Chapter 4
Results

4.1 Sensitivity & Specificity of the Screening Tests

To test the sensitivity and specificity of the screening tests, 310 students were examined and classified as having eye diseases or no eye diseases. There are 72 students with eye diseases and 238 students without eye diseases. All of these students were screened using different screening tests. The results were filled in the contingency tables.

When using the VA test and stereopsis test as screening test, 54 students with eye diseases were screen positive and 10 students without eye disease were screen positive. The result was calculated into sensitivity of 75.0% and the specificity of 95.8%.

When using the VA test only as screening test, 49 students with eye diseases were screen positive and 8 students without eye disease were screen positive. The result was calculated into sensitivity of 68.1% and the specificity of 96.6%.

Table 4.1   Contingency table of the VA test + stereopsis test

	Disease	No disease
Screening positive	54	10
Screening negative	18	228

Table 4.2   Contingency table of the VA test

	Disease	No disease
Screening positive	49	8
Screening negative	23	230

Table 4.3   Sensitivity and specificity of the screening tests

Screening test	Sensitivity (95% CI)	Specificity (95% CI)
VA + stereopsis	75.0% (65.0-85.0)	95.8% (93.3-98.3)
VA test	68.1% (57.3-78.9)	96.6% (94.3-98.9)

4.2 Referral compliance rate and explanatory socioeconomic variables

The referral compliance rate and the explanatory variables were asked from the parents of screen positive students by questionnaires. The questionnaire was intended to ask for the information of the family size, parents' age, education level, and occupation, the family income, the amount of money the family was able to spend for the eye health problem of the child without difficulty, the parents' decision to take the child to health care facility if the child was screened and found to be positive (referral compliance), the choice of health care facility, the traveling cost and the opportunity cost. The draft questionnaires were tested in

10 parents. After the test and feed back, the questionnaire was modified to be more comprehensible. The final questionnaire was shown in appendix B.

Eight participating schools were randomly selected. The questionnaires were distributed to the parents of the screening positive students in those schools. Three hundred and eleven questionnaires were distributed. Two hundred and twenty six questionnaires were returned (response rate 72.7%). The author excluded one of the responses that had abnormally high income (60,000 Baht per month). The results of the questionnaires were summarized in the table 4.4.

Table 4.4   Summarized of the response for the questionnaire

Items	Results
Student's age (mean ± SD), years	10.04 ± 1.64
Family size (number of family members) (mean ± SD)	4.21 ± 1.54
Father's characteristics	
Father's age (mean ± SD), years	39.81 ± 7.91
Father's education (%)	
Primary school	41.55
Secondary school (or comparable)	34.70
Certificate level (or comparable)	11.87
Bachelor degree (or comparable)	7.76
Post graduate degree (or comparable)	4.11

Father's occupation (%)	
Employee (temporary)	27.56
Employee (permanent)	35.11
Family business, self employ	20.44
Civil servant or employee of government enterprise	10.67
Mother's characteristics	
Mother's age (mean ± SD), years	38.13 ± 6.76
Mother's education (%)	
Primary school	46.15
Secondary school (or comparable)	35.29
Certificate level (or comparable)	9.05
Bachelor degree (or comparable)	7.24
Post graduate degree (or comparable)	2.26
Mother's occupation (%)	
Housewife	38.46
Employee (temporary)	11.31
Employee (permanent)	30.77
Family business, self employ	16.29
Civil servant or employee of government enterprise	3.17
Family income per month * (mean ± SD), Baht	9,892.16 ± 5,827.08
Family income per month * (median), Baht	8,000

* Note: exclude one questionnaire which household income 60,000 Baht

Distribution of family income per month (%)	
≤ 6,000 Baht	32.11
6,001 - 9,000 Baht	31.65
9,001 – 12,000 Baht	12.39
12,001 – 15,000 Baht	8.72
> 15,000 Baht	15.14
Possible health spending capability for the child's eye care per year (mean ± SD), Baht	931.64 ± 1,656.65
Distribution of possible eye health care spending for the child per year (%)	
0 Baht	21.92
1 – 300 Baht	21.46
301 – 600 Baht	19.63
601 – 900 Baht	1.37
900 – 1,200 Baht	20.09
> 1200 Baht	15.53
Referral compliance (%)	
Certainly	82.30
Probably	15.93
Not comply	1.77

