REFERENCES

Abel-Smith B.(1992)."Can the Poor Afford Free Health Services? A Case Study of Tanzania", Health Policy and Planning:7 (4):329-341

Carrin, G.and Evlo, K.(1995).A Methodology for the Calculation of Health Care Cost and Their Recovery, World Health Organization.

Collier, J.A.B and Longmore, J.M.(1983). "The Reliability of the Microscopic Diagnosis of Malaria in the Field and in the Laboratory", Annals of Tropical Medicine and Parasitology:(77):113-117

Creese, A.and Parker, D.(1994). Cost Analysis in Primary Health Care, A Training Manual for Programme Managers, World Health Organization.

Department of Clinical Epidemiology and Biostics, Macmaster University Health Center(1981)." How to Read Clinical Journals:To Learn About a Diagnostic Test". Can Med Asso J 124: 703-710.

Ettling M.B, et.al.(1991). "Economic Analysis of Several Types of Malaria Clinics in Thailand", Bull WHO,69(4) :467-76.

Hoffman, L. Beadler, C. et.al.(1994). "Diagnosis of Malaria by Detection of Plasmodium falciparum HRP-2 antigen with A Rapid Dipstick Antigen-Capture Assay", Lancet, 343:564-568.

Hongvivatana, T. Leerapan,P.and Smithisampan, M. (1985). knowledge Perception and Behavior of Malaria. Monograph Series, Center For Health Policy Studies, Mahidol University.

Indaratna, K.and Kidson, C.(1995a). "Economics of Malaria: Where to Now?" Health Economics Issues 2(1):2-6.

Indaratna, K.and Kidson, C.(1995b). "Changing Economic Challenges in Malaria Control" South East Asian J Trop Med Public Health,26(3):388-396.

Indaratna, K.and Kidson, C.(1995c). " Economic Implications of Changing Malaria Technology". Unpublished Paper, Ministry of Public Health, Thailand.

Kaewsonthi, S. and Harding, A.G.(1984). "Cost and Performance of Malaria Surveillance in Thailand", Social Science Medicine,19(10):1081-97.

Kaewsonthi, S.(1993). "Economic Questions Concerning Leprosy Control", South East Asian J Trop Med Public Health,24 (1):1-2.

Kamolratanakul P,Prasittisuk C,et.al.(1993). "Economic Analysis of Malaria Control for Migrant Workers in Eastern Thailand", South East Asian J Trop Med Public Health,22(2):155-9.

Kamolratanakul, P.and Chunhaswasdikul, B.et.al.(1993). "Cost-Effectiveness Analysis of There Short Course Anti-tuberculosis Programmes Compared With a Standard Regimen in Thailand", J Clin Epidemol,46(7):631-636.

Kidson, C.(1991). "Malaria Vaccines in the Future -What Strategies Now?", South East Asian J Trop Med Public Health,22(2):155-9.

Kidson, C.(1993). "Trade, Population Flow and Transnation Malaria Control", South East Asian J Trop Med Public Health,24(2):213-5.

Kidson, C.(1995). "The Model Illusion in Health Care", South East Asian J Trop Med Public Health,26(2):201-3.

Lavy, V. and Quigley, J.M.(1993). "Willingness To Pay for the Quality and Intensity of Medical Care: Low-Income Households in Ghana,"Living Standard Measurement Study Working Paper No. 94, World Bank, Washington DC.

Mills, A. (1991). "The Economics of Malaria Control". In:Target, G.A.T.(ed) Malaria: Waiting for the Vaccine. London:Wiley, 1991:141-165.

Mills, A. (1993). "Is Malaria Control a Priority? Evidence from Nepal?", Journal of Health Economics,2:333-347.

Oslen, J. A. and Donaldson, C.(1990). "Willingness To Pay for Public Sector Health Care Programmes in Northern Norway", The Health Economics Research Unit Discussion Paper 05/93.

Pornchaiwiseskul, P.(1993). "Economics of Communicable Disease Control : Malaria in Thailand", Chula Econ,5(2):161-82.

Ryan, M. (1995). "Using the Closed Ended Willingness to Pay Technique to Established Arguments in the Infertile Person's Utility Function", Health Economics Research Unit Discussion Paper 07/95, University of Aberdeen, Aberdeen.

