CHAPTER 4

RESULTS

Due to time constraints, this study uses (1) some actual data of a previous study on treatment seeking pattern of malaria cases (2) data on effectiveness of microscopy and dipstick from the previous studies carried out by other researchers and (3) some actual and estimated data on costs of microscopy and dipstick, in order to simulate the methodology developed in Chapter 3. These results and the analysis of data are presented below.

4.1 Analysis of Treatment Seeking Pattern of Malaria Cases

The data collected by a study in traditionally non-malarious area in Sri Lanka shows that 65% of malaria cases had used public health facilities for treatment of malaria. Of the malaria cases in the area, a considerable percentage (26%) have visited private health facilities, 2% have visited other informal health facilities and 7% have not visited any health facility (see Table 4.1)

Table 4.1 Treatment Seeking Pattern of Malaria Cases in Traditionally Non Malarious Area in Sri Lanka, 1989-1992

Services attended	Number of visits	Number of malaria cases	Percentage of malaria cases
Public	397	147	65
Private	160	59	26
Other	10	4	2
Failure of cure at other service	-	17	7
Total	567	227	100

Source: Kusumawathie and others (1992). Unpublished data.

The perceived quality of service, convenient travel and proximity of the service to the residence determine the choice of a particular service by patients to a great extent. According to the data, 27% of the patients had selected a service because of perceived quality of the service. Among the visits to the private health facilities, 48% of visits were because of perceived quality of the private health facilities. A considerable percentage (21%) has selected services because of convenient travel and another 21% has considered

the proximity of the health facility. Among the visits 21 % of the visits were because of failure of cure at other services where they have previously attended. This constitutes a considerable percentage (23%) of the visits to the government health facilities (see Table 4.2).

Table 4.2 Reasons for Visiting a Particular Health Facility by Malaria Cases in Traditionally Non-malarious Area in Sri Lanka, 1989- 1992

Reasons for visit	Services attended			
	public	Private	Other	Total
Convenient travel	112 (28%)	2 (1%)	7 (70%)	121 (21%)
Failure to cure at other services	92 (23%)	29 (18%)	0	121 (21%)
Close	85 (22%)	28 (18%)	3 (30%)	116 (21%)
Perceived quality	77 (19%)	77 (48%)	0	154 (27%)
Referred	24 (6%)	0	0	24 (5%)
Off working hours	0	13 (8%)	0	13 (2%)
Other	7 (2%)	11 (7%)	0	18 (3%)
Total	97 (100%)	160 (100%)	10 (100%)	567 (100%)

Source: Kusumawathie and others (1992). Unpublished data.

The analysis of costs to patients shows that the patients have incurred a considerable cost (Rs. 267) per visit per patient to a private health facility before attending a public health facility (see Table 4.3). The patients incur costs to attend public health facilities too. The data shows that the cost per visit per patient is Rs. 246.0 at a public health facility (see Table 4.4) The cost items were travel and time cost of patient and accompanying person(s) and the cost of drugs. Of the cost items, the time cost constitutes the major portion of the total cost (see Table 4.3 & 4.4).

Table 4.3 Cost to Patients in Seeking Treatment Prior to Attending a Public Service in Traditionally Non-malarious Area in Sri Lanka, 1989-1992

Unit: Rupees

Cost	Service		
	Private	Other	Total
Cost to patient (direct costs)			
Travel	1,408	4	1,412
Diagnosis & treatment	5,925	1,205	7,130
Time	9,543	445	9,988
Cost for accompanying person (indirect costs)			
Travel	623	0	623
Time	13,715	112	13,827
Total cost	31,214	1,766	32,980
Number of visits	117	10	127
Average cost per visit	267	177	260

Source: Kusumawathie and others (1992). Unpublished data

Table 4.4 Cost to Patient for Treatment at Public Health Facilities in Traditionally Non-malarious Area in Sri Lanka, 1989-1992.

Unit: Rupees

Cost item	Direct cost	Indirect cost	Total cost
Travel	3,009	2,692	5,701
Treatment	102	-	102
Time	33,168	58,706	91,874
Total cost	36,279	61,398	97,677
Number of visits	397	376	397
Average cost	91	163	246

Source: Kusumawathie and others (1992). Unpublished data.

