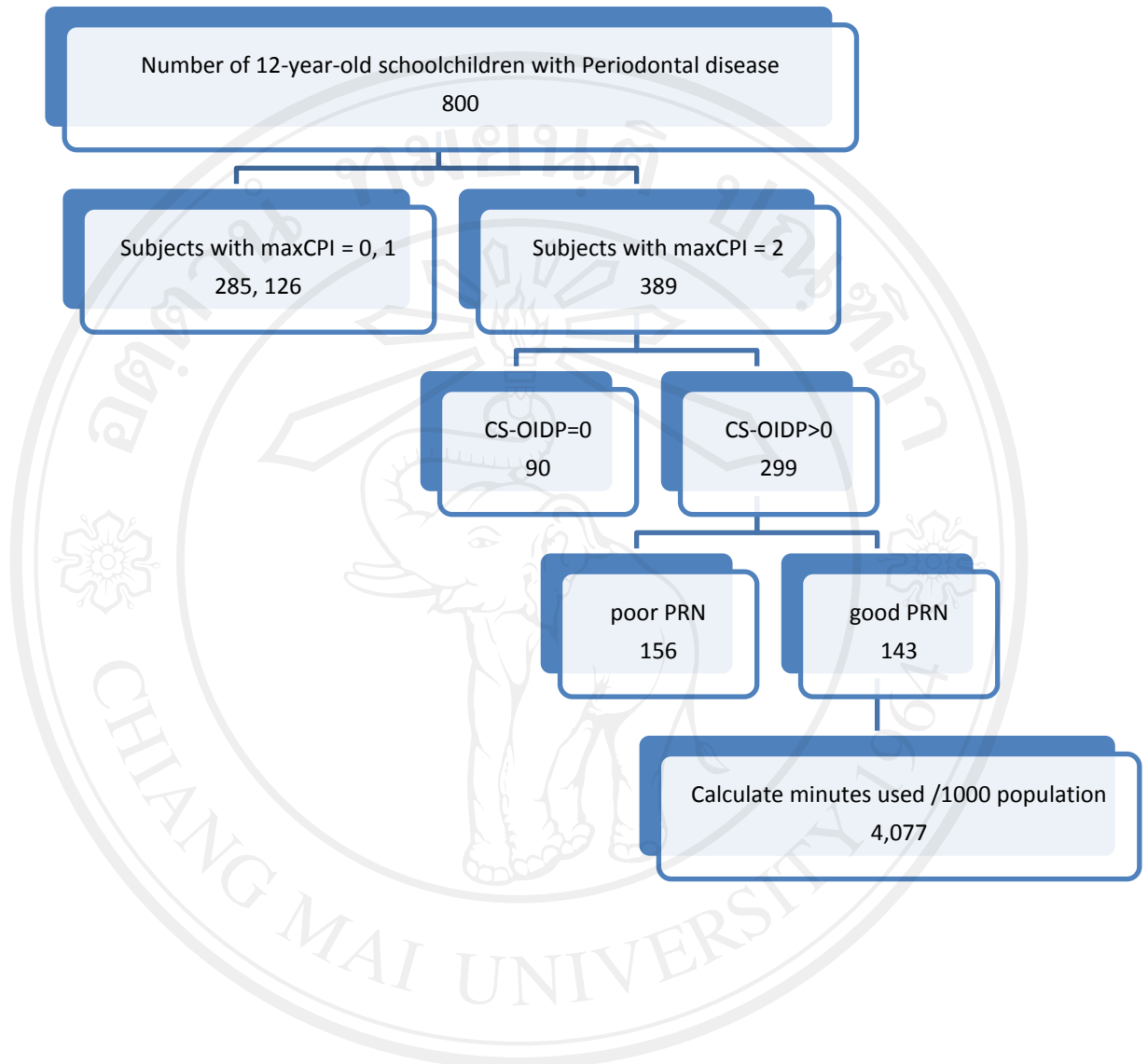
4.5.8 Teeth with dental trauma

```
                        Dental trauma
                             16

          With normaitve need        No normative need
                16                          0

Need              Need              Need  Crown / RCT
uncomplicated     complicated       /Extraction
filling           filling           0 / 1 / 0
  1                 14

Calculate         Calculate         CS-OIDP=0      CS-OIDP>0
minutes           minutes              0              1
used              used
/1000             /1000                       poor PRN    good PRN
population        population                     0           1

                                                          Calculate
                                                          minutes
                                                          used /1000
                                                          population
```

4.6 Manpower estimation

As breakdown diagram derives number of subjects who were affected their daily life activity by oral impacts. It is sensible to use those number as input for calculate manpower requirement on dental treatment.

In order to complete the calculations some assumptions have been made as follows:

1. The estimation would be done under various models and scenarios.

2. The distribution and severity of diseases found in this study were proportional to the disease distribution and severity in the models and scenarios.

