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APPENDIX A

Procedure of Microscopy

Procedure of microscopy

There are twelve steps in the procedure of microscopy.

Step

1. Prepare thick and thin blood films on a glass slide by using a few drops of finger prick blood

2. Allow the blood films to dry

3. Fix the thin film by dipping it in a container of methanol for a few seconds (to prevent dehaemoglobinization)

4. Place the slide on a staining trough

5. Prepare a 3 percent Giemsa solution in pH 7.2 buffered distilled water. Mix the stain well.

6. Pour the stain gently into the trough until the slides are totally covered

7. Allow to stain for 30-40 minutes out of the sunlight

8. Pour clean water gently into the trough to float off the iridescent scum on the surface of the stain. Alternatively, gently immerse the whole trough in a vessel filled with clean water

9. Gently pour off the remaining stain and rinse again in clean water for a few seconds. Pour the water off.

10. Place the slide on a slide rack to drain and dry

11. Examine the slide for malaria parasite and species under the microscope with oil-immersion objective

12. Malaria parasites are well defined with deep red chromatin and pale purplish blue cytoplasm. In P.vivax and p.ovale infections the presence of Schuffner's stippling in the 'ghost' of the host erythrocyte can be seen specially at the edge of the film.

Source: World Health organization (1985).

APPENDIX B

Procedure of Dipstick for Diagnosis of Malaria

Procedure of Dipstick for Diagnosis of Malaria

There are seven steps in the procedure of dipstick.

Step

1. Take a finger-prick blood sample in a standardized 50 microlitre heparinized blood capillary tube

2. Transfer the blood to a holding/dispensing tube containing a haemolysing agent

3. Transfer one drop of haemolysed blood from the dispensing tube into a well on a plastic plate

4. Place the dipstick vertically into the haemolysed blood sample (the sample is rapidly taken up in the dipstick by capillary action)

5. Add a drop of detection agent (the detection agent consists of micelles containing a rabbit polyclonal antibody raised against PfHRP-II labelled with sulfo-rhodamine B)

6. Once absorption is complete add one or two drops of a washing reagent to clear the haemolysed blood

7. If the blood sample is positive for P.falciparum, a pink line develops almost simultaneously at the monoclonal antibody deposit site with a pink broken line above it as the reagent control. In negative cases, only the pink broken line is seen.

Source: World Health Organization (1995).

APPENDIX C

Models for Calculating Cost of Microscopy and Dipstick Developed by Kaewsonthi and others (1996)

Models for Calculating Cost of Microscopy and Dipstick developed by Kaewsonthi and others (1996).

The micro cost models 1 and 2 developed by Kaewsonthi and others (1996) are used for the calculation of cost of microscopy and dipstick at the six medical services (s = 1 to 6) mentioned in chapter 3. These models assess the cost of microscopy and dipstick by activity related to microscopy and dipstick, and the total and average cost incurred by supplier and the consumer for microscopy and dipstick.

Model 1 Assess the cost of microscopy for two types of services i = 1 & 2
i = 1 service without microscopes at the point of service
i = 2 service with microscopes at the point of service

Model 2 Assess cost of microscopy and dipstick (RDT) for two types of services i = 1 & 2
i = 1 service with dipstick at the point of service
i = 2 service with microscopy at the point of service

The below mentioned equations of the models are used to assess the cost of microscopy and dipstick.

Model 1.

Costs incurred by supply organization

1. Cost components for services without microscope at the point of service i = 1

1.1 Cost of taking blood slides from service i = 1 (C_b)

$$C_b = (N_b \times AC_b) + (N_{s1} \times AC_{sb})$$

1.2 Cost of blood slide examination for service i = 1 (C_{m1})

$$C_{m1} = \left[\frac{(A_{m1} \times N_{s1})}{(A_{m1} \times N_{s1}) + (A_{m2} \times N_{s2})} \times (AC_m \times N_m) \right] + \left[\frac{N_{s1}}{N_{sz}} \times (AC_{m1} \times N_{m1}) \right] + (AC_{sm} \times N_{s1})$$

$$N_{sz} = \sum_{i=1}^{2} N_{si}$$

1.3 Cost of regular training of blood slide takers at service i = 1 (C_{tb})

$$C_{tb} = B_{tb}$$

1.4 Cost of regular training of microscopists examining slides from service i = 1 (C_{tm1})

$$C_{tm1} = ((N_{s1}/N_{sz}) \times B_{tm}))$$

1.5 Cost of supervision at service i = 1 (C_{c1})

$$C_{c1} = ((AC_c \times N_c) + (AC_{ct} \times N_{ct})) \times ((N_{v1}/(N_{v1} + N_{v2}))$$

1.6 Cost of administration at service i = 1 (C_{a1})

$$C_{a1} = (N_{u1}/N_{u1} + N_{u2})(C_{hm} + C_{am})$$

$$C_{hm} = (1-p_3) \times (1/N_a) \times p_1 \times B_1$$

$$C_{am} = (1-p_3) \times p_2 \times B_2$$

Costs incurred by patients for the year

2. Cost components incurred by positive cases

2.1 Costs incurred in using non formal services prior to attending service i (C_{1i})

$$C_{1i} = (p_{6i} \times NP_{xi} \times AN_{1i}) \times [AC_1 + AC_{1ti} + \{A_{1i} \times (A_w/8)\}]$$