4.2 Analysis of Effectiveness of Microscopy and Dipstick.

The effectiveness of microscopy and dipstick is calculated under four scenarios. The calculations are shown in the Appendix F. The analysis shows that microscopy and dipstick has more or less the same accuracy level. But dipstick will improve the percentage of on-site diagnosis and coverage both within public and private sectors (see Table 4.5).

Table 4.5 The Effectiveness of Microscopy and Dipstick in Public and Private Health Sectors in Sri Lanka

Indicator (Percentages)	Public		Private		Public + Private	
	Mic	Dip	Mic	Dip	Mic	Dip
A	99.0	98.0	99.0	98.0	99.0	98.0
POD	43.0	68.7	9.3	50.0	32.6	62.2
PAOD	42.0	67.3	9.3	49.0	32.0	61.0
C	42.8	100.0	9.3	50.0	32.6	84.1

Source: Kodisinghe and others (1995).
Kusumawathie and others (1992). Unpublished data.

4.3 Analysis of Cost of Microscopy and Dipstick

The total cost and average cost of microscopy and dipstick were calculated by using the malaria control cost models 1 & 2 developed by Kaewsonthi and others (1996) by using estimated data. According to the analysis, it seems that the average cost of dipstick is more than double the average cost of microscopy. The private provider can provide both microscopy and dipstick at a slightly lower average cost than that in the public sector. The reason for this is that the private provider does not incur cost on formal initial training of microscopists and blood slide takers. This is shown in Table 4.6. The analysis of cost for providing microscopic diagnosis at the services where there is no microscopy at the point of service shows that the unit cost of providing microscopic diagnosis at both public and private sectors are the same. Both services incur Rs. 23 per blood slide examination (see Table 4.7).

Table 4.6 Cost for Microscopy and Dipstick to the Provider in Sri Lanka

Costs by Activity	Total cost (Rs '000,000)					
	Public		Private		Public + Private	
	Mic	Dip	Mic	Dip	Mic	Dip
Blood slide taking & examination	15.50	-	3.75	-	19.25	-
Training	0.04	0.01	-	-	0.04	0.01
Administration	0.56	0.03	0.13	0.01	0.69	0.03
Supervision	1.13	1.13	0.20	0.20	1.32	1.32
Dipstick testing	-	37.86	-	9.30	-	47.16
Total cost	17.23	39.03	4.08	9.51	21.30	48.52
No.of blood slides	685303		171325		856628	
Average cost per slide (Rs)	25	56	23	55	25	57

Notes: the estimated data from records from the NMCP 1995.

Table 4.7 Cost of Microscopic Diagnosis of Blood Slides for Malaria at the Services Where There is no Microscopy at the Point of Service in Sri Lanka

Costs by activity	Total cost (Rs'000,000)	
	Public	Private
Blood slide takers and materials	2.65	0.66
Blood slide examination	10.30	2.57
Training of microscopists	0.03	-
Training of blood slide takers	0.03	-
Administration	1.59	0.39
Supervision	1.08	0.27
Total cost	15.68	3.89
Number of blood slides	685303	171325
Average cost per slide (Rs)	23	23

Note: the estimated data from NMCP 1995.

4.4 Analysis of Cost-effectiveness of Microscopy and Dipstick

Using earlier mentioned cost and effectiveness data, the cost-effectiveness of microscopy and dipstick has been calculated under the three scenarios. The method of calculations are shown in the Appendix G. According to the calculations it is seen that microscopy is more cost-effective in both public and private sectors. When POD and PAOD are concerned dipstick is cost-effective only in the private sector (see Table 4.8). This is true when the accuracy of microscopy and dipstick is the same. But it has been shown that the accuracy of microscopy under field conditions is lower than that of dipstick (Dietz and others 1995). The accuracy is about 80 percent. Therefore, an analysis is made by assuming the accuracy of microscopy is 80% as compared to dipstick. The results of such analysis shows that dipstick is more cost-effective in the private sector and when both public and private sectors are considered together. This is shown in Table 4.9. Considering the cost-effectiveness of microscopy and dipstick in patient perspective, dipstick is more cost-effective both in public and private sectors (see Table 4.10).

Table 4.8 Cost-effectiveness of Microscopy and Dipstick in Public and Private Health Facilities in Sri Lanka

Indicator	Public		Private		Public + Private	
	Mic	Dip	Mic	Dip	Mic	Dip
A	17.4	39.8	4.1	9.7	21.5	49.5
POD	40.0	57.3	45.3	19.0	64.5	78.2
PAOD	41.0	58.2	45.3	19.4	66.5	79.5

Note: the estimated data from NMCP 1995.