3. The estimated number of dentists was calculated from the times spent on dental work per year identified in the questionnaires in this study.

4. The number of schoolchildren in the year 2030 was an estimation by the Office of the National Economic and Social Development Board.

5. Values from 6-year-old schoolchildren in this study were used as the estimated input of disease status values of 6-10-year-old schoolchildren in the scenarios. Values from 12-year-old schoolchildren in this study were used as input for 11-12-year-old schoolchildren in the scenarios.

From the described assumptions the dental manpower need in the year 2030 was estimated. The estimates are shown in the part 4.6.1 to 4.6.3.

4.6.1 Model 1: Entire normative need

The number of dentists and dental nurses necessary to take care of schoolchildren in the year 2030 estimated using the traditional health need model

based on the entire normative need of schoolchildren alone was calculated. Estimates from Model 1 are shown in Table 52. As described before that Model 1 may have shortcoming in concept thus the estimation was done in one scenario for purpose of comparison only. The prevalence of dental diseases in Model 1 was assumed to be those identified in Scenario 2 in Model 2.

Table 52 Number of dentists needed to treat 6-10-year-old schoolchildren, estimated using Model 1

Treatment	From this study		Number of dentists needed Per 1,000 population (persons)	Number of schoolchildren from 2030 Population trajectory (persons)	Number of dentists needed in the year 2030 (Model 1) (persons)
	Number of school children from this study (persons)	Average time in minutes used per treatment (minutes)			
Primary teeth uncomplicated filling	411	20.90	0.106	2,546,400	363
Primary teeth complicated filling	411	30.67	0.374	2,546,400	1282
Primary teeth crown	411	52.87	0.143	2,546,400	488
Primary teeth pulp care	411	66.32	0.071	2,546,400	244
Primary teeth extraction	411	13.75	0.104	2,546,400	356
Primary teeth sealant	411	10.20	0.381	2,546,400	891
Permanent teeth uncomplicated filling	411	134.04	0.002	2,546,400	13
Permanent teeth complicated filling	411	36.84	0.001	2,546,400	4
Permanent teeth extraction	411	77.48	0.001	2,546,400	8
Permanent teeth sealant	411	8221.2	0.098	2,546,400	891
Total					**4,540**

By using the entire normative need alone, Model 1 estimated 4,540 as the number of dentists needed to take care of 6-10-year-old schoolchildren in the year 2030.

Table 53 Number of dentists needed to treat 11-12-year-old schoolchildren, estimated by Model 1

Treatment	From this study		Number of dentists needed Per 1,000 population (persons)	Number of schoolchildren from 2030 Population trajectory (persons)	Number of dentists needed in the year 2030 (Model 1) (persons)
	Number of school children from this study (persons)	Average time in minutes used per treatment (minutes)			
Uncomplicated filling	800	22.34	0.029	1,415,600	69
Complicated filling	800	36.84	0.026	1,415,600	62
Crown	800	163.33	0.041	1,415,600	183
Pulp care	800	163.82	0.046	1,415,600	236
Extraction	800	19.37	0.003	1,415,600	26
Sealant	800	10.2	0.435	1,415,600	565
Scaling	800	22.81	0.029	1,415,600	193
Total					**1,334**

By using the entire normative need alone, the Model 1 estimated 1,334 as the number of dentists needed to take care of 11-12-year-old schoolchildren in the year 2030.

Table 54 Number of dental nurses needed to treat 6-10-year-old schoolchildren, estimated by Model 1

Treatment	From this study		Number of dental nurses needed Per 1,000 population (persons)	Number of schoolchildren from 2030 Population trajectory (persons)	Number of dental nurses needed in the year 2030 (Model 1) (persons)
	Number of school children from this study (persons)	Average time in minutes used per treatment (minutes)			
Primary teeth uncomplicated filling	411	18.50	0.136	2,546,400	465
Primary teeth complicated filling	411	31.67	0.560	2,546,400	1915
Primary teeth extraction	411	8.90	0.098	2,546,400	334
Primary teeth sealant	411	10.1	0.546	2,546,400	1289
Permanent teeth uncomplicated filling	411	98.46	0.004	2,546,400	14
Permanent teeth complicated filling	411	27.67	0.001	2,546,400	4
Permanent teeth extraction	411	60.00	0.002	2,546,400	9
Permanent teeth sealant	411	15197.18	0.342	2,546,400	1289
Total					**5,319**

By using the entire normative need alone, Model 1 estimated 5,319 as the number of dental nurses needed to take care of 6-10-year-old schoolchildren in the year 2030.