Health care facility of choice (%)	
Health center	11.95
Clinic	6.64
Public hospital	73.45
Private hospital	7.52
Others	0.44
Traveling time to the health care facility (mean ± SD), minutes	45.54 ± 33.56
Cost to take the child to health care facility (traveling cost) (mean ± SD), Baht	51.08 ± 54.48
Income forgone if taking the child to health care facility (mean ± SD), Baht	108.23 ± 143.07

* Note: exclude one questionnaire which household income 60,000 Baht

The average family size was 4.2. The mean age of the father was 39.81 years. Fathers' whose education level was primary school were 41.55%, secondary school were 34.7%. Thus the majority of the fathers (76.25%) had education level of secondary level or less. Majority of the fathers (62.67%) were employees (either temporary or permanent).

The mean age of the mother was 38.01 years. Mothers' whose education level was primary school were 46.15%, secondary school were 35.29%. Thus the majority of the mothers (81.44%) had education level of secondary level or less. Thirty eight percent of mothers were housewives. Mothers who were employees (either temporary or permanent) were 42.08%.

The average family income was 9,892.16 Baht per month. About 32% of the families had monthly income of 6,000 Baht or less. When asking how much money that the family could spend without difficulties (e.g. no need to borrow or to sell their property), the average response was 931.64 Baht per year with the range of 0 to 10,000 Baht. About 22% of the families answered that they could not spend anything without difficulties.

When asking about what the parents decide to do if the school vision screening program asks to bring the screen positive child to the eye care facility (referral compliance), 82.3% of the parents answered that they would certainly comply. The eye care facility of choices was public hospital in 73.45%. The average traveling time to the health care facility of choice was 45.54 minutes. When asking about the cost to take the child to health care facility (traveling cost), the average answer was 51.08 Baht, while the average income forgone if taking the child to health care facility was 108.23 Baht.

The total referral cost to the parents composes of traveling cost and income forgone. The referral cost to the parents ranges from 0 to 1,100 Baht. To make this more sensible, the author calculates the proportion of the referral cost to the monthly family income. The frequency distribution of the proportions is shown in the following table.

Table 4.5   Distribution of the proportion of the referral cost to the monthly family income

Proportion of the referral cost to the monthly family income	Frequency (%)
0 – 2%	63.5
2.01 – 4.0%	21.5
4.01 – 6.0%	11.4
> 6.0%	3.6

Since the referral compliance is important for the vision screening program, the factors that affect the non-compliance are studied. The factors includes: income, the proportion of referral cost to monthly income, traveling time, father's education level and mother's education level. The explanatory factors and the compliance are presented in cross tabulation in the table 4.6.

Table 4.6   Cross tabulation of the explanatory factors and the referral compliance

Factors	Compliance	Non-compliance	Statistical test (p)
Father's education level, n (%)			
Primary school	71 (39.4)	20 (52.6)	Chi square
Secondary school	61 (33.9)	14 (36.8)	(0.09)
Higher	48 (26.7)	4 (10.5)	
Mother's education level, n (%)			
Primary school	78 (42.2)	24 (68.6)	Chi square
Secondary school	68 (36.8)	9 (25.7)	(0.01)
Higher	39 (21.1)	2 (5.7)	
Monthly family income, Baht			
Mean	10,268.01	8,053.51	t-test
Frequency, n (%)			(0.035)
6,000 Baht or less	55 (30.4)	15 (40.5)	
6,001 – 9,000 Baht	55 (30.4)	14 (37.8)	
9,001 – 12,000 Baht	25 (13.8)	2 (5.4)	
12,001 – 15,000 Baht	16 (8.8)	3 (8.1)	
> 15,000 Baht	30 (16.6)	3 (8.1)	