Reynolds, J. and Gaspari, C.K.(1990) "Cost Effectiveness Analysis:Operations Research Methods". Primary Health Care Operations Research, Center for Human Services, Maryland.

Sauerborn, R. Shepard, D.S. et.al.(1991). "Estimation the Direct and Indirect Economic Costs Of Malaria in a Rural District of Burkina Faso", Trop.Med.Parasitol 42:219-223.

Shepard, D. S. and Ettling, M.B (1991). " Economic Cost of Malaria in Rwanda", Trop. Med.P arasitol.42:214-218.

Soe-Aung, Soe-Win et.al.(1994). "Malaria Diagnosis Treatment and Referral Patterns of Basic Health Staff at the Peripheral Health Services in Mudon Township, Mon State", Research Paper, Vector-borne Diseases Control project, Department of Health, Myanmar.

Vector-borne Diseases Control Project, Department of Health, Myanmar (1993a). Annual Report.

Vector-borne Diseases Control Project, Department of Health, Myanmar (1993b). Revised Malaria Control Strategy in Myanmar.

Vector-borne Diseases Control Project, Department of Health, Myanmar (1994). Guidelines for the Diagnosis and Treatment of Malaria in Myanmar.

Vector-borne Diseases Control Project, Department of Health, Myanmar (1995). ABC of Health Economics with Examples from Malaria Control.

Vector-borne Diseases Control Project, Department of Health, Myanmar (1996). Evaluation of Performance of a Township Hospital Laboratory.

World Health Organization (1993). Technical Report Series NO. 839, Implementation of the Global Malaria Control Strategy. Geneva.

World Health Organization (1995a). " A Rapid Dipstick Antigen Capture Assay for the Diagnosis of Falciparum Malaria", Unpublished Report, Institute of Immunology, New Delhi, India.

World Health Organization (1995b). Health Economics, A WHO Perspective, WHO Task Force on Health Economics. Geneva.