Table 55   Number   of   dental   nurses   needed   to   treat   11-12-year-old

schoolchildren, estimated by Model 1

Treatment	From this study		Number of dental nurses needed Per 1,000 population (persons)	Number of schoolchildren from 2030 Population trajectory (persons)	Number of dental nurses needed in the year 2030 (Model 1) (persons)
	Number of school children from this study (persons)	Average time in minutes used per treatment (minutes)			
Uncomplicated filling	800	22.81	0.042	1,415,600	73
Complicated filling	800	16.41	0.038	1,415,600	67
Extraction	800	27.67	0.005	1,415,600	29
Sealant	800	15	0.630	1,415,600	818
Scaling	800	10.1	0.070	1,415,600	279
Total					**1,266**

By using the entire normative need alone, Model 1 estimated 1,266 as the
number of dental nurses needed to take care of 11-12-year-old schoolchildren in the
year 2030.

4.6.2   Model 2: Entire normative need incorporated with sociodental approach

The numbers of dentists and dental nurses needed to take care of the oral
health of schoolchildren by the year 2030, estimated by using the entire normative
need incorporated with sociodental approach are presented in Tables 56-59.

Table 56 Number of dentists needed to treat 6-10-year-old schoolchildren, estimated by Model 2

Treatment	From this study		Number of dentists needed Per 1,000 population (persons)	Number of schoolchildren from 2030 Population trajectory (persons)	Estimated manpower requirement		
	Number of school children from this study (persons)	Average time in minutes used per treatment (minutes)			Number of dentists needed in the year 2030 for Scenario 1 (persons)	Number of dentists needed in the year 2030 for Scenario 2 (persons)	Number of dentists needed in the year 2030 for Scenario 3 (persons)
Primary teeth uncomplicated filling	411	20.90	0.106	2,546,400	290	363	413
Primary teeth complicated filling	411	30.67	0.374	2,546,400	1025	1282	1457
Primary teeth crown	411	52.87	0.143	2,546,400	390	488	555
Primary teeth pulp care	411	66.32	0.071	2,546,400	195	244	277
Primary teeth extraction	411	13.75	0.104	2,546,400	285	356	405
Primary teeth sealant	411	10.20	0.381	2,546,400	952	891	849
Permanent teeth uncomplicated filling	411	134.04	0.002	2,546,400	11	13	36
Permanent teeth complicated filling	411	36.84	0.001	2,546,400	3	4	10
Permanent teeth extraction	411	77.48	0.001	2,546,400	6	8	21
Permanent teeth sealant	411	8221.2	0.098	2,546,400	952	891	849
Total					**4,109**	**4,540**	**4,872**

By using the entire normative need incorporated with sociodental approach, Model 2 estimated 4,109, 4,540, and 4,872

as the numbers of dentists needed to take care of 6-10-year-old schoolchildren in the year 2030 for Scenarios 1, 2, and 3,

respectively.

Table 57 Number of dentists needed to treat 11-12-year-old schoolchildren, estimated by Model 2

Treatment	From this study		Number of dentists needed Per 1,000 population (persons)	Number of schoolchildren from 2030 Population trajectory (persons)	Estimated manpower requirement		
	Number of school children from this study (persons)	Average time in minutes used per treatment (minutes)			Number of dentists needed in the year 2030 for Scenario 1 (persons)	Number of dentists needed in the year 2030 for Scenario (persons)	Number of dentists needed in the year 2030 for Scenario (persons)
Uncomplicated filling	800	22.34	0.029	1,415,600	43	69	95
Complicated filling	800	36.84	0.026	1,415,600	39	62	85
Crown	800	163.33	0.041	1,415,600	61	97	134
Pulp care	800	163.82	0.046	1,415,600	68	109	150
Extraction	800	19.37	0.003	1,415,600	5	8	11
Sealant	800	10.2	0.435	1,415,600	612	565	518
Scaling	800	22.81	0.029	1,415,600	57	71	85
Total					**885**	**981**	**1,078**

By using the entire normative need incorporated with sociodental approach, Model 2 estimated 885, 918, and 1,078 as the numbers of dentists needed to take care of 11-12-year-old schoolchildren in the year 2030 for Scenarios 1, 2, and 3, respectively.

Table 58 Number of dental nurses needed to treat 6-10-year-old schoolchildren, estimated by Model 2

Treatment	From this study			Number of schoolchildren from 2030 Population trajectory (persons)	Estimated manpower requirement		
	Number of school children from this study (persons)	Average time in minutes used per treatment (minutes)	Number of dentists needed Per 1,000 population (persons)		Number of dentists needed in the year 2030 for Scenario 1 (persons)	Number of dentists needed in the year 2030 for Scenario 2 (persons)	Number of dentists needed in the year 2030 for Scenario 3 (persons)
Primary teeth uncomplicated filling	411	18.50	0.136	2,546,400	372	465	529
Primary teeth complicated filling	411	31.67	0.560	2,546,400	1532	1915	2177
Primary teeth extraction	411	8.90	0.098	2,546,400	267	334	379
Primary teeth sealant	411	10.1	0.546	2,546,400	1378	1289	1228
Permanent teeth uncomplicated restoration	411	98.46	0.004	2,546,400	11	14	16
Permanent teeth complicated filling	411	27.67	0.001	2,546,400	3	4	5
Permanent teeth extraction	411	60.00	0.002	2,546,400	7	9	10
Permanent teeth sealant	411	15197.18	0.342	2,546,400	1378	1289	1228
Total					**4,948**	**5,319**	**5,571**

By using the entire normative need incorporated with sociodental approach, Model 2 estimated 4,948, 5,319, and 5,571 as the numbers of dental nurses needed to take care of 6-10-year-old schoolchildren in the year 2030 for Scenarios 1, 2, and 3, respectively.