Factors	Compliance	Non-compliance	Statistical test (p)
Proportion of the referral cost to the monthly family income, percent			
Mean	2.06	1.61	t-test
Frequency, n (%)			(0.224)
≤ 2.00%	117 (64.3)	22 (59.5)	
2.01 – 4.00%	36 (19.8)	11 (29.7)	
4.01 – 6.00%	22 (12.1)	3 (8.1)	
> 6.00%	7 (3.8)	1 (2.7)	
Traveling time, minutes			
Mean	46.1	40.9	t-test
Frequency, n (%)			(0.365)
≤ 30 minutes	100 (54.1)	29 (72.5)	
31 – 60 minutes	66 (35.7)	8 (20.0)	
61 – 90 minutes	2 (1.1)	0	
91 – 120 minutes	15 (8.1)	0	
> 120 minutes	2 (1.1)	3 (7.5)	

The logit model is used to test the relationship of the independent factors to the referral compliance. Firstly, all the independent variables are included in the model. The results are shown in the table 4.7.

$$\log_e \left\{ \frac{p_i}{(1-p_i)} \right\} = C + \beta_1 INC + \beta_2 FEDU1 + \beta_3 FEDU2 + \beta_4 MEDU1 + \beta_5 MEDU2 + \beta_6 TIME + \beta_7 COST + \beta_8 PROP$$

Table 4.7   The results of the logit model with all independent variables included

Variable	β Coefficient	Std. Error	Z-statistic	Prob.	Exp. (β)
β₀	0.321499	0.594151	0.541107	0.5884	1.3792
INC	0.067675	0.055912	1.210386	0.2261	1.0700
FEDU1	0.001855	0.444045	0.004178	0.9967	1.0019
FEDU2	0.362442	0.645780	0.561248	0.5746	1.4368
MEDU1	0.735606	0.447297	1.644558	0.1001	2.0867
MEDU2	1.327841	0.818285	1.622712	0.1047	3.7729
TIME	-0.003781	0.005872	-0.643814	0.5197	0.9962
COST	0.458866	0.393807	1.165205	0.2439	1.5822
PROP	-0.110530	0.240344	-0.459883	0.6456	0.8954

Method: Binary Logit

Included observation: 213   Convergence achieved after 6 iterations

Log likelihood   -86.17915   Restr. Log likelihood   -95.16058

Probability (LR Stat) 0.021507

The logit model when all independent variables included has the probability (LR stat) at 0.021507. When looking at each variable, the p-values of all variables are quite high. The model was adjusted by removing the non-significant variables one at a time to see the changes in overall probability level of the model. For the probability level at $p < 0.10$, the results of the final model are shown in table 4.8. The significant factors are: income, proportion of referral cost to monthly family income, and the level of mothers' education.

$$\log_e \left\{ \frac{p_i}{(1-p_i)} \right\} = C + \beta_1 INC + \beta_4 MEDU1 + \beta_5 MEDU2 + \beta_7 COST$$

Table 4.8   The results of the final logit model

Variable	β Coefficient	Std. Error	Z-statistic	Prob.	Exp. (β)
β_0	0.129287	0.486222	0.265900	0.7903	1.1380
INC	0.076010	0.045030	1.687696	0.0914	1.0790
MEDU1	0.759998	0.432763	1.756152	0.0791	2.1383
MEDU2	1.570037	0.770653	2.037282	0.0416	4.8068
COST	0.295929	0.169948	1.741285	0.0816	1.3444

Method: Binary Logit

Included observation: 217   Convergence achieved after 6 iterations

Log likelihood   -87.18143   Restr. Log likelihood   -95.87133

Probability (LR Stat) 0.001631

Thus, the logit model that can be used to estimate the referral compliance rate is as following.

$$\log_e \left\{ \frac{p_i}{(1-p_i)} \right\} = 0.129 + 0.076INC + 0.760MEDU1 + 1.570MEDU2 + 0.296COST$$

(p-value)   (0.7903) (0.0914)   (0.0791)   (0.0416)   (0.0816)

p   = referral compliance

INC   = monthly family income (unit of measurement 1,000 Baht)

MEDU1 = Mother's education1 (secondary level = 1; else = 0)

MEEU2 = Mother's education2 (certificate level or bachelor degree or post-graduation = 1; else = 0)

COST = the total referral cost to the parent (unit of measurement 100 Baht)

4.3 Results of effectiveness calculation

In order to calculate the effectiveness of each alternative, the students in 60 schools participated in the SFK program was use as starting number, with the total number of 87,534. The author uses the prevalence rate of 3.4% from the school eye health survey in Thailand. (Ratanachu-ake & Untanuvatana, 1993) From these numbers, the author could calculate the number of students with eye diseases to be 2,976 and number of students without eye disease to be 84,554. The number of positive screen among the students with eye diseases could be calculated by using the sensitivity of the screening test. The number of positive screen among the students without eye diseases could be calculated by using the specificity of the screening test.