Appendices

Figure A.1 Factors Influencing Mortality of Severe and Complicated Malaria

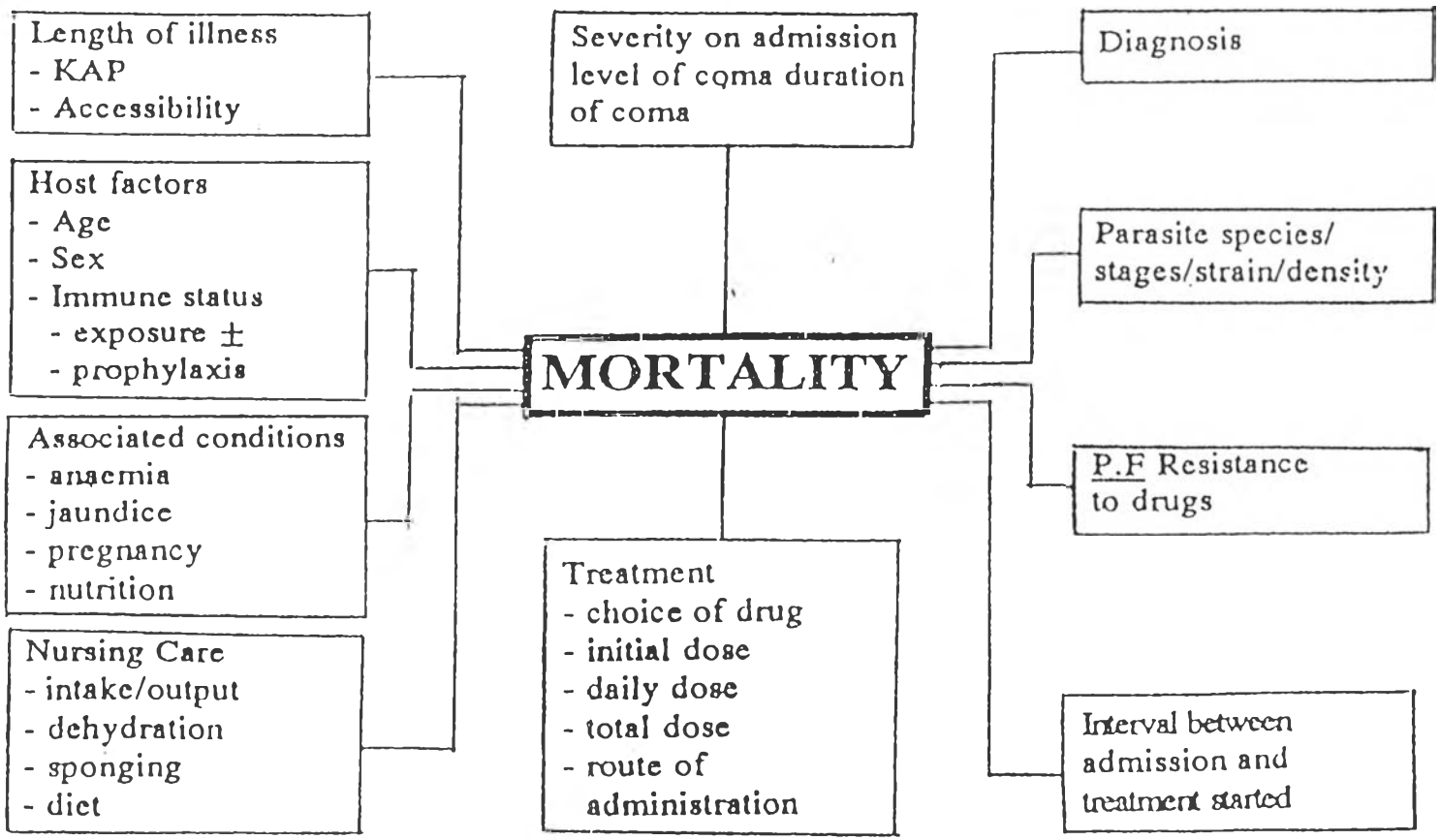


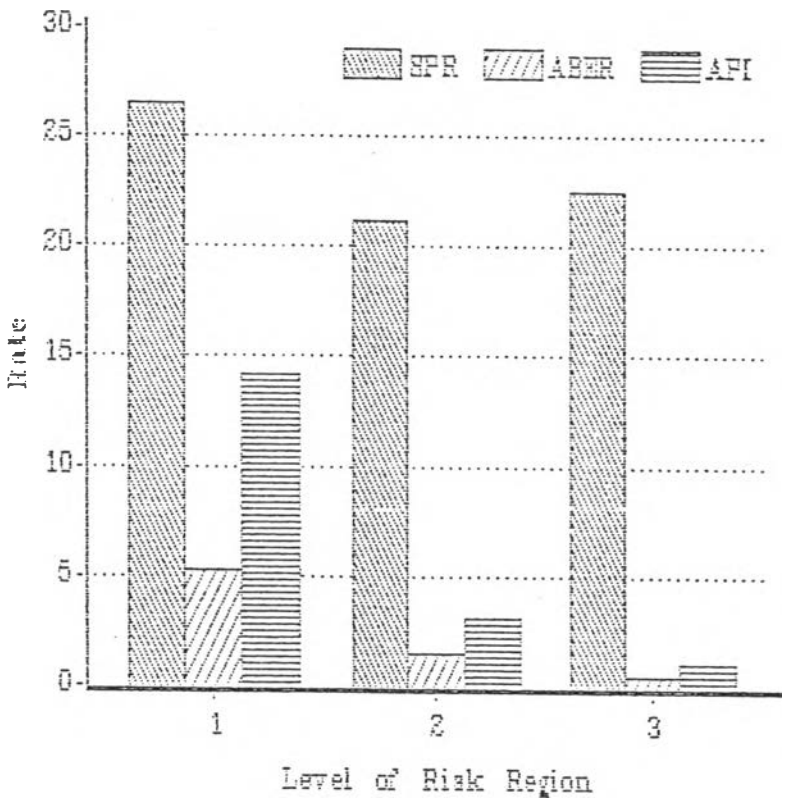
Table A.1 In-vivo Response of P.falciparum to Antimalarials

State/ Division	Township	Drug	No. tested	S/RI	RII& RIII	Test
Sagaing	Budalin	sp	23	14(61%)	9(39%)	7 days
Mandalay	Thabeikyin	SP	19	9(47%)	10 (53%)	7 days
Bago	Bago	SP	36	25(69%)	11 (31%)	28 days
Mon	Mudon	CQ	24	14(59%)	10 (41%)	28 days
Mon	Thaton	CQ	40	26(65%)	14 (35%)	7 days
Mandalay	Thabeikyin	SP	21	11(52%)	10 (4*%)	7 days

Source: Annual Report(1993), VBDC Project, DOH, Yangon, Myanmar.