Table 59 Number of dental nurses needed to treat 11-12-year-old schoolchildren, estimated by Model 2

Treatment	From this study		Number of dentists needed Per 1,000 population (persons)	Number of schoolchildren from 2030 Population trajectory (persons)	Estimated manpower requirement		
	Number of school children from this study (persons)	Average time in minutes used per treatment (minutes)			Number of dentists needed in the year 2030 for Scenario 1 (persons)	Number of dentists needed in the year 2030 for Scenario 2 (persons)	Number of dentists needed in the year 2030 for Scenario 3 (persons)
Uncomplicated filling	800	22.81	0.042	1,415,600	46	73	101
Complicated filling	800	16.41	0.038	1,415,600	42	67	93
Extraction	800	27.67	0.005	1,415,600	6	9	13
Sealant	800	15	0.630	1,415,600	886	818	750
Scaling	800	10.1	0.070	1,415,600	82	103	123
Total					**1,062**	**1,070**	**1,079**

By using the entire normative need incorporated with sociodental approach, Model 2 estimated 1,062, 1,070, and 1,079 as the number of dental nurses needed to take care of 11-12-year-old schoolchildren in the year 2030 for Scenarios 1, 2, and 3, respectively.

4.6.3 Model 3: Annual incremental normative need incorporated with sociodental approach

The numbers of dentists and dental nurses necessary to take care of the oral health of schoolchildren by the year 2030, estimated by using the annual incremental normative need incorporated with sociodental approach are presented in Tables 60-63.

Table 60 Number of dentists needed to treat 6-10 year old schoolchildren, estimated by Model 3

Treatment	From this study		Number of dentists needed Per 1,000 population (persons)	Number of schoolchildren from 2030 Population trajectory (persons)	Number of dentists needed in the year 2030 (Model 3) (persons)
	Number of school children from this study (persons)	Average time in minutes used per treatment (minutes)			
Primary teeth uncomplicated filling	411	20.90	0.106	2,546,400	363
Primary teeth complicated filling	411	30.67	0.374	2,546,400	1282
Primary teeth crown	411	52.87	0.143	2,546,400	488
Primary teeth pulp care	411	66.32	0.071	2,546,400	244
Primary teeth extraction	411	13.75	0.104	2,546,400	356
Primary teeth sealant	411	10.20	0.381	2,546,400	891
Permanent teeth uncomplicated filling	411	134.04	0.002	2,546,400	13
Permanent teeth complicated filling	411	36.84	0.001	2,546,400	4
Permanent teeth extraction	411	77.48	0.001	2,546,400	8
Permanent teeth sealant	411	8221.2	0.098	2,546,400	891
Total					**4,540**

By using the annual incremental normative need incorporated with sociodental approach, Model 3 estimated 4,540 as the number of dentists needed to take care of 6-10-year-old schoolchildren in the year 2030.

Table 61 Number of dentists needed to treat 11-12 year old schoolchildren group, estimated by Model 3

Treatment	From this study		Number of dentists needed Per 1,000 population (persons)	Number of schoolchildren from 2030 Population trajectory (persons)	Number of dentists needed in the year 2030 (Model3) (persons)
	Number of school children from this study (persons)	Average time in minutes used per treatment (minutes)			
Uncomplicated filling	800	22.34	0.029	1,415,600	69
Complicated filling	800	36.84	0.026	1,415,600	62
Crown	800	163.33	0.041	1,415,600	183
Pulp care	800	163.82	0.046	1,415,600	236
Extraction	800	19.37	0.003	1,415,600	26
Sealant	800	10.2	0.435	1,415,600	565
Scaling	800	22.81	0.029	1,415,600	193
Total					**1,334**

By using the annual incremental normative need incorporated with sociodental approach, Model 3 estimated 1,334 as the number of dentists needed to take care of 11-12-year-old schoolchildren in the year 2030.