2.2 Costs incurred in using private medical services prior to attending service i (C_{2i})

$$C_{2i} = (p_{7i} \times NP_{xi} \times AN_{2i}) \times [AC_2 + AC_{2ti} + \{A_{2i} \times (A_w/8)\}]$$

2.3 Costs incurred in diagnosis and treatment in using service i (C_{3i})

$$C_{3i} = (NP_{xi} \times AN_{3i}) \times [AC_{3i} + AC_{3ti} + \{A_{3i} \times (A_w/8)\}]$$

where

A_{1i} = Average time (hr) per visit to non formal services prior to attending formal service i

A_{2i} = Average time (hr) per visit to private medical services prior to attending formal service i

A_{3i} = Average time (hr) per visit to formal service i

AC_1 = Average treatment/ drug costs, incurred by patients, per visit to non formal services

AC_{1ti} = Average travel costs, incurred by patients, per visit to non formal services prior to attending formal service i

AC_2 = Average treatment/drug costs incurred by patients, per visit to private medical services

AC_{2ti} = Average travel costs, incurred by patients, per visit to private medical services prior to attending formal service i

AC_{3i} = Average treatment/drug costs, incurred by patients when attending formal service i

AC_{3ti} = Average travel costs, incurred by patients, per visit to formal service i

AC_b = Average labour cost per man month (salary/ wage) of blood slide takers at service i = 1

AC_c = Average labour cost per man month of supervisor

AC_{ct} = Average travel costs per return trip for supervisory visits

AC_m = Average labour cost per man month of microscopist

AC_{ml} = Annual depreciation costs of a microscope per year

AC_{sb} = Average material cost for blood slide taking per slide

AC_{sm} = Average material cost per slide examined

A_{m1} = Average time (minutes) for a microscopist to examine a blood slide and provide diagnosis

A_{m2} = Average time for a microscopist to take and examine a blood slide and provide diagnosis

AN_{1i} = Average number of visits, by positive cases, per malaria infection to non formal services prior to attending formal service i

AN_{2i} = Average number of visits, by positive cases, per malaria infection to private medical services prior to attending formal service i

AN_{3i} = Average number of visits, by positive cases, per malaria infection to formal service i

A_w = Average wage rate (per day)

B_1 = National budget on malaria control

B_2 = Malaria control budget of operational area of study

B_{tb} = Total training budget for blood slide takers

B_{tm} = Total training budget for microscopists

C_{am} = Administrative costs of area office allocated to malaria case detection and treatment

C_{nm} = Administrative costs of malaria national HQ allocated to malaria cases detection and treatment of the study area

N_a = Number of malaria operational areas in the country

N_b = Number of man months per year of blood slide taking at service i = 1

N_c = Number of man months per year for supervisory visits

N_{ct} = Number of supervisory trips per year

N_m = Number of man months of microscopists per year

N_{ml} = Number of microscopes used for blood slide examination

NP_{xi} = Number of positive cases (all species) from formal service i, in the area, during the year

N_{si} = Number of blood slides taken from formal service i per year

N_{sz} = Number of blood slides taken from all services in the area, during the year

N_{ui} = Number of malaria units operating as formal service i in the study area

N_{vi} = Estimated number of services i receiving supervisory visits per year

p_1 = Percentage of national malaria control budget to administration (malaria headquarters budget)

p_2 = Percentage of operational area malaria control budget to administration

p_3 = Percentage of malaria control budget to vector control

p_{6i} = Percentage of positive cases visiting non formal services prior to attending formal service i

p_{7i} = Percentage of positive cases visiting private medical services prior to attending formal service i

Model 2

i = 1 Formal service unit using dipstick
i = 2 Formal service unit using microscopy

Costs incurred by supply organization

1. Cost components for services providing dipstick

1.1 Cost of RD(dipstick) testing (RC_b)

$$RC_b = (RAC_b \times RN_b) + (RAC_{sb} \times RN_{s1}) + [RP_e \times (RS_{t1} + RN_{d1} - RN_{s1}) \times RAC_{sb}$$

1.2 Costs of regular training of RD testers for service i = 1 (RC_{tb})

$$RC_{tb} = ((RN_{tb})/(RN_{td} + RN_{tb})) \times RB_{tb}$$

1.3 Cost of conversion training of RD testers (RC_{td})

$$RC_{td} = ((RN_{td}/(RN_{td} + RN_{tb})) \times RB_{tb}$$

1.4 Cost of supervision at service i = 1 (RC_{c1})

$$RC_{c1} = [(RAC_c \times RN_c) + (RAC_{ct} \times RN_{ct})][RN_{v1}/(RN_{v1} + RN_{v2})]$$