Appendix 3

Figure A.2 Level of Endemicity in Myanmar (1993)



1 = High Risk Region
2 = Moderate Risk Region
3 = Low Risk Region

Appendix 4

Questionnaire for Patient Interview

A Sincere Request to the Participants:

1. It will be much appreciated if this questionnaire is completed sincerely.
2. Name, address and signature are not needed in completing the forms.
3. Your answers will be assured to be confidential.
4. Sincere and cordial thanks to all participants.

Patient ID.....

Interviewer's name.....

State/ Division.....

I. General Information

1. Sex [ ]
   1.1 male
   1.2 female
2. Age (completed year) [ ]
3. Level of education (year of schooling) [ ]
4. Occupation [ ]
   4.1 private(agriculture, home industry,.)
   4.2 public(forestry, gem-mining,.....)
   4.3 self-employed
   4.4 dependent
   4.5 others ...
5. Household income [ ]kyats per annum/month
6. Total number of family [ ]
7. What is your position in the family? [ ]
   7.1 Head of the family
   7.2 Non-head of the family
8. Distance between your residence and this clinics.
   [ ] miles

Appendix 4
(Continued)

9. How many hours does it take to arrive this clinic?
[ ] hours

II. Costs Information

1. How much you pay for traveling to this clinic?[ ]
2. How much you have to pay for your registration in this clinics? [ ] kyats
3. Do you pay for diagnosis? [ ]

   3.1 No
   3.2 Yes
   If yes, how much? [ ] kyats
4. Do you pay for treatment? [ ]

   4.1 No
   4.2 Yes
   If yes, how much? [ ] kyats
5. How much you spent for food while you are seeking services in this clinic? [ ] kyats
6. Have you take a leave of absence from your work? [ ]

   6.1 No
   6.2 Yes
7. Do you come here alone or with accompany person? [ ]

   7.1 Alone
   7.2 With accompanying person
   If you come with accompanying person, does he/she take leave of absent from his/her work?[ ]

      7.2.1 No
      7.2.2 Yes. If yes, what is his/her income?

      [ ] kyats per day/month/annum
8. Where did you go for the treatment of the last episode of malaria? [ ]

   8.1 public malaria clinic

   8.2 private clinic

   8.3 district/township/station hospital

   8.4 public traditional medicine clinic

   8.5 traditional healer/folk healer

   8.6 self-medication(modern medicine or traditional medicine)

Appendix 4
(continued)

8.7 others.....

9. How much did you pay for that visit? [ ] kyats

10. what is the total cost of seeking diagnosis and treatment for that visit? [ ] kyats

III. Willingness to Pay for the Services

1.How do you grade this clinic?

1.1.Availability of antimalarial drugs [ ]

1.1.1 Poor
1.1.2 Fair
1.1.3 Good

1.2 Availability of the staff [ ]

1.2.1 Poor
1.2.2 Fair
1.2.3 Good

1.3 Dealing of the staff [ ]

1.3.1 Poor
1.3.2 Fair
1.3.3 Good

2. What is your level of severity? [ ]

2.1 Mild
2.2 Moderate
2.3 Severe

3. How much are you willing to pay for diagnosis and of malaria? [ ]

3.1 Not willing to pay (your reason.....)
3.2 5-10 kyats
3.3 11-15
3.4 16-20
3.5 21+ (maximum amount.....)

4. How much are you willing to pay for treatment of malaria? [ ]

4.1 Not willing to pay(your reason.....)
4.2 5-10 kyats
4.3 11-15
4.4 16-20
4.5 21+ (maximum amount.....)

5. How much are you willing to pay for both diagnosis and treatment of malaria? [ ]

5.1 Not willing to pay (your reason.....)
5.2 5-10 kyats

Appendix 4

(continued)

5.3 11-15
5.4 16-20
5.5 21+ (maximum amount.....)