Table 62 Number of dental nurses needed to treat 6-10-year-old schoolchildren, estimated by Model 3

Treatment	From this study		Number of dental nurses needed Per 1,000 population (persons)	Number of schoolchildren from 2030 Population trajectory (persons)	Number of dental nurses needed in the year 2030 (Model 3) (persons)
	Number of school children from this study (persons)	Average time in minutes used per treatment (minutes)			
Primary teeth uncomplicated filling	411	18.50	0.136	2,546,400	96
Primary teeth complicated filling	411	31.67	0.560	2,546,400	396
Primary teeth extraction	411	8.90	0.098	2,546,400	69
Primary teeth sealant	411	10.1	0.546	2,546,400	410
Permanent teeth uncomplicated filling	411	98.46	0.004	2,546,400	3
Permanent teeth complicated filling	411	27.67	0.001	2,546,400	1
Permanent teeth extraction	411	60.00	0.002	2,546,400	2
Permanent teeth sealant	411	15197.18	0.342	2,546,400	207
Total					1184

By using the annual incremental normative need incorporated with sociodental approach, Model 3 estimated 5,319 as the number of dental nurses needed to take care of 6-10-year-old schoolchildren in the year 2030.

Table 63 Number of dental nurses needed to treat 11-12-year-old schoolchildren, estimated by Model 3

Treatment	From this study		Number of dental nurses needed Per 1,000 population (persons)	Number of schoolchildren from 2030 Population trajectory (persons)	Number of dental nurses needed in the year 2030 (Model 3) (persons)
	Number of school children from this study (persons)	Average time in minutes used per treatment (minutes)			
Uncomplicated filling	800	22.81	0.042	1,415,600	4
Complicated filling	800	16.41	0.038	1,415,600	4
Extraction	800	27.67	0.005	1,415,600	1
Sealant	800	15	0.630	1,415,600	494
Scaling	800	10.1	0.070	1,415,600	82
Total					**585**

By using the annual incremental normative need incorporated with sociodental approach, the Model 3 estimated 1,266

as the number of dental nurses need needed to take care of 11-12-year-old schoolchildren in the year 2030.

4.7 Summary of Dental Manpower Need to Take care of Schoolchildren

From the calculations by different models and scenarios, the number of dental personnel needed to take care of schoolchildren in the year 2030 are summarized in Table 64-67

From the concept of skill mix, if some kind of dental treatments were delivered by dental nurses the number of dentists needed decreases. In this study, three combinations of task delivery were assumed: (1) all one-surface restorations, complicated fillings, extractions, sealants, and scalings were delivered by dentists, (2) half of these treatments were delivered by dentists and the other half by dental nurses, and (3) all of these treatments were delivered by dental nurses. Manpower needs for the three situations of skill mix shown in Table 68-69.

Table 64a Estimated numbers of dentists needed for treatment of caries and periodontal disease in children in the Thai

school system in the year 2030, according to scenarios (including sealant workload)

Treatment	Estimated Dentist Requirement (persons)				
	MODEL 1	**MODEL 2**			**MODEL 3**
	Calculated from entire normative needs alone	Scenario 1 DMFT 0.2 to 1.8 Calculated from entire normative needs with sociodental approach	Scenario 2 DMFT 0.5 to 2.2 Calculated from entire normative needs with sociodental approach	Scenario 3 DMFT 0.8 to 3.1 Calculated from entire normative needs with sociodental approach	Calculated from annual incremental normative needs with sociodental approach
6-10-year-old schoolchildren					
Primary teeth uncomplicated	363	290	363	413	75
Primary teeth complicated filling	1282	1025	1282	1457	265
Primary teeth crown	488	390	488	555	101
Primary teeth pulp care	244	195	244	277	50
Primary teeth extraction	356	285	356	405	74
Primary teeth sealant	891	952	891	849	284
Permanent teeth uncomplicated	13	11	13	36	3
Permanent teeth complicated	4	3	4	10	1
Permanent teeth extraction	8	6	8	21	2
Permanent teeth sealant	891	952	891	849	143
Total	**4,540**	**4,109**	**4,540**	**4,872**	**998**
Percent	**100**	**90.5**	**100**	**100.7**	**22.0**

Table 64b Estimated numbers of dentists needed for treatment of caries and periodontal disease in children in the Thai

school system in the year 2030, according to scenarios (including sealant workload)

Treatment	Estimated Dentist Requirement (persons)				
	MODEL 1	MODEL 2			MODEL 3
	Calculated from entire normative needs alone	Scenario 1 DMFT 0.2 to 1.8 Calculated from entire normative needs with sociodental approach	Scenario 2 DMFT 0.5 to 2.2 Calculated from entire normative needs with sociodental approach	Scenario 3 DMFT 0.8 to 3.1 Calculated from entire normative needs with sociodental approach	Calculated from annual incremental normative needs with sociodental approach
11-12-year-old schoolchildren					
Uncomplicated restoration	69	43	69	95	4
Complicated restoration	62	39	62	85	4
Crown	183	61	97	134	6
Pulp care	236	68	109	150	7
Extraction	26	5	8	11	0
Sealant	565	612	565	518	342
Scaling	193	57	71	85	57
Total	**1,334**	**885**	**981**	**1,078**	**420**
percent	**100**	**66.3**	**73.5**	**80.8**	**31.5**
Overall Total 6 to 12 year olds	**5,874**	**4,994**	**5,521**	**5,950**	**1,418**
percent	**100**	**85.0**	**94.0**	**101.3**	**24.1**

The number of dentists need in Model 1, the model based on the entire normative need alone was 5,793 dentists. The three scenarios based on the entire normative need incorporated with the sociodental approach produced requirements of 4,996 dentists for Scenario 1 (areas with a DMFT 0.2 to 1.8), 5,521 for Scenario 2 (areas with a DMFT 0.5 to 2.2) and 5,949 for Scenario 3 (areas with a DMFT 0.8 to 3.1), respectively. Model 3, incorporating incremental need but not normative need with the sociodental approach produced a manpower requirement of 1,418 dentists.