1.5 Cost of administration at service i = 1 (RC_{a1})

$$RC_{a1} = (RN_{u1}/(RN_{u1} + RN_{u2}) \times (RC_{hm} + RC_{am})$$

$$RC_{hm} = (1 - Rp_3) \times (1/RN_a) \times Rp_1 \times RB_1$$

$$RC_{am} = (1 - Rp_3) + Rp_2 \times RB_2$$

2. Cost components for services with microscopes i = 2

2.1 Costs of blood slide taking and examination per year (RC_{m2})

$$RC_{m2} = (RAC_m \times RN_m) + RAC_{sm} \times RN_{s2}) + (RAC_{m1} \times RN_{m1})$$

2.2 Costs of regular training microscopists for i = 2 (RC_{tm2})

$$RC_{tm2} = RB_{tm}$$

2.3 Costs of supervision at service i = 2 (RC_{c2})

$$RC_{c2} = [(RAC_c \times RN_c) + (RAC_{ct} \times RN_{ct})] \times [RN_{v2}/(RN_{v1} + RN_{v2})]$$

2.4 Costs of administration at service i = 2 (RC_{a2})

$$RC_{a2} = ((RN_{u2}/(RN_{u1} + RN_{u2})) \times (RC_{hm} + RC_{am})$$

3. Cost components incurred by positive cases at service i

3.1 Costs incurred in using non formal services prior to attending service i (RC_{1i})

$$RC_{1i} = (Rp_{6i} \times RAN_{1i} \times RNP_{xi}) \times [RAC_1 + RAC_{1ti} + \{RA_{1i} \times (RA_w/8)\}]$$

3.2 Costs incurred in using private medical services prior to attending service i (RC_{2i})

$$RC_{2i} = (Rp_{7i} \times RAN_{2i} \times RNP_{xi}) \times [RAC_2 + RAC_{2ti} + \{RA_{2i} \times (RA_w/8)\}]$$

3.3 Costs incurred in diagnosis and treatment in using services i (RC_{3i})

$$RC_{3i} = (RNP_{xi} \times RAN_{3i}) \times [RAC_{3i} + RAC_{3ti} + \{RA_{3i} \times (RA_w/8)\}]$$

where

RA_{1i} = Average time (hr) per visit to non formal services prior to attending service i

RA_{2i} = Average time (hr) per visit to private medical services prior to attending service i

RA_{3i} = Average time (hr) per visit to formal service i

RA_{c1} = Average treatment/ drug costs, incurred by patients, per visit to non formal services

RAC_{1ti} = Average travel costs, incurred by patients, per visit to non formal services prior to attending service i

RAC_2 = Average treatment/drug costs incurred by patients, per visit to private medical services

RAC_{2ti} = Average travel costs, incurred by patients, per visit to private medical services prior to attending service i

RAC_{3i} = Average treatment/drug costs, incurred by patients, per visit formal service i

RAC_{3ti} = Average travel costs, incurred by patients, per visit to formal service i

RAC_b = Average labour cost per man month for RD testers at service i = 1

RAC_c = Average labour cost per man month of supervisor

RAC_{ct} = Average travel costs per return trip for supervisory visit

RAC_{m} = Average labour cost per man month of microscopist

RAC_{ml} = Average annual depreciation costs of a microscope per year

RAC_{sm} = Average material cost per slide examined

RAN_{2i} = Average number of visits, by positive case, per infection to private medical services prior to attending formal service i

RAN_{3i} = Average number of visits, by positive cases , per infection to formal service i

RA_{w} = Average wage rate (per day)

RB_{1} = National budget on malaria control

RC_{am} = Administrative costs of area office allocated to malaria case detection and treatment

RC_{hm} = Administrative costs of malaria national HQ allocated to malaria cases detection and treatment of the study area

RAC_{sb} = Average cost of RDT (dipstick) kit per test

RAN_{1i} = Average number of visits, by positive cases, per infection to non formal services prior to attending service i

RB_{2} = Malaria control budget of operational area under study

RB_{tb} = Total training budget for RDT testers

RB_{tm} = Total training budget for microscopists

RN_{a} = Number of malaria operational area in the country

RN_{b} = Number of man months per year of RD testers at formal service i = 1

RN_{c} = Number of man months per year of supervisory visits

RN_{ct} = Number of supervisory round trips per year

RN_{dl} = Number of RDT kits distributed each year to service i

RN_{m} = Number of man months of microscopists per year at service i = 2

RN_{ml} = Number of microscopes used for blood slide examination

RNP_{xi} = Number of positive cases (all species) detected at service i, during the year

RN_{si} = Number of patients taking the test/ examination at service i per year

RN_{tb} = Number of persons being trained, during the year, as RDT testers

RN_{td} = Number of persons to take initial conversion training for RDT

RN_{ui} = Number of malaria units operating as formal service i in the study area

RN_{vi} = Estimated number of services i receiving supervisory visits per year

Rp_{1} = Percentage of national malaria control budget to administration (malaria headquarters budget)

Rp_{2} = Percentage of operational area malaria control budget to administration

Rp_{3} = Percentage of malaria control budget to vector control

Rp_{6i} = Percentage of positive cases visiting non formal services prior to attending formal service i

Rp_{7i} = Percentage of positive cases visiting private medical services prior to attending formal service i

Rp_e = Percent of RDT kits, in relation to unused kits, expiring per year

RS_{ti} = Estimated stock of RDT kits at the beginning of the financial year

APPENDIX D

Cost-effectiveness of Microscopy and Dipstick in Diagnosis of Malaria in Sri Lanka (Questionnaire 1)

Cost-effectiveness of Microscopy and Dipstick in Diagnosis of Malaria in Sri Lanka (Questionnaire 1)

INTRODUCTION

This questionnaire is designed by the staff of the Anti Malaria Programme to understand the problems related to diagnosis of malaria in this area. Please help us answer the questions. Your co-operation and sincerity is very much appreciated.