Table 4.9 Cost-effectiveness of Microscopy and Dipstick in Public and Private Sectors in Sri Lanka When the Accuracy of Microscopy is 80%

Indicator	Public		Private		public + Private	
	Mic	Dip	Mic	Dip	Mic	Dip
A	21.5	39.0	5.1	9.5	26.8	4.8
PAOD	50.7	57.4	58.3	19.0	81.9	78.2

Note: the estimated data from NMCP 1995.

Table 4.10 Cost-effectiveness of Microscopy and Dipstick at Public and Private Health Facilities: Patient Perspective

	Public		Private		Public + Private	
	Mic	Dip	Mic	Dip	Mic	Dip
Cost-effectiveness	230.9	144.7	344.4	63.3	400.0	209.8

Note: the estimated data from Kusumawathie and others 1992.

The calculation of cost-effectiveness of microscopy and dipstick was made by assuming the cost of dipstick is Rs. 50 (according to Ministry of Health, Thailand) and the number of blood slides taken per year is 685303 (number of blood slides collected at service s=1). There is a possibility of lowering the price of dipstick (Indaratna and Kidson 1995). Again, the number of blood slides collected at different institutions are different. Therefore, a sensitivity analyses were made for different prices of dipstick and different number of blood slides per year. It shows that if dipstick is available at the price Rs. 17 the cost-effectiveness of microscopy and dipstick is same. This is shown in Table 4.11.

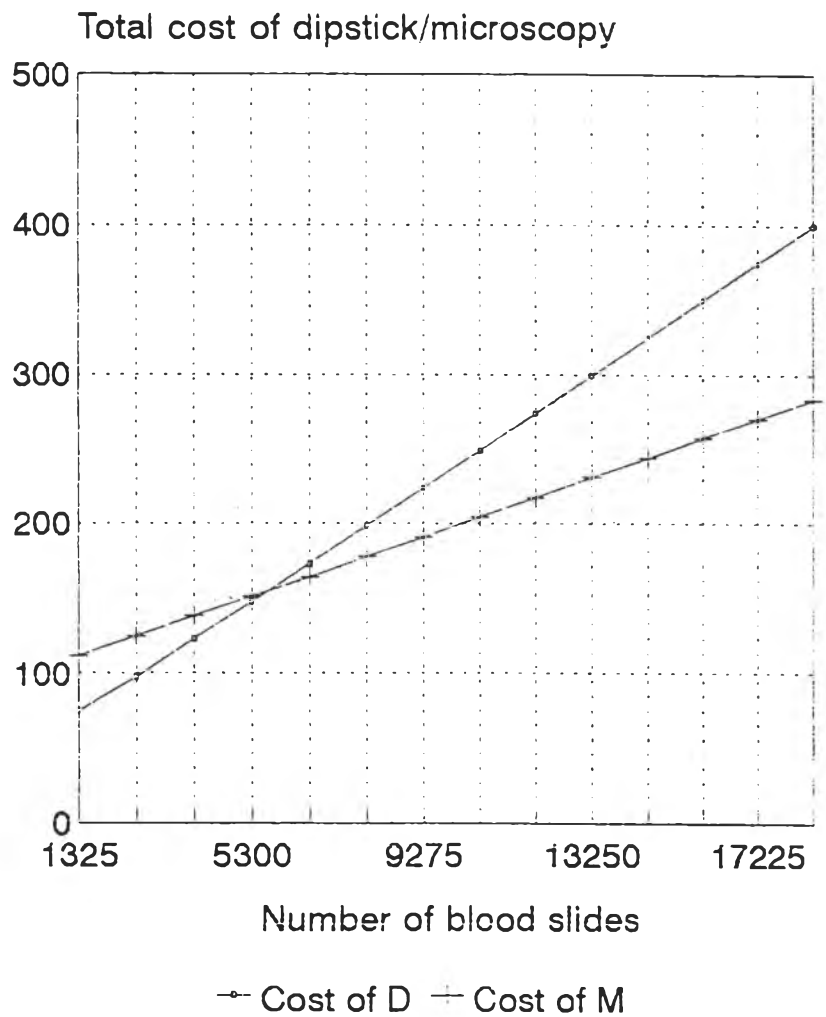
Table 4.11 Sensitivity Analysis of Unit Cost of Provision of Dipstick at Different Prices of Dipstick

Price of dipstick (Rs)	Unit cost of provision (Rs.)
10	17
11	18
12	19
13	20
14	21
15	22
16	23
17	24
18	25
19	26
20	27

Unit cost of provision of microscopy = Rs. 24

The sensitivity analysis done for different number of blood slides shows that at the level of 5830 blood slides per year (= 5830/265 = 22 blood slides per day) the cost of providing microscopy and dipstick is the same (see Figure 4.1).