For the alternatives 1 and 2, which provide the mobile team as the method for diagnostic eye care delivery, all the screen positive students are examined. For the alternatives 3 and 4, which refer the screen positive students to the eye care facilities, the number of screen positive students who receive diagnostic eye care could be calculated from the referral compliance rate (from the questionnaire). The author use the percentage of parents who answered that they would "certainly take the child to eye care facility" as the referral compliance rate. The effectiveness, defined as students with eye diseases who received diagnostic eye care could be calculated.

The effectiveness is highest in alternative 1, which using the VA and stereopsis tests as screening test and providing mobile team to deliver diagnostic eye care to the students.

Table 4.9   Summary of the effectiveness calculation

	A 1 Combined screening tests + Mobile team	A 2 VA test + Mobile team	A 3 Combined screening tests + Refer	A 4 VA test + Refer
Number of students	87,534	87,534	87,534	87,534
Screened positive	5,783	4,902	5,783	4,902
Eye examination	mobile team	mobile team	refer	refer
Compliance	100%	100%	82.3%	82.3%
# students examined	5,783	4,902	4,759	4,034
Effectiveness	2,232	2,027	1,837	1,668
False negative	744	949	744	949

4.4 Results of cost calculation

The cost calculation was performed by grouping the cost according to the activities of the program as the followings.

1. Administrative cost

2. Training cost

3. Screening cost

4. Cost of providing mobile team

5. Cost of referral screen positive students to the eye care facilities

The cost is estimated for the whole 3-year period of the SFK program. The cost of the 2nd and the 3rd year is converted into the present value of the first year. The present value is calculated using the following formula. (Drummond et al., 1997)

$$P = \sum F_n (1 + r)^{-n}$$

(P = present value; F_n = future cost at year n; r = annual discount rate)

The author uses discount rate of 3% according to Boardman et al. (Boardman et al., 1996) The length of time of useful life of equipments was used according to the American Hospital Association. (American Hospital Association, 1978) The straight line depreciation method was used.

The total administrative cost is 604,387.39 Baht. Administrative cost is considered to be equal among the four alternatives. Interestingly, from the total administrative cost, only 294,938.05 Baht (48.8%) was actually spent by the program. The other half was absorbed by the NGO.

Table 4.10   Summary of the administrative cost in Baht

Administrative Cost (Baht)	Cost to the program	Cost not to the program
Office rent 20x400x12 (per year)		279,693.09
Furniture		
Table (TWS1823-80) 9,200 (12 yr)		2,233.67
Chairs 1(AL1) 2(PM1/C) 15,300 (15 yr)		2,971.74
File cabinet 2(15WTSS) 18,400 (15 yr)		3,573.86
Computer 33,400 (5 yr)	19,461.98	
Printer 20,220 (5 yr)	11,782.07	
Central services 20x30x12 (per year)		20,976.98
Stationary, mail & others	18,150.97	
Salary (6,000x12+6,000) expected to raise 8% per year	245,543.03	
Total	294,938.05	309,449.34

Total administrative cost = 604,387.34 Baht

The training of school teachers to use the screening tests in the SFK program was already completed. The training cost was calculated using the actual cost spent by the program, as well as the cost absorbed by others. The rent for the training hall was absorbed by the participating schools. The opportunity cost of the volunteers facilitating in the training was calculated using the wage rate of 170 Baht per day. The total training cost is 163,864 Baht and is considered to be equal among the four alternatives.