Table 65a Estimated numbers of dental nurses needed for treatment of caries and periodontal disease in children in the Thai school system in the year 2030, according to scenarios (not including sealant workload)

Treatment	Estimated Dental Nurse Requirement (persons)				
	MODEL 1	MODEL 2			MODEL 3
	Calculated from entire normative needs alone	Scenario 1 DMFT 0.2 to 1.8 Calculated from entire normative needs with sociodental approach	Scenario 2 DMFT 0.5 to 2.2 Calculated from entire normative needs with sociodental approach	Scenario 3 DMFT 0.8 to 3.1 Calculated from entire normative needs with sociodental approach	Calculated from annual incremental normative needs with sociodental approach
6-10-year-old schoolchildren					
Primary teeth uncomplicated	363	290	363	413	75
Primary teeth complicated filling	1282	1025	1282	1457	265
Primary teeth crown	488	390	488	555	101
Primary teeth pulp care	244	195	244	277	50
Primary teeth extraction	356	285	356	405	74
Permanent teeth uncomplicated	13	11	13	36	3
Permanent teeth complicated	4	3	4	10	1
Permanent teeth extraction	8	6	8	21	2
Total	**2,758**	**2,205**	**2,758**	**3,174**	**571**
Percent	**100**	**79.9**	**100.0**	**115.1**	**20.7**

Table 65b **Estimated numbers of dental nurses needed for treatment of caries and periodontal disease in children in the Thai school system in the year 2030, according to scenarios (not including sealant workload)**

| Treatment | Estimated Dental Nurse Requirement (persons) | | | | |
| | MODEL 1 | MODEL 2 | | | MODEL 3 |
	Calculated from entire normative needs alone	Scenario 1 DMFT 0.2 to 1.8 Calculated from entire normative needs with sociodental approach	Scenario 2 DMFT 0.5 to 2.2 Calculated from entire normative needs with sociodental approach	Scenario 3 DMFT 0.8 to 3.1 Calculated from entire normative needs with sociodental approach	Calculated from annual incremental normative needs with sociodental approach
11-12-year-old schoolchildren					
Uncomplicated restoration	69	43	69	95	4
Complicated restoration	62	39	62	85	4
Crown	183	61	97	134	6
Pulp care	236	68	109	150	7
Extraction	26	5	8	11	0
Scaling	193	57	71	85	57
Total	**769**	**273**	**416**	**560**	**78**
percent	**100.0**	**35.5**	**54.1**	**72.8**	**10.1**
Overall Total 6 to 12 year olds	**3,527**	**2,478**	**3,174**	**3,734**	**649**
percent	**100**	**70.3**	**90.0**	**105.9**	**18.4**

The number of dentists need in Model 1, the model based on the entire normative need alone was 3,527 dentists. The three scenarios based on the entire normative need incorporated with the sociodental approach produced requirements of 2,478 dentists for Scenario 1 (areas with a DMFT 0.2 to 1.8), 3,174 for Scenario 2 (areas with a DMFT 0.5 to 2.2) and 3,734 for Scenario 3 (areas with a DMFT 0.8 to 3.1), respectively. Model 3, incorporating incremental need but not normative need with the sociodental approach produced a manpower requirement of 649 dentists.

Table 66a Estimated numbers of dental nurses needed for treatment of caries and periodontal disease in children in the Thai school system in the year 2030, according to scenarios (including sealant workload)

Treatment	Estimated Dental Nurse Requirement (persons)				
	MODEL 1	MODEL 2			MODEL 3
	Calculated from entire normative needs alone	Scenario 1 DMFT 0.2 to 1.8 Calculated from entire normative needs with sociodental approach	Scenario 2 DMFT 0.5 to 2.2 Calculated from entire normative needs with sociodental approach	Scenario 3 DMFT 0.8 to 3.1 Calculated from entire normative needs with sociodental approach	Calculated from annual incremental normative needs with sociodental approach
6-10-year-old schoolchildren					
Primary teeth uncomplicated	465	372	465	529	96
Primary teeth complicated filling	1915	1532	1915	2177	396
Primary teeth extraction	334	267	334	379	69
Primary teeth sealant	1289	1378	1289	1228	410
Permanent teeth uncomplicated	14	11	14	16	3
Permanent teeth complicated	4	3	4	5	1
Permanent teeth extraction	9	7	9	10	2
Permanent teeth sealant	1289	1378	1289	1228	207
Total	**5,319**	**4,948**	**5,319**	**5,571**	**1,184**
percent	**100.0**	**93.0**	**100.0**	**104.7**	**22.3**