QUESTIONNAIRE 1 - FOR PATIENTS

Instruction for interviewers

1. Interview all the malaria positive cases attending the public health service
2. If the patient is under 12 years of age please interview the mother, father or the guardian
3. Mark '✓' within the given bracket in front of the correct answer
4. Do not read the answers to respondents
5. Write in answers if response is not covered by checklist

Questions

1. Locality .....
2. Patient No. .....
3. Name .....
4. Sex: [ ] 1. Male [ ] 2. Female
5. Age: Years ..... Months .....
6. Education:
   - [ ] 1. Not attended school
   - [ ] 2. Attended grade 1-5
   - [ ] 3. Attended grade 6-10
   - [ ] 4. Attended above grade 10
7. Occupation:
   - [ ] 1. Farmer
   - [ ] 2. Skilled labourer
   - [ ] 3. Unskilled labourer
   - [ ] 4. Government employee
   - [ ] 5. Private employee
   - [ ] 6. Self-employed
   - [ ] 7. Other (specify) .....

8. When did you start fever?
   Date..... Month..... Year.....

9. Did you attend any health facility for treatment?
   [ ] 1. Yes [ ] 2. No

10. If yes, what services did you attend for treatment?

    First visit:
    [ ] 1. Traditional healer
    [ ] 2. Private practitioner
    [ ] 3. Public hospital/dispensary

    Second visit:
    [ ] 1. Traditional healer
    [ ] 2. Private practitioner
    [ ] 3. Public hospital/dispensary

    Third visit:
    [ ] 1. Traditional healer
    [ ] 2. Private practitioner
    [ ] 3. Public hospital/dispensary

11. What drugs did you take for fever before attending the above mentioned services?
    [ ] 1. Not taken any drug
    [ ] 2. Parasitamol
    [ ] 3. Anti malarials
    [ ] 4. Other(specify) .....

12. From where did you buy this medicine?
    [ ] 1. Pharmacy
    [ ] 2. Shop
    [ ] 3. Stored drugs at home
    [ ] 4. Other (specify) .....

13. Who bought drugs for you?
    [ ] 1. Myself
    [ ] 2. Attending person

14. How much did you/attending person spend on self medication?
    [ ] 1. Drugs Rs. .....
    [ ] 2. Travel Rs. .....
    [ ] 3. Time Hr. .....

15. If you visit any health facility, how much did you spend for treatment on your first visit?

    Patient:
    [ ] 1. Diagnosis Rs. .....
    [ ] 2. Drugs Rs. .....
    [ ] 3. Travel Rs. .....
    [ ] 4. Time Hr. .....

    Attending person:
    [ ] 1. Travel Rs. .....
    [ ] 2. Time Hr. .....

Were you treated on microscopic diagnosis of malaria?

[ ] 1. Yes [ ] 2. No

16. How much did you spend for treatment on your second visit.

Patient:

[ ] 1. Diagnosis Rs. .....
[ ] 2. Drugs Rs. .....
[ ] 3. Travel Rs. .....
[ ] 4. Time Hr. .....

Attending person:

[ ] 1. Travel Rs. .....
[ ] 2. Time Hr. .....

Were you treated on microscopic diagnosis of malaria?

[ ] 1. Yes [ ] 2. No

17. How much did you spend for treatment on your third visit.

Patient:

[ ] 1. Diagnosis Rs. .....
[ ] 2. Drugs Rs. .....
[ ] 3. Travel Rs. .....
[ ] 4. Time Hr. .....

Attending person:

[ ] 1. Travel Rs. .....
[ ] 2. Time Hr. .....

Were you treated on microscopic diagnosis of malaria?

[ ] 1. Yes [ ] 2. No

18. Which service do you prefer?

[ ] 1. First service
[ ] 2. Second service
[ ] 3. Third service

19. Why did you prefer that service?

[ ] 1. Closest
[ ] 2. Perceived quality
[ ] 3. Perceived severity
[ ] 4. Non availability of finance
[ ] 5. Other (specify) .....

20. How many working days did you lose due to malaria?

Days .....

21. How much is your monthly income

[ ] 1. Less than Rs.1000
[ ] 2. Rs.1000-2000
[ ] 3. Rs.2001-3000
[ ] 4. Rs.3001-4000
[ ] 5. Rs.4001-5000
[ ] 6. More than Rs.5000

22. How many dependents in your family? .....

Thank you.