Figure 4.1 Sensitivity Analysis of Microscopy and Dipstick for Different Levels of Blood Slides Per Year



D = Dipstick
M = Microscopy

4.5 Discussion of the Results and Policy Implications

The analysis of the data shows that microscopy is more cost-effective, in terms of accuracy, as compared to that of dipstick both in public and private sectors. In the public sector, one unit of accuracy of microscopy and dipstick costs 17.4 and 39.8 million rupees respectively (see Table 4.8). This is true if the microscopists in the field are well experienced, and the equipments and staining procedures are of good quality. But, under field situations it is very much difficult to expect 99% accuracy with microscopy because of the non availability of competent microscopists, especially in the periphery. Therefore, it is reasonable to assume the accuracy of microscopy under field situations is between 70 to 80%. The analysis made for the 80% accuracy level of microscopy shows that the provision of one unit of accuracy increases from 17.4 to 21.5 million rupees when the accuracy of microscopy decrease from 99% to 80%, i.e. with the decreasing accuracy of microscopy the cost-effectiveness of microscopy decreases and the cost-effectiveness of dipstick increases (see Table 4.8 & 4.9). The percentage on-site diagnosis and the percentage of accurate on-site diagnosis can be improved by dipstick since all the malaria cases attending an institution where there is dipstick can be given on-site diagnosis. But, for the microscopy, some portion of patients attending the medical institutions where there is microscopy may not have on-site diagnosis. This is because that dipstick is less time consuming and more than 100 cases can be handled without fatigue which helps to maintain higher percentage of accuracy. The coverage given by dipstick is also larger, because, the peripheral institutions with less trained manpower can be provided with dipstick and the private practitioners can use dipstick, since the test is simple and does not need well trained manpower and sophisticated equipment.

When cost-effectiveness of microscopy and dipstick in patient perspective is considered, dipstick is always cost-effective (see Table 4.10).

In Sri lanka, the number of blood slides collected per day at the medical institution is different from one another. Therefore, a sensitivity analysis was carried out for different numbers of blood slides. This analysis shows that, for the lower number of blood slides (22 or lower blood slides per day), dipstick is more cost-effective, while for the higher number of blood slides (more than 22 blood slides per day) microscopy is more cost-effective. Therefore, the NMCP can use its scarce resources more efficiently, by using dipstick at the institutions where less than 22 blood slides are collected and retaining microscopy at the remaining institutions.

Dipstick may be available at a lower price to the countries where malaria is endemic (Indaratna and Kidson 1995), so a sensitivity analysis was carried out for different prices of dipstick. This analysis shows that if dipstick is available at the price of Rs.17 or lower, dipstick is more cost-effective at the institutions where 26 blood slides are collected per day (685303/ 265 x 100 = 26). But the

current price of dipstick, Rs.50, is far above the cost-effective price of dipstick. Furthermore, it is difficult to believe that dipstick will be available at that cost-effective price of dipstick. Therefore, the public sector have to consider some cost recovery mechanism in order to provide dipstick for the on-site diagnosis of malaria. Also, most of the private sector may not be able to afford dipstick at that price. The provision of dipstick at a subsidized price will be more helpful for the involvement of private sector in early diagnosis and treatment of malaria.

The analysis also shows that the private sector provides both microscopy and dipstick at only a slightly lower price than that of public sector (see Table 4.6). The reasons for this may be that the private sector do not involve in formal training of microscopists and blood slide takers, and transportation for supervisors. Since the difference between provision of dipstick and microscopy in public and private sectors is very small, it is difficult to make any decision for contracting out diagnostic services of the public sector to the private sector.

The difference in cost of provision of microscopy at the point or not at the point of service in the public sector is very small (Rs.2) while, in private sector, there is no difference between these two services (see Tables 4.6 & 4.7). Therefore, it is worthwhile to provide microscopy or dipstick at the point of service by considering their cost-effectiveness under different situations, rather than sending blood slides to the regional laboratories, which serves little purpose in early diagnosis and appropriate treatment of malaria.

