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SECOND INDEPENDENT ASSESSMENT
OF THE
INTENSIVE MALARIA CONTROL PROGRAMME
ANTI-MALARIA CAMPAIGN
SRI LANKA

11TH JUNE - 30TH JUNE

1984

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2ND ANNUAL EVALUATION OF THE INTENSIVE MALARIA
CONTROL PROGRAMME 11-30 JUNE 1984

SUMMARY REPORT

1983 has been a very difficult year for the Anti-Malaria Campaign, and the epidemiological situation showed a very serious deterioration, malaria cases reported rising from 38,566 in 1982 to 127,264 in 1983 - a three fold increase.

Besides the various constraints in administrative and management aspects which have been dealt with in previous assessment reports and which have crippled the operational efficiency of the A.M.C. climatic factors triggered an upsurge in transmission, particularly in the intermediate zone. Added to this, population mobility soon increased the malaria reservoir countrywide. Towards the end of the year, and in the first four months of 1984 excessive rainfall in the "Dry Zone" appears to have, in turn, produced a further upsurge in malaria transmission in that region of the country. The surveillance mechanism has been unable to quantify this increase in transmission in the Dry Zone due to lack of slides. However it appears to be considerable on the basis of 1983-1984 fever rates in institutions and whatever malariometric data is available. The present situation therefore presents a major threat to the dry zone in general and to the Mahaweli Accelerated Development Area in particular. Here Voluntary Treatment Centres were seen to be without drugs. This is particularly serious, since these Volunteers are in the first line of defence against an epidemic wave, and such a situation is bad for their morale. Further operational constraints were noted relating to petrol supply and insecticide availability. Spraying operations are very poor in some areas, and it is open knowledge that malathion is being sold to the farmers who use it on paddy, chillies and tobacco.

Laboratories are functioning under low pressure because of the shortage of slides.

(contd..)-

As yet there are no technical difficulties of a sufficient magnitude to pose a serious threat to operational impact. As noted above most of the constraints on the effective functioning of the A.M.C. are administrative and managerial in nature. However this comparative freedom from real technical problems may not last much longer. The entomology section of the A.M.C. has already given warning of the onset of resistance to malathion in An.culicifacies in a small proportion as yet, but likely to develop rapidly. Any eventual decision on a suitable replacement insecticide must depend on elucidation of the cross resistance pattern - an investigation for which there are as yet no suitable insectory/laboratory facilities.

Resistance of P.falciparum to chloroquine has not yet been demonstrated in Sri Lanka although such resistance is now present in practically every other country in S.E. Asia. Its appearance in Sri Lanka cannot now be long delayed.

Another technical problem of which the significance is as yet uncertain is that of G.6.P.D. deficiency. Further work is required in order to determine the seriousness of this problem and its extent.

The full co-ordination and confidence of other branches of the public health service still appears to be elusive, and the intersectoral co-operation aspect requires streamlining and expansion.

The A.M.C. continues to have a core of conscientious and dedicated workers who are worthy of the fullest administrative and technical support and who deserve to be allowed to pursue the goal of malaria control free from unnecessary constraints and harassments.

The alternative is the distinct probability of large scale disaster, particularly in the development areas.

**2nd Annual Evaluation of the Intensive Malaria
Control Programme, 11-30 June 1984**

INTRODUCTION

1) Composition of the Team

Dr. A.V.K.V. de Silva (Leader)
Mr. R.M.P. Rajapakse (Treasury)
Mr. S. Hulugalle (Ministry of Plan Implementation)
Mr. B.H. Passapera (External Resources)
Professor, George Davidson (British ODA)
Dr. P.A. Wickremasinghe (USAID)
Mr. John Stivers (USAID)
Dr. R. Slooff (Netherlands Government)
Dr. S. Kuribayashi (Japanese Government)
Dr. N. Kumara Rai (WHO Consultants)
Dr. K.M. Rashid (WHO, New Delhi)
Dr. D.A. Muir (WHO, Geneva)

ii) Terms of Reference

Terms of Reference for the Second Independent
Assessment of the Intensive Malaria Control
Programme Anti-Malaria Campaign, Sri Lanka

01. To review the implementation of the recommendations made by the First Independent Assessment Team and to identify constraints responsible for incomplete implementation if any.
02. To review the progress of the programme during 1983 and the present status of malaria in the country and its relationship to the proposed "plan of action 1984".
03. To review the nature and extent of operational problems affecting the programme as well as finance and man power constraints.
04. To review the programme activity wise.
05. To review the progress and present status of research activities.
06. To review training facilities for staff.
07. To review the role of the PHC worker vis a vis Anti-Malaria Campaign.

iii) Review of the Implementation of the recommendations made by the First Independent Assessment of the Intensive Malaria