Table 4.11   Summary of the training cost in Baht

Training Cost (Baht)	Cost to the program	Cost not to the program
Rent (2,000x6)		12,000
CD-ROM	29,960	
Training materials	4,895	
Transportation + accommodation	41,205	
Food	22,204	
Training fee	48,500	
Volunteers 170 x 5 persons x 6 days		5,100
Total	146,764	17,100

Total Training cost = 163,864 Baht

Since the SFK program has not completed the screening process yet. The screening cost is calculated using the available data from some of the screening activity that has been performed. Since the SFK program has already produced all the screening kits to be used. The actual cost of the screening kits was used. The

cost of the VA test charts is 98,385.40 Baht. The cost of the stereopsis test kits is 93,367.50 Baht.

To estimate the opportunity cost of time the teachers spent in screening, the author asked 27 teachers (2 males, 25 females). The teachers have average age of 36.7 ± 9.7 years. The average annual income (salary and fringe benefit) was 17,230.22 ± 9,773.11 Baht. The teachers estimated the average time used for screening to be 4 minutes per student. There is no significant difference in time used between using VA test alone and the VA test plus stereopsis tests, because most of the time is used for the gathering of students and recording.

The total cost of screening using VA test plus stereopsis test is 789,641.53 Baht. The total cost of screening using VA test alone is 696,274.03 Baht.

Table 4.12   Summary of screening cost in Baht

Screening Cost (Baht)	Cost to the program	Cost not to the program
Screening Kits VA Chart		
Development fee		50,000
VA charts	48,385.40	
Screening Kits Stereopsis		
Development fee		50,000
Stereopsis	43,367.50	
Labour cost 87,534 x 4 min = 5,836 hr = 729.5 d = 34.7 mo x 17,230.22		597,888.63
Total	91,752.90	697,888.63

Total Screening Cost

    Using VA + stereopsis tests   = 789,641.53 Baht

    Using VA tests   = 696,274.03 Baht

The information used for calculation of the mobile team is drawn by two mobile team sessions to examine 222 and 275 students. Most of the medical equipment was borrowed from the equipment companies or the public hospitals for free. The opportunity cost of the equipment used is estimated by asking the equipment companies. The nurses and ophthalmologist were volunteers from public hospitals. The information asking from 8 nurses volunteered in the program shows that the average income from public hospital (salary plus fringe benefit) is 20,535 ± 5,324.78 Baht. When the nurses volunteer to help in the program, there is opportunity cost to the hospitals. The opportunity cost was calculated using the average income and time spent in the mobile team. The total cost for the two mobile team sessions is 226,231.16 Baht (for examination of 497 students). The average cost is 455.19 Baht. This figure is used to calculate the total cost of mobile team for alternative 1 and alternative 2.

For alternative 3 and alternative 4, the author asked what is the cost if the program refers the screen positive students to health care facilities (instead of providing mobile team). The referral compliance rate was obtained from the questionnaires asking the parents what is their response if the program ask them to take their child to the health care facility. The percentage of the response of "I will take the child to see the doctor certainly" is used as compliance rate. The average transportation cost and income forgone from the questionnaires are also used. Sine majority of parents (74%) chose to take their children to public hospitals, the average cost of a visit to ophthalmic OPD was used. The author uses the unit cost for ophthalmic OPD from Pranangklao Hospital. (Cook, 2002) She found that the unit cost for the ophthalmic out patient department was 217 Baht. The cost components were material cost (23%), labour cost 45%, and capital cost (33%). (Cook, 2002)

Table 4.13   Cost of the mobile team

Mobile Team Costs (Baht) (222+275 students)	Cost to the program	Cost not to the program
Space rent		6,000
Allowance for house keepers	400	
Accessory	4,852	
Equipment		
Autorefractor 2 x 2 x 10,000		40,000
Portable slit-lamp 2 x 2 x 10,000		40,000
Trial lens set 2 x 4 x 1,000		8,000
Retinoscope 2 x 4 x 500		4,000
Ophthalmoscope 2 x 4 x 500		4,000
Prism & muscles sets 2 x 2 x 1,000		4,000
Snellen charts, Occluders, pen light, fluorescein, cotton balls, gauze, medicines 2 x 2,000		4,000
Transportation + accommodation	37,150	10,000
Food	7,400	
Labour cost		
nurses 800 x 6 x 2	9,600	
opportunity cost of nurses 6 x 2 x 20,535/21 =		11,734.29
teachers 10 x 17,230.22/21		8,204.87
volunteers 170 x 6 x 2		2,040
ophthalmologists fee 50 per case		24,850
Total	59,402	166,829.16