Table 66b **Estimated numbers of dental nurses needed for treatment of caries and periodontal disease in children in the Thai school system in the year 2030, according to scenarios (including sealant workload)**

Treatment	Estimated Dental Nurse Requirement (persons)				
	MODEL 1	MODEL 2			MODEL 3
	Calculated from entire normative needs alone	Scenario 1 DMFT 0.2 to 1.8 Calculated from entire normative needs with sociodental approach	Scenario 2 DMFT 0.5 to 2.2 Calculated from entire normative needs with sociodental approach	Scenario 3 DMFT 0.8 to 3.1 Calculated from entire normative needs with sociodental approach	Calculated from annual incremental normative needs with sociodental approach
11-12-year-old schoolchildren					
Uncomplicated restoration	73	46	73	101	4
Complicated restoration	67	42	67	93	4
Extraction	29	6	9	13	1
Sealant	818	886	818	750	494
Scaling	279	82	103	123	82
Total	**1,266**	**1,062**	**1,070**	**1,079**	**585**
Percent	**100.0**	**83.9**	**84.5**	**85.2**	**46.2**
Overall Total 6-to-12-year-olds	**6,585**	**6,010**	**6,585**	**6,650**	**1,769**
Percent	**100.0**	**91.3**	**97.0**	**101.0**	**26.9**

The number of dental nurses needed in Model 1, the model based on the entire normative need alone was 6,585 dental nurses. The three scenarios based on the entire normative need incorporated with the sociodental approach produced requirements of 6,010 dental nurses for Scenario 1 (areas with a DMFT 0.2 to 1.8), 6,585 for Scenario 2 (areas with a DMFT 0.5 to 2.2) and 6,650 for Scenario 3 (areas with a DMFT 0.8 to 3.1), respectively. Model 3, incorporating incremental need but not normative need with the sociodental approach produced a manpower requirement of 1,769 dental nurses.

Table 67a Estimated numbers of dental nurses needed for treatment of caries and periodontal disease in children in the Thai school system in the year 2030, according to scenarios (not including sealant workload)

Treatment	Estimated Dental Nurse Requirement (persons)				
	MODEL 1	MODEL 2			MODEL 3
	Calculated from entire normative needs alone	Scenario 1 DMFT 0.2 to 1.8 Calculated from entire normative needs with sociodental approach	Scenario 2 DMFT 0.5 to 2.2 Calculated from entire normative needs with sociodental approach	Scenario 3 DMFT 0.8 to 3.1 Calculated from entire normative needs with sociodental approach	Calculated from annual incremental normative needs with sociodental approach
6-10-year-old schoolchildren					
Primary teeth uncomplicated	465	372	465	529	96
Primary teeth complicated filling	1915	1532	1915	2177	396
Primary teeth extraction	334	267	334	379	69
Permanent teeth uncomplicated	14	11	14	16	3
Permanent teeth complicated	4	3	4	5	1
Permanent teeth extraction	9	7	9	10	2
Total	**2,741**	**2,192**	**2,741**	**3,116**	**567**
percent	**100.0**	**80.0**	**100.0**	**113.7**	**20.7**

Table 67b   **Estimated numbers of dental nurses needed for treatment of caries and periodontal disease in children in the Thai school system in the year 2030, according to scenarios (not including sealant workload)**

Treatment	Estimated Dental Nurse Requirement (persons)				
	MODEL 1	MODEL 2			MODEL 3
	Calculated from entire normative needs alone	Scenario 1 DMFT 0.2 to 1.8 Calculated from entire normative needs with sociodental approach	Scenario 2 DMFT 0.5 to 2.2 Calculated from entire normative needs with sociodental approach	Scenario 3 DMFT 0.8 to 3.1 Calculated from entire normative needs with sociodental approach	Calculated from annual incremental normative needs with sociodental approach
11-12-year-old schoolchildren					
Uncomplicated restoration	73	46	73	101	4
Complicated restoration	67	42	67	93	4
Extraction	29	6	9	13	1
Scaling	279	82	103	123	82
Total	**448**	**176**	**252**	**330**	**91**
Percent	**100.0**	**39.3**	**56.3**	**73.7**	**20.3**
Overall Total 6-to-12-year-olds	**3,189**	**2,368**	**2,993**	**3,446**	**658**
Percent	**100.0**	**74.3**	**93.9**	**108.1**	**20.6**

The number of dental nurses needed in Model 1, the model based on the entire normative need alone was 3,189 dental nurses. The three scenarios based on the entire normative need incorporated with the sociodental approach produced requirements of 2,368 dental nurses for Scenario 1 (areas with a DMFT 0.2 to 1.8), 2,993 for Scenario 2 (areas with a DMFT 0.5 to 2.2) and 3,446 for Scenario 3 (areas with a DMFT 0.8 to 3.1), respectively. Model 3, incorporating incremental need but not normative need with the sociodental approach produced a manpower requirement of 658 dental nurses.