APPENDIX E

Cost-Effectiveness of Microscopy and Dipstick in Diagnosis of Malaria in Sri Lanka (Questionnaire 2)

Cost-Effectiveness of Microscopy and Dipstick in Diagnosis of Malaria in Sri Lanka (Questionnaire 2)

INTRODUCTION

This questionnaire is designed by the staff of the Anti Malaria Programme. We try to study the cost-effectiveness of microscopy and dipstick in diagnosis of malaria. Please answer the questions. Your kind co-operation and sincerity is very much appreciated. All information are kept confidential.

Instructions

1. Please answer all questions
2. Mark "√" within the given bracket in front of the correct answer
3. Write the answer when the answer is not covered by the checklist
4. Use the enclosed envelope to send back the completed questionnaire.

QUESTIONNAIRE 2 - FOR PRIVATE HEALTH CARE PROVIDERS

SECTION i.

1. Name of the GS area .....

2. Name of the AGA area .....

3. Type of service:
   [ ] 1. Individual private practitioner
   [ ] 2. Private clinic
   [ ] 3. Private hospital
   [ ] 4. Other

4. Did you get malaria cases at your service during the last year?
   [ ] 1. Yes [ ] 2. No

   If yes, how many clinical malaria patients did you get monthly? .....

5. What method do you use to diagnose these malaria cases?
   [ ] 1. Clinical diagnosis only
   [ ] 2. Microscopy to support clinical diagnosis

   If you do not use microscopy, please go to SECTION II.

6. What percentage of malaria cases attending to your clinic/hospital does receive treatment on microscopic diagnosis? .....%

7. How do you get microscopic service?
   [ ] 1. By your own microscopist service
   [ ] 2. Get service of a public sector microscopist
   [ ] 3. Hire microscopist from private sector
   [ ] 4. Send the blood films to public hospital
   [ ] 5. Send the blood films to private hospital/laboratory

8. If you have your own microscopist, or you get microscopist service from public/private sector,

   How much do you pay for the microscopist per month? Rs.....

   How many months of microscopist service do you use per year? .....

9. What percentage of microscopist time is spent for blood slide examination for malaria? .....%

10. How many blood slides for malaria are examined per month? .....

11. What is the average material cost per slide? Rs.....

12. What is the cost of microscope? Rs.....

13. What is the lifespan of the microscope Years.....

14. How long have you been used that microscope by now? Years.....

15. Is the microscope imported or locally produced?
   [ ] 1. Imported
   [ ] 2. Locally produced

   If imported, what is the country of importation? .....

16. What is the monthly salary of the administrator? Rs.....

17. What percentage of time of administrator spent on administration of the microscopist? Hr.....

18. Do you have a supervisor for supervising microscopists/dipstick testers?

   What is the monthly salary of supervisor? Rs.....

19. What percentage of time of supervisor spent on supervision of the microscopist? Hr.....

SECTION II

A rapid diagnostic test called dipstick is available for diagnosis of malaria. The details of the test is annexed here. One test kit is needed per patient and the price of one test kit is around Rs.50.

23. Would you buy dipstick for diagnosis of malaria patients attending to your clinic/hospital?
    [ ] 1. Yes [ ] 2. No

24. If yes, at what cost can you provide diagnosis of malaria per patient? Rs.....

25. What percentage of malaria cases attending to your clinic/hospital can afford dipstick diagnosis at that price?
    .....%

26. If dipstick is available at the different prices as mentioned below, what percentage of malaria cases attending to your clinic can afford dipstick at each price?

Price (Rs.)	% of malaria cases can afford dipstick
Rs. 25	.....%
Rs. 50	.....%
Rs. 75	.....%
Rs.100	.....%

Thank you.

APPENDIX F

Calculation of Effectiveness of Microscopy and Dipstick

Calculation of Effectiveness of Microscopy and Dipstick

Scenario 1. Effectiveness of microscopy and dipstick in terms of accuracy.

In the usual practice the NMCP uses microscopy with 100 oil-immersion field examination per blood slide in the diagnosis of malaria. During this study the accuracy of microscopy with examination of 100 oil-immersion fields and dipstick are compared with microscopy with examination of 400 oil-immersion fields (gold standard). The author use the data of the study which has been carried out to evaluate the effectiveness of dipstick in Sri Lanka by Kodisinghe and others (1995) for determining the accuracy of microscopy and dipstick.

The study has compared microscopy with 100 and 400 oil-immersion examination fields (oif) with dipstick. The results are shown in Tables F.1 and F.2

Table F.1 Results of Dipstick as Compared to Microscopy with 100 and 400 Oil-immersion Fields

Dipstick	Microscopy					
	100 oil immersion fields			400 oil immersion fields		
	+	-	Total	+	-	Total
+	145	15	160	155	5	160
-	32	717	749	15	734	749
Total	177	732	909	170	739	909

Source: Kodisinghe and others (1995). personal communication

Table F.2 Results of Microscopy of Examination of 100 Oil-immersion Fields as Compared to Microscopy with 400 Oil-immersion Fields

Microscopy (100 oif)	Microscopy (400 oif)		
	+	-	Total
+	170	7	177
-	0	732	732
Total	170	739	909

Source: Kodisinghe and others (1995). Personal communication

According to this study the sensitivity, specificity, percentage of false positives, percentage of false negatives are shown in Table F.3.