Average cost of mobile team per student examined 226,231.16/497 = 455.19 Baht

Table 4.14   Calculation of referral cost

Referral Cost (Baht)	
Costs to Parents	
Transportation cost	51.08
Income forgone	108.23
Eye examination fee	50
Costs to health care facility	
Eye examination cost	*200*

Average Refer Cost = 359.31 Baht per case

4.5 Cost-effectiveness Analysis

In summary the effectiveness of each alternative is calculated. The cost of each alternative is also calculated. The cost per effectiveness of alternative 1 through 4 is, 1,877.36; 1,823.32; 1,822.95 and 1,788.11 Baht, respectively. The summary of the cost-effectiveness calculation is shown in the table 4.15. When considering the societal cost, the alternative with highest cost-effectiveness ratio (CER) (alternative 1) differs from the alternative with lowest CER (alternative 4) is less than 5%. When considering only cost to the program, alternatives 1 and 2 (which provide mobile team) cost more than double of the costs of alternatives 3 and 4 (which refer the patient to health care facilities).

Table 4.15   Summary of cost-effectiveness analysis

	A 1 Combined screening tests + Mobile team	A 2 VA test + Mobile team	A 3 Combined screening tests + Refer	A 4 VA test + Refer
Number of students	87,534	87,534	87,534	87,534
# students examined	5,783	4,902	4,759	4,034
Effectiveness	2,232	2,027	1,837	1,668
False negative cases	744	949	744	949
Cost (Baht)				
Administrative	604,387.34	604,387.34	604,387.34	604,387.34
Training	163,864	163,864	163,864	163,864
Screening	789,641.53	696,274.03	789,641.53	696,274.03
Mobile team x 400.87	2,318,231.21	1,965,064.74	0	0
Refer x 376.31	0	0	1,790,859.29	1,518,034.54
Total cost	4,910,256.64	3,695,866.75	3,267,849.16	2,913,981.91
Cost/Effectiveness	1,877.36	1,823.32	1,822.95	1,788.11
Cost to the program	1,224,639.11	1,075,974.49	533,454.95	490,087.45

4.6 Sensitivity Analysis

Sensitivity analysis is performed in various scenarios under the assumption "what if a single input is changed". The author performs sensitivity analysis for the following input parameter.

1. Prevalence rate

2. Sensitivity & specificity of the screening tests

3. Discount rate

4. Referral compliance rate

1. Sensitivity analysis for different prevalence rates

Change in prevalence rate could affect the effectiveness, and also the cost of each alternative. The sensitivity analysis is performed for changes in prevalence rate of 3.4% to 5%, 8% and 10%. Within the range of prevalence tested, Alternative 1 is the highest cost per effectiveness while alternative 4 is the lowest cost per effectiveness. When the prevalence is increased, the CER of all alternatives decrease.

Table 4.16   Summary of cost-effectiveness analysis using prevalence rate 5%

	A 1 Combined screening tests + Mobile team	A 2 VA test + Mobile team	A 3 Combined screening tests + Refer	A 4 VA test + Refer
Number of students	87,534	87,534	87,534	87,534
Screen positive	6775	5808	6775	5808
Compliance	100	100	82.3	82.3
# of students examined	6775	5808	5576	4780
Effectiveness	3283	2981	2702	2453
False negative	1094	1396	1094	1396
Cost (Baht)				
Administrative	604,387.34	604,387.34	604,387.34	604,387.34
Training	163,864	163,864	163,864	163,864
Screening	789,641.53	696,274.03	789,641.53	696,274.03
Mobile team x 455.19	3,083,972.15	2,643,689.31	0	0
Refer x 376.31	0	0	2,098,279.46	1,798,718.89
Total cost	4,641,865.02	4,108,214.68	3,656,172.33	3,263,244.26
Cost/Effectiveness	1,414.11	1,378.35	1,353.38	1,330.32