Table 68   Number of dentists and dental nurses needed in three situations of different patterns of work delivery

(including sealant workload)

Treatment	Estimated Dental Manpower Requirement (number of dentists/dental nurses)				
	MODEL 1	MODEL 2			MODEL 3
	Calculated from entire normative needs alone	Scenario 1 DMFT 0.2 to 1.8 Calculated from entire normative needs with sociodental approach	Scenario 2 DMFT 0.5 to 2.2 Calculated from entire normative needs with sociodental approach	Scenario 3 DMFT 0.8 to 3.1 Calculated from entire normative needs with sociodental approach	Calculated from annual incremental normative needs with sociodental approach
All treatment delivered by dentists					
6-10-year-old schoolchildren	4,540 / 0	4,109 / 0	4,540 / 0	4,872 / 0	998 / 0
11-12-year-old schoolchildren	1,334 / 0	885 / 0	981 / 0	1,078 / 0	420 / 0
Total	5,874 / 0	4,994 / 0	5,521 / 0	5,950 / 0	1,418 / 0
50:50 treatment delivered by dentists and dental nurses					
6-10-year-old schoolchildren	2,636 / 2,660	2,347 / 2,474	2,636 / 2,660	2,852 / 2,786	575 / 592
11-12-year-old schoolchildren	759 / 633	473 / 531	539 / 535	606 / 540	213 / 293
Total	3,395 / 3,293	2,820 / 3,005	3,175 / 3,195	3,458 / 3,326	788 / 885
All possible treatment delivered by dental nurses					
6-10-year-old schoolchildren	732 / 1,289	585 / 1,378	732 / 1,289	832 / 1,228	151 / 207
11-12-year-old schoolchildren	419 / 1,266	129 / 1,062	206 / 1,070	284 / 1,080	13 / 585
Total	1,151 / 6,585	714 / 6,010	938 / 6,389	1,116 / 6,652	164 / 1,769

Having all dental tasks in schoolchildren delivered by dentists alone requires the as many as 1,418 to 5,874 dentists, depending on the model of estimation. By delivering some dental tasks by dental nurses, the dentist requirement decreases to 788 to 3,395. Delivering all possible tasks by dental nurses further reduces the dentist requirement to 164 to 1,151. Contrarily, the number of dental nurses needed to maintain the oral health status of schoolchildren increases.

Table 69   Number of dentists and dental nurses needed in three situations of different patterns of work delivery (not including sealant workload)

Treatment	Estimated Dental Manpower Requirement (number of dentists/dental nurses)				
	MODEL 1	MODEL 2			MODEL 3
	Calculated from entire normative needs alone	Scenario 1 DMFT 0.2 to 1.8 Calculated from entire normative needs with sociodental approach	Scenario 2 DMFT 0.5 to 2.2 Calculated from entire normative needs with sociodental approach	Scenario 3 DMFT 0.8 to 3.1 Calculated from entire normative needs with sociodental approach	Calculated from annual incremental normative needs with sociodental approach
All treatment delivered by dentists					
6-10-year-old schoolchildren	2,758 / 0	2,205 / 0	2,758 / 0	3,174 / 0	571 / 0
11-12-year-old schoolchildren	769 / 0	273 / 0	416 / 0	560 / 0	78 / 0
Total	3,257 / 0	2,478 / 0	3,174 / 0	3,734 / 0	649 / 0
50:50 treatment delivered by dentists and dental nurses					
6-10-year-old schoolchildren	1,745 / 1,371	1,395 / 1,196	1,745 / 1,371	2,003 / 1,558	291 / 385
11-12-year-old schoolchildren	193 / 224	167 / 88	246 / 126	347 / 215	42 / 46
Total	1.938 / 1,595	1,562 / 1,284	1,991 / 1,497	2,350 / 1,773	333 / 431
All possible treatment delivered by dental nurses					
6-10-year-old schoolchildren	732 / 2,741	585 / 2,192	732 / 2,741	832 / 3,115	151 / 770
11-12-year-old schoolchildren	419 / 448	129 / 176	206 / 252	284 / 330	13 / 91
Total	1,151 / 3,189	714 / 2,368	938 / 2,993	1,116 / 3,445	164 / 861

Having all dental tasks in schoolchildren delivered by dentists alone requires the as many as 649 to 3,734 dentists, depending on the model of estimation. By delivering some dental tasks by dental nurses, the dentist requirement decreases to 333 to 2,350. Delivering all possible tasks by dental nurses further reduces the dentist requirement to 164 to 1,151. Contrarily, the number of dental nurses needed to maintain the oral health status of schoolchildren increases.