Table F.3 Results of Microscopy of 100 Oil Immersion Fields and Dipstick as Compared to Microscopy of 400 Oil Immersion Fields

Indicator	Dipstick	Microscopy (100 oil immersion fields)
Sensitivity	91.2	100
Specificity	99.3	99.05
% of false positive	0.55	0.77
% of false negative	1.65	0
Accuracy	98	99

Source: Kodisinghe and others (1995). Personal communication.

Scenario 2 Effectiveness of microscopy and dipstick in terms of on-site diagnosis of malaria

By using the decision tree the effectiveness of microscopy and dipstick in terms of on-site diagnosis of malaria and accurate on-site diagnosis of malaria are calculated. The decision trees for microscopy and dipstick are shown in Figures F.1 and F.2

Percentage of on-site diagnosis by microscopy

$$\text{in both public and private sectors} = \frac{185}{567} \times 100 = 32.6\%$$

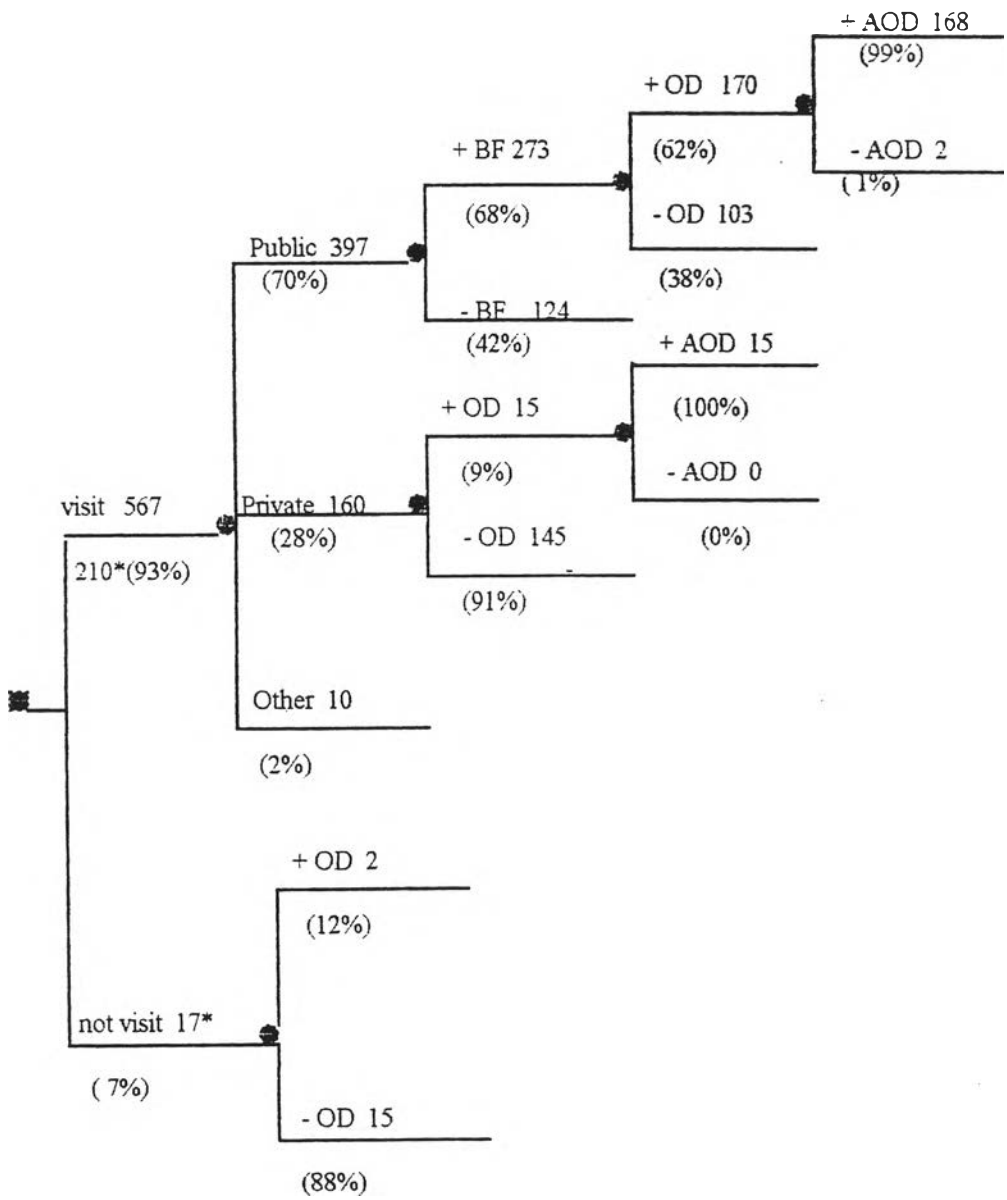
$$\text{in public sector} = \frac{170}{397} \times 100 = 43.0\%$$

$$\text{in private sector} = \frac{15}{160} \times 100 = 9.3\%$$

Percentage of on-site diagnosis by dipstick

Assumptions:
1. All malaria cases receive blood filming in public sector will receive on-site diagnosis by dipstick
2. 50% of patients attending private sector will receive on-site diagnosis by dipstick
3. No false positives and false negatives