6. If you have a choice to select microscopy and dipstick technology, which one do you prefer?
[ ]

6.1 Microscopy
6.2 Dipstick
why?.....

7. If waiting time for dipstick technology is shorter than that of microscopy, do you want to use it?

7.1 No...(your reason.....)
7.2 Yes
If yes, how much?

7.2.1 5-10 kyats
7.2.2 11-15
7.2.3 16-20
7.2.4 21+ (maximum amount.....)

8. If service time for diagnosis and treatment is extend to 24 hour services, do you want to pay for it?

8.1 Not willing to pay (your reason. .....)
8.2 5-10 kyats
8.3 11-15
8.4 16-20
8.5 21+ (maximum amount.....)

Appendix 5

Software Package Application

A software package being developed at the Centre for Health Economics(CHE) for comparative analysis of the costs of existing and new diagnostic technologies will be applied.

Model-1 : Micro Cost Models 1

Costs incurred by malaria organizations and patients in parasite control using existing technology (microscopy).

Model-2: Micro Cost Models 2

Costs incurred by malaria organizations and patients in parasite control using RDT and microscopy.

Model Equations

(1) Cost of Radical Drug Treatment at Service

$$RAC_{rp1} = [(RP_{r1i} * RC_{r11}) + (RP_{r12i} + RC_{r12}) + (RP_{r131} * RC_{r13})]$$

Rp_{r1i} = Percent of Pf cases being treated by 1st line drugs per year at service
Rp_{r2i} = Percent of Pf cases being treated by 2nd line drugs per year at service
Rp_{r3i} = Percent of Pf cases being treated by 3rd line drugs per year at service
Rc_{r11} = Cost of 1st line drugs to treat a Pf case
Rc_{r21} = Cost of 2nd line drugs to treat a Pf case
Rc_{r31} = Cost of 3rd line drugs to treat a Pf case

(2) Cost of Drug for False Positives at Service

$$Rc_{fp1} = \sum_{n=1}^{4} (RP_{5n1} * RNP_{n1} * RAC_{rp1})$$

RP_{5n1} = Percentage of false positives in detecting Pf cases at service
RAC_{rp1} = Average cost of drugs to treat a Pf case
RNP_{n1} = Number of Pf case being detected/treated during the year at service

Appendix 5
(Continued)

(3) Cost of blood slide examination for service

$C_{mx2}=[A_{m2}* N_{S2}*(AC_m/9600)]+(AC_{Sm}*N_{S2}* [N_{S2}/N_{SZ})*(ACm1*Nm1)]$

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

N_{S2} = Number of blood slides taken from formal service per year

Ac_m = Average labor cost per man month of microscopist

AC_{Sm}= Average materials cost per slide examined

N_{SZ} = Number of blood slides taken from all formal service, in the area, during the year

(4) Cost of radical drug treatment at service with microscope

$C_{rp2}=(((P_{r11}*C_{r11})+(p_{r12}*C_{r12})+(p_{r13}*C_{r13}))*NP_{12})+(C_{r2}*NP_{22})+(Cr3*NP_{32})+(C_{r4}* NP_{42}))$

P_{r11}= Percent of Pf cases being treated by 1st line drugs per year

P_{r12}=Percent of Pf cases being treated by 2nd line drugs per year

P_{r13}= Percent of Pf cases being treated by 3rd line drugs per year

C_{r11}= Cost of 1st line drugs to treat a Pf case

C_{r12}= Cost of 2nd line drugs to treat a Pf case

C_{r13}= Cost of 3rd line drugs to treat a Pf case

NP_{12}= Number of Pf cases detected and treated during the year at service

NP_{22}= Number of Pv cases detected and treated during the year at service

NP_{32}= Number of Pm cases detected and treated during the year at service

NP_{42}= Number of Po cases detected and treated during the year at service

C_{r2} = Cost of drugs to treat a Pv case

C_{r3} = Cost of drugs to treat a Pm case

C_{r4} = Cost of drugs to treat a Po case

(5) Cost of Drugs for False Positive at Service

$C_{fp2}= (P_5* N_{p2})* AC_{rp2}$

P_5 = Percentage of false positives(all species) from positive slides reexamined

Appendix 5
(Continued)