Table 4.17   Summary of cost-effectiveness analysis using prevalence rate 8%

	A 1 Combined screening tests + Mobile team	A 2 VA test + Mobile team	A 3 Combined screening tests + Refer	A 4 VA test + Refer
Number of students	87,534	87,534	87,534	87,534
Screen positive	8634	7507	8634	7507
Compliance	100	100	82.3	82.3
# of students examined	8634	7507	7106	6178
Effectiveness	5252	4769	4322	3925
False negative	1751	2234	1751	2234
Cost (Baht)				
Administrative	604,387.34	604,387.34	604,387.34	604,387.34
Training	163,864	163,864	163,864	163,864
Screening	789,641.53	696,274.03	789,641.53	696,274.03
Mobile team x 455.19	3,930,271.49	3,417,073.02	0	0
Refer x 376.31	0	0	2,674,086.38	2,324,915.33
Total cost	5,488,164.36	4,881,598.39	4,231,979.25	3,789,440.70
Cost/Effectiveness	1,044.96	1,023.64	979.07	965.52

Table 4.18   Summary of cost-effectiveness analysis using prevalence rate 10%

	A 1 Combined screening tests + Mobile team	A 2 VA test + Mobile team	A 3 Combined screening tests + Refer	A 4 VA test + Refer
Number of students	87,534	87,534	87,534	87,534
Screen positive	9874	8640	9874	8640
Compliance	100	100	82.3	82.3
# of students examined	9874	8640	8126	7110
Effectiveness	6565	5961	5403	4906
False negative	2188	2792	2188	2792
Cost (Baht)				
Administrative	604,387.34	604,387.34	604,387.34	604,387.34
Training	163,864	163,864	163,864	163,864
Screening	789,641.53	696,274.03	789,641.53	696,274.03
Mobile team x 455.19	4,494,471.04	3,932,662.16	0	0
Refer x 376.31	0	0	3,057,957.67	2,675,712.96
Total cost	6,052,363.91	5,397,187.53	4,615,850.54	4,140,238.33
Cost/Effectiveness	921.91	905.41	854.31	843.92

2. Sensitivity analysis for changes in sensitivity and specificity of the screening tools

Changes in sensitivity and specificity of the screening tests also affect the effectiveness and cost of each alternative. The author performs sensitivity analysis using the lower limit and upper limit of the 95% confidence interval.

Table 4.19   Shows mean and 95% CI of Sensitivity & Specificity of the
screening tests

	Sensitivity (95% CI)	Specificity (95% CI)
VA + stereopsis	75.0% (65.0-85.0)	95.8% (93.3-98.3)
VA test	68.1% (57.3-78.9)	96.6% (94.3-98.9)

Table 4.20   Summary of cost-effectiveness analysis if the sensitivity and the
specificity of the VA plus stereopsis test are 65% and 93.3%; and the sensitivity
and the specificity of the VA test alone are 57.3% and 94.3% respectively

	A 1 Combined screening tests + Mobile team	A 2 VA test + Mobile team	A 3 Combined screening tests + Refer	A 4 VA test + Refer
Number of students	87,534	87,534	87,534	87,534
Screen positive	7600	6525	7600	6525
Compliance	100	100	82.3	82.3
# of students examined	7600	6525	6255	5370
Effectiveness	1935	1705	1592	1403
False negative	1042	1271	1042	1271
Cost (Baht)				
Administrative	604,387.34	604,387.34	604,387.34	604,387.34
Training	163,864	163,864	163,864	163,864
Screening	789,641.53	696,274.03	789,641.53	696,274.03
Mobile team x 455.19	3,459,387.99	2,970,175.97	0	0
Refer x 376.31	0	0	2,353,705.68	2,020,854.58
Total cost	5,017,280.86	4,434,701.34	3,911,598.55	3,485,379.95
Cost/Effectiveness	2,593.58	2,600.48	2,456.89	2,483.36

Table 4.21   Summary of cost-effectiveness analysis if the sensitivity and the specificity of the VA plus stereopsis test are 85% and 98.3%; and the sensitivity and the specificity of the VA test alone are 78.9% and 98.9% respectively