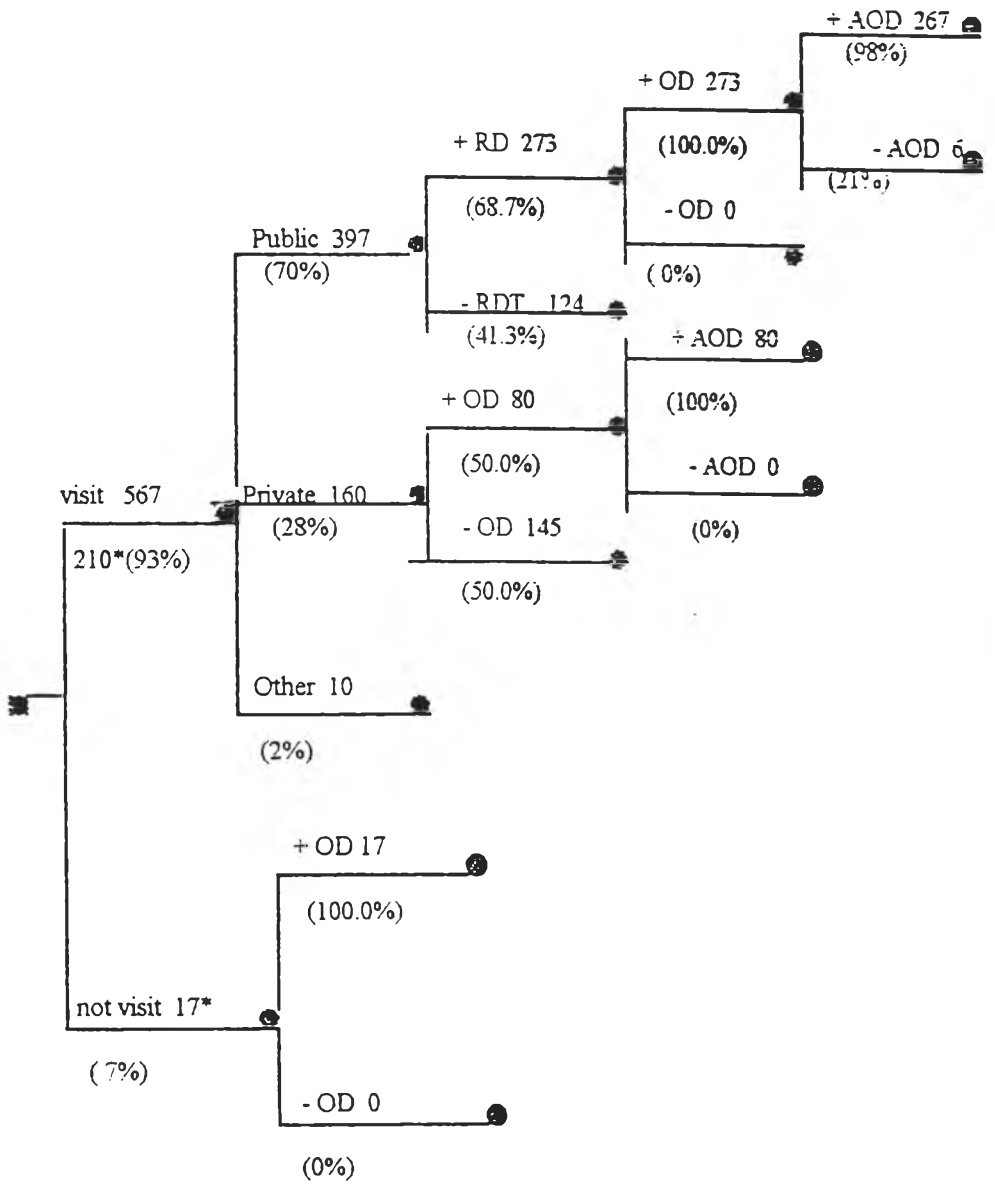
Figure F.1 Decision Tree Analysing the Decisions of Using a Particular Health Facility and the Resulted Accurate On-site Diagnosis by Microscopy



where

BF = Blood filming for malaria
OD = On-site diagnosis of malaria
AOD = Accurate on-site diagnosis of malaria

Figure F.2 Decision Tree Analysing the Decisions of Using a Particular Health Facility and the Resulted Accurate On-site Diagnosis by Dipstick



where

RD = Using dipstick for diagnosis of malaria
OD = On-site diagnosis of malaria
AOD = Accurate on-site diagnosis of malaria

$$\text{in both public and private sectors} = \frac{273 + 80}{567} \times 100 = \frac{353}{567} \times 100$$

$$= 62.2$$

$$\text{In public sector} = \frac{273}{397} \times 100 = 68.7\%$$

$$\text{in private sector} = \frac{80}{160} \times 100 = 50.0\%$$

Scenario 3 Effectiveness in terms accurate on-site diagnosis by microscopy and dipstick