N_{p2} = Number of positive cases(all species) from all formal service

Ac_{rp2}= Average cost of radical drug treatment for all cases at service

(6) Cost of Regular Training of Microscopist for Service With Microscope

$C_{tm2} = (N_{s2}/ N_{sz}) * B_{tm}$

N_{s2} = Number of blood slides taken from formal service per year

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

B_{tm} = Total training budget for microscopists

(7) Cost of Regular Training RDT Testers for Service

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

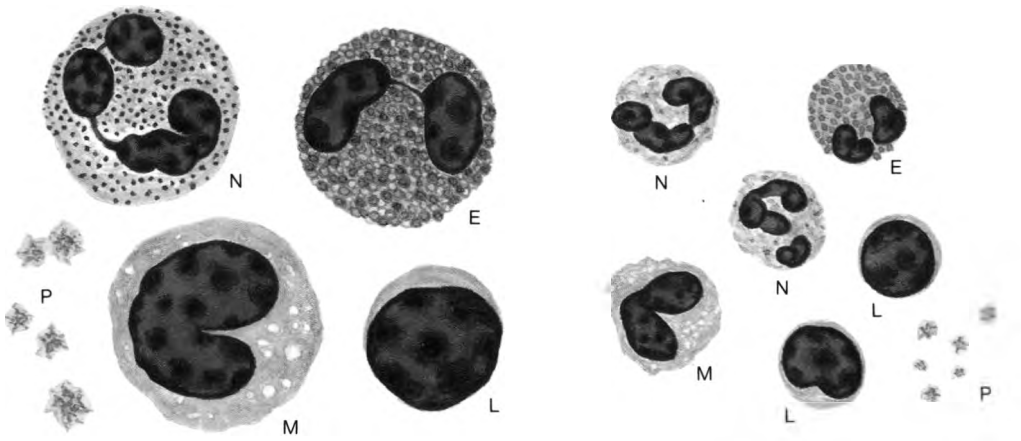
RN_{tb} = Number of persons being trained, during the year, as RDT testers