	A 1 Combined screening tests + Mobile team	A 2 VA test + Mobile team	A 3 Combined screening tests + Refer	A 4 VA test + Refer
Number of students	87,534	87,534	87,534	87,534
Screen positive	3967	3278	3967	3278
Compliance	100	100	82.3	82.3
# of students examined	3967	3278	3265	2698
Effectiveness	2530	2348	2082	1933
False negative	446	628	446	628
Cost (Baht)				
Administrative	604,387.34	604,387.34	604,387.34	604,387.34
Training	163,864	163,864	163,864	163,864
Screening	789,641.53	696,274.03	789,641.53	696,274.03
Mobile team x 455.19	1,805,837.03	1,492,260.01	0	0
Refer x 376.31	0	0	1,228,659.20	1,015,307.01
Total cost	3,363,729.90	2,956,785.38	2,786,552.07	2,479,832.38
Cost/Effectiveness	1,329.68	1,259.18	1,338.42	1,283.19

3. Sensitivity analysis for different discount rates

The discount rate of 5% and 7% were included for the sensitivity analysis. The changes in discount rate affect the cost but not the effectiveness. The cost per effectiveness for each alternative for the discount rate of 3%, 5% and 7% is shown in table 4.22. Changes in the discount rates account for very small changes in the cost effectiveness of each alternative

Table 4.22   Sensitivity analysis for different discount rates

	A 1 Combined screening tests + Mobile team	A 2 VA test + Mobile team	A 3 Combined screening tests + Refer	A 4 VA test + Refer
Discount Rate 3%				
Total cost	4,190,505.38	3,695,743.36	3,349,075.31	2,982,606.16
Cost/Effectiveness	1,877.37	1,823.47	1,823.09	1,788.11
Discount Rate 5%				
Total cost	4,178,804.66	3,684,414.77	3,337,300.18	2,971,107.93
Cost/Effectiveness	1,872.22	1,817.67	1,816.71	1,781.24
Discount Rate 7%				
Total cost	4,167,919.16	3,673,529.27	3,326,414.68	2,960,222.43
Cost/Effectiveness	1,867.35	1,812.30	1,810.79	1,774.71

(Cost in Baht)

4. Sensitivity analysis for different referral compliance rates

The referral compliance obtained from the questionnaires is 82.3% with 95% CI from 71.2% to 93.4%. Changes in the compliance rate affect the effectiveness and cost of each alternative.

Table 4.23   Sensitivity analysis for referral compliance rate of 71.2%

	A 1 Combined screening tests + Mobile team	A 2 VA test + Mobile team	A 3 Combined screening tests + Refer	A 4 VA test + Refer
Number of students	87,534	87,534	87,534	87,534
Screen positive	5784	4902	5784	4902
Compliance	100	100	71.2	71.2
# of students examined	5784	4902	4118	3490
Effectiveness	2232	2027	1589	1443
False negative	744	949	744	949
Cost (Baht)				
Administrative	604,387.34	604,387.34	604,387.34	604,387.34
Training	163,864	163,864	163,864	163,864
Screening	789,641.53	696,274.03	789,641.53	696,274.03
Mobile team x 455.19	2,632,612.51	2,231,217.99	0	0
Refer x 376.31	0	0	1,549,601.33	1,313,333.57
Total cost	4,190,505.38	3,695,743.36	3,107,494.20	2,777,858.94
Cost/Effectiveness	1,877.37	1,823.47	1,955.30	1,924.99

Table 4.24   Sensitivity analysis for referral compliance rate of 93.4%

	A 1 Combined screening tests + Mobile team	A 2 VA test + Mobile team	A 3 Combined screening tests + Refer	A 4 VA test + Refer
Number of students	87,534	87,534	87,534	87,534
Screen positive	5784	4902	5784	4902
Compliance	100	100	93.4	93.4
# of students examined	5784	4902	5402	4578
Effectiveness	2232	2027	2085	1893
False negative	744	949	744	949
Cost (Baht)				
Administrative	604,387.34	604,387.34	604,387.34	604,387.34
Training	163,864	163,864	163,864	163,864
Screening	789,641.53	696,274.03	789,641.53	696,274.03
Mobile team x 455.19	2,632,612.51	2,231,217.99	0	0
Refer x 376.31	0	0	2,032,763.54	1,722,828.02
Total cost	4,190,505.38	3,695,743.36	3,590,656.41	3,187,353.39
Cost/Effectiveness	1,877.37	1,823.47	1,722.30	1,683.76