Percentage accurate on-site diagnosis by microscopy

$$\text{in both public and private sectors} = \frac{168 + 15}{567} \times \frac{99}{100} \times 100 = 32.0\%$$

$$\text{in public sector} = \frac{168}{397} \times \frac{99}{100} \times 100 = 42.0\%$$

$$\text{in private sector} = \frac{15}{160} \times \frac{99}{100} \times 100 = 9.3\%$$

Percentage of accurate on-site diagnosis by dipstick

Assumptions:
1. All malaria cases receive blood filming in public sector will receive on-site diagnosis by dipstick
2. 50% of patients attending private sector will receive on-site diagnosis by dipstick

$$\text{in both public and private sectors} = \frac{273 + 80}{567} \times \frac{98}{100} \times 100 = 61.0\%$$

$$\text{in public sector} = \frac{273}{397} \times \frac{98}{100} \times 100 = 67.3\%$$

$$\text{in private sector} = \frac{80}{160} \times \frac{98}{100} \times 100 = 49.0\%$$

Scenario 4 Effectiveness in terms of coverage

1. All the medical institutions in the public sector can be provided with dipstick
2. 50% of the patients attend private health facilities will get on-site diagnosis by dipstick
3. No false positives and false negatives

Percentage of on-site diagnosis by microscopy

$$\text{in both public and private sectors} = \frac{185}{567} \times 100 = 32.6\%$$

$$\text{in public sector} = \frac{170}{397} \times 100 = 42.8\%$$

$$\text{in private sector} = \frac{15}{160} \times 100 = 9.3\%$$

Percentage of on-site diagnosis by dipstick

$$\text{in both public and private sectors} = \frac{397 + 80}{397 + 160} \times 100 = \frac{477}{567} \times 100$$

$$= 84.1\%$$

$$\text{In public sector} = \frac{397}{397} \times 100 = 100.0\%$$

$$\text{in private sector} = \frac{80}{160} \times 100 = 50.0\%$$

APPENDIX G

Calculation of cost-effectiveness of microscopy and dipstick under scenarios 1,2 and 3.

Calculation of Cost-effectiveness of Microscopy and Dipstick Under Scenarios 1,2 and 3.

During this calculations the costs are given in millions of rupees.

Scenario 1 Cost-effectiveness in terms of accuracy

$$CE_{11} = \frac{17.23}{0.99} = 17.4$$

$$CE_{13} = \frac{39.03}{0.98} = 39.8$$

$$CE_{12} = \frac{4.08}{0.99} = 4.1$$

$$CE_{14} = \frac{9.51}{0.98} = 9.7$$

$$CE_{11} + CE_{12} = \frac{21.3}{0.99} = 21.5$$

$$CE_{13} + CE_{14} = \frac{48.22}{0.98} = 49.5$$

Scenario 2 Cost-effectiveness of microscopy and dipstick in terms of on-site diagnosis of malaria

$$CE_{21} = \frac{17.23}{0.43} = 40.0$$

$$CE_{23} = \frac{39.03}{0.68} = 57.3$$

$$CE_{22} = \frac{4.08}{0.09} = 45.3$$

$$CE_{24} = \frac{9.51}{0.50} = 19.0$$

$$CE_{21} + CE_{22} = \frac{21.3}{0.33} = 64.5$$

$$CE_{23} + CE_{24} = \frac{48.52}{0.62} = 78.2$$

Scenario 3 Cost-effectiveness of microscopy and dipstick in terms of accurate on-site diagnosis of malaria

$$CE_{31} = \frac{17.23}{0.42} = 41.0$$

$$CE_{33} = \frac{39.03}{0.67} = 58.2$$

$$CE_{32} = \frac{4.08}{0.09} = 45.3$$

$$CE_{34} = \frac{9.51}{0.49} = 19.4$$

$$CE_{31} + CE_{32} = \frac{21.3}{0.32} = 66.5$$

$$CE_{33} + CE_{34} = \frac{48.52}{0.61} = 79.5$$

Cost-effectiveness of microscopy and dipstick in patient perspective

$$PCEM_1 = \frac{97}{0.42} = 230.9$$

$$PCED_3 = \frac{97}{0.67} = 144.7$$

$$PCEM_2 = \frac{31}{0.09} = 344.4$$

$$PCED_4 = \frac{31}{0.49} = 63.3$$

$$PCEM_1 + PCEM_2 = \frac{128}{0.32} = 400.0$$

$$PCED_3 + PCED_4 = \frac{128}{0.61} = 209.8$$

CURRICULUM VITAE

NAME	MRS.P.H.D.Kusumawathie
ADDRESS	252/2 Ankelipitiya Talatuoya Sri Lanka
PHONE	08-24135
QUALIFICATION	Degree of Bachelor of Science
TRAINING	Malaria Control
OFFICE	Regional Malaria Officer Anti Malaria Campaign Kandy Sri Lanka
PRESENT POST	Regional Malaria Officer