The study shows that a considerable percentage (26%) of malaria cases visit private health facilities. They visit private services mainly (48%) due to the perceived quality of the private services (see Table 4.2). It is shown that patients also incur a considerable cost prior and during visits to public health facilities. Their cost are Rs. 267 per visit per patient at private health facilities prior to attending a public health facility (see Table 4.3). Moreover, since a considerable portion of malaria cases visits private sector, it is advisable to consider the private sector as an integral part of the public sector.

Therefore, when making a decision to implement dipstick in Sri Lanka, changes in some policies of the Ministry of Health will be involved. For example, the consideration of private health services as an integral part of the NMCP involves changes in drug policy. At present, the second line drugs (sulfadoxine-pyrimethamine) is issued only to the public medical institutions where there is a microscopist at the point of service in order to prevent the misuse of second line drugs. The private sector has no access to second line drugs because the sole authority of supplying sulfadoxine-pyrimethamine is the Ministry of Health. If dipstick is used by the private sector, the provision of second line drugs to the private providers enables them to manage the drug resistant malaria. Another policy implication is that the intensification of diagnostic facilities in public sector requires

more staff. Since dipstick can be handled by less trained personnel the members of the general health staff can be used for dipstick testing if there is a shortage of staff at the NMCP, especially at the peripheral health facilities. This involves more transportation, monitoring and supervision, quality assurance, and changes in duty lists of general health staff.

The current price of dipstick may not be affordable to many providers and many patients (only 50% of the patients are covered by dipstick at the private sector). If dipstick can be provided at a subsidized price to private provider, it will induce more providers into the market which will result in the competitive price of the provision of diagnosis, and thereby, the improvement of early diagnosis and treatment. In this case, the Ministry of finance has to be convinced to subsidize the dipstick to the private sector. The below mentioned two arguments can be used to convince the Ministry of Finance. (1) Twenty three percent of the visits of malaria patients to public health facilities are due to failure of cure at the services they have previously attended. Of this percentage, 26% had used private health services for treatment before attending public health services. The attendance at public services can be decreased if they would be diagnosed and treated properly at the private health services they are attending. This helps to reduce much of the hospital cost in treatment and case management of malaria since malaria constitutes a major portion of Out Patient Department and one of the major cause of hospitalization. Furthermore, dipstick helps to prevent/control malaria epidemics which results due to delays in appropriate treatment, and thereby to reduce the large unexpected expenses in controlling such malaria epidemics. (2) The provision of dipstick at a subsidized price to the private sector encourage entry of more private providers into the market. This creates competition among providers and helps to provide dipstick diagnosis at a competitive price. In addition, Again the use of diagnostic facilities at the point of service will improve the quality of service at public health facilities. Since a considerable percentage of malaria cases use private health facilities, the government may employ cost recovery mechanism for diagnosis of malaria in the public sector and use income generated by cost recovery to subsidize dipstick at the private sector. However, to consider this issue further research is needed on the willingness to pay for service, since this is a very sensitive point, because, the medical facilities in government sector are now provided free of charge. As indicated in one of the National Health Policies (MOH 1991) " The government is committed to provide comprehensive promotive, preventive, curative and rehabilitative health care free of direct cost and within easy access to the entire population". Thus, changes in this policy should provide a satisfactory level of the percentage of accurate diagnosis.

If it is decided to implement dipstick in Sri Lanka, its scarce resources will be used efficiently by way of providing dipstick to the institutions where 22 or less blood films are collected per day and using microscopy at the institutions where more than 22 blood films are collected. Since dipstick can be handled by a less trained personnel, it can be implemented at peripheral health facilities with less trained

manpower. This helps to improve the equity of provision of diagnostic facilities to malaria patients. The use of diagnostic facilities to support clinical diagnosis will improve the quality of care by way of providing appropriate treatment. With the new diagnostic test, subsidy to private sector and user charge scheme, there will be an increase in the public and private provision and financing of diagnosis of malaria. Therefore dipstick helps to promote public private mix.

According to this study, the use of dipstick helps to achieve the objectives of health care financing reform, i.e. efficient use of scarce resources, improve quality of service and equity in provision of diagnostic facilities, and financing for diagnosis (Cassels 1995). The role of private health sector is also important in health care financing which has been identified as one of the four components of a reform agenda (Akin and others 1987, quoted in Creese and Kutzin 1995).