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

Rb_{tb} = Total training budget for RDT testers

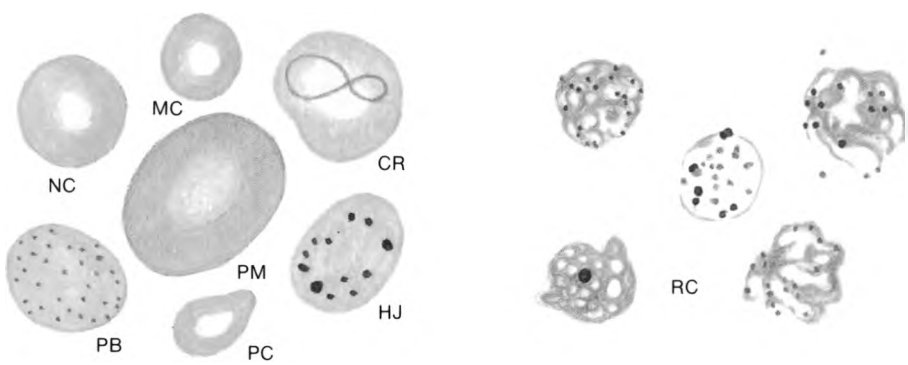
Appendix 7

Methods of Counting Malaria Parasites in Thick Blood Films



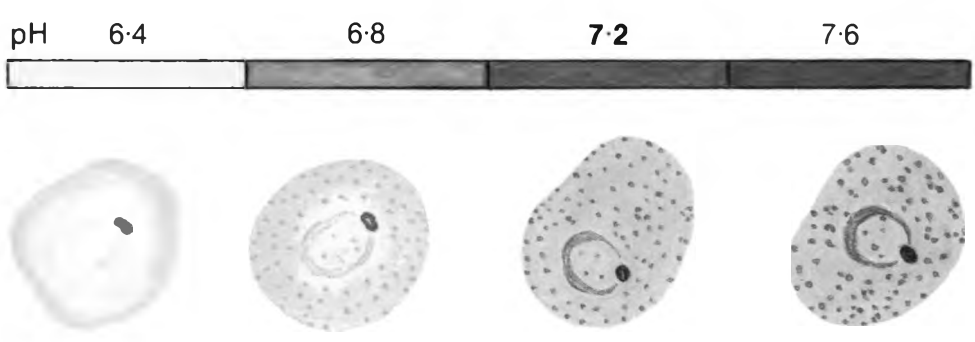
Thin Film — LEUKOCYTES — Thick Film

N = Neutrophil, E = Eosinophil, M = Monocyte, L = Lymphocyte, P = Platelets



Thin Film — ERYTHROCYTES — Thick Film

NC = Normocyte, MC = Microcyte, PM = Polychromatic macrocyte, PC = Poikilocyte, PB = Punctate basophilia, CR = Cabot's ring, HJ = Howell-Jolly bodies, RC = Reticular 'clouds' and chromatoid bodies in severe anaemia



MALARIA STAINING AND pH

AIDS TO HUMAN MALARIA DIAGNOSIS 6

APPEARANCE OF CELLULAR ELEMENTS IN GIEMSA-STAINED
THIN AND THICK BLOOD FILMS
EFFECT OF pH ON GIEMSA STAINING OF MALARIA PARASITES
(Original illustration by Yap Loy Fong)

GIEMSA STAINING TECHNIQUES: REGULAR METHOD

Thick and thin blood films on the same slide

For optimum staining, the thick and thin films should be made on separate slides and different concentrations and times used for staining. This is often not possible and the thick and the thin films are generally made on the same slide. When this is done, good-quality staining of the thick film is of primary importance. Best results are obtained if the blood films have dried overnight.

Method for 20 or more slides

1. Fix the thin film by dabbing gently with a pledget of cotton wool dampened with methanol, or by dipping it in a container of methanol for a few seconds. With prolonged fixation it may be difficult to demonstrate Schuffner's dots and Maurer's spots. To permit dehaemoglobinization, the thick film should not be fixed; therefore avoid methanol or methanol vapour touching the film.
2. Place the slides back to back in a staining trough.
3. Prepare a 3% Giemsa solution in pH 7.2 buffered distilled or de-ionized water in sufficient quantity to fill the number of troughs being used. Mix the stain well.
4. Pour the stain gently into the trough until the slides are totally covered.
5. Allow to stain for 30–45 minutes out of the sunlight.
6. 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.
7. Gently pour off the remaining stain and rinse again in clean water for a few seconds. Pour the water off.
8. Remove the slides one by one and place them in a slide rack to drain and dry, film side downwards, making sure that the film does not touch the slide rack.

Note: Evaluation of a well-stained thick film

(a) The background should be clean, free from debris, with a pale mottled-grey colour derived from the lysed erythrocytes.

(b) Leukocyte nuclei are a deep, rich purple.

(c) Malaria parasites are well defined with deep-red chromatin and pale purplish blue cytoplasm. In *Plasmodium vivax* and *P. ovale* infections the presence of Schüffner's stippling in the "ghost" of the host erythrocyte can be seen especially at the edge of the film.

Figure A.4 Steps in dipstick assay for malaria diagnosis

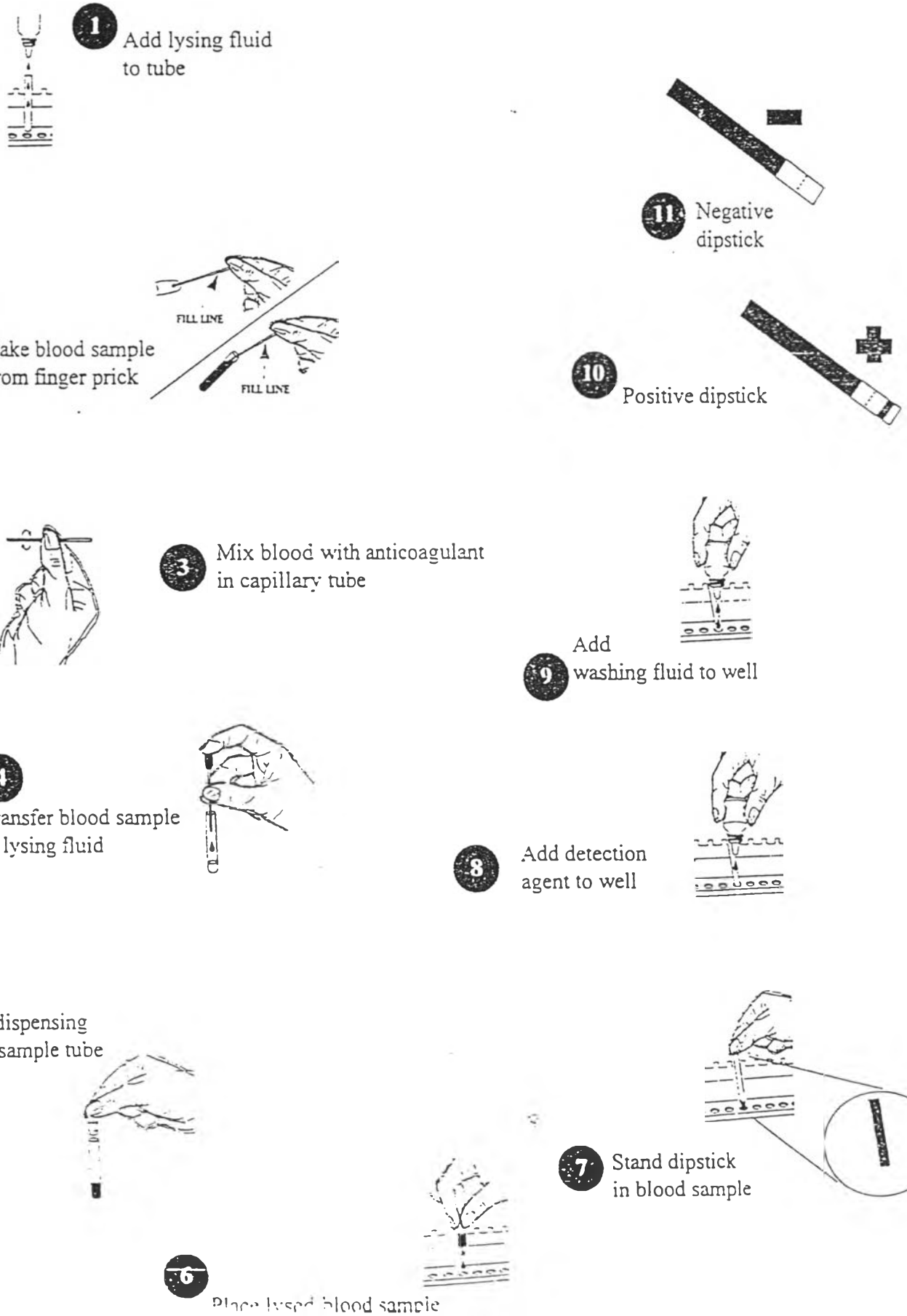


Table A-1 Annualization Table

Lifetime of Assets (n)	Interest Rates (r)		
	5%	10%	15%
1			
2	0.5378	0.5762	0.6151
3	0.3672	0.4021	0.4380
4	0.2820	0.3155	0.3503
5	0.2310	0.2638	0.2983
6	0.1970	0.2296	0.2642
7	0.1728	0.2054	0.2403
8	0.1547	0.1874	0.2229
9	0.1407	0.1736	0.2096
10	0.1295	0.1627	0.1993
11	0.1204	0.1540	0.1911
12	0.1128	0.1468	0.1849
13	0.1065	0.1408	0.1791
14	0.1010	0.1357	0.1747
15	0.0963	0.1315	0.1710
16	0.0923	0.1278	0.1679
17	0.0887	0.1247	0.1654
18	0.0855	0.1219	0.1632
19	0.0827	0.1195	0.1613
20	0.0802	0.1175	0.1598
21	0.0780	0.1156	0.1584
22	0.0760	0.1140	0.1573
23	0.0741	0.1126	0.1563
24	0.0725	0.1113	0.1554
25	0.0710	0.1102	0.1547
26	0.0696	0.1092	0.1541
27	0.0683	0.1083	0.1535
28	0.0671	0.1075	0.1531
29	0.0660	0.1067	0.1527
30	0.0651	0.1061	0.1523

*Annualization Formula: $a(r,n) = \frac{[r(1+r)^n]}{[(1+r)^n - 1]}$

where r = interest rate and n= lifetime of asset for depreciation.

Source: Henry M. Levin, Cost-Effectiveness: A Primer (Beverly Hills: Sage Publications, 1983), p. 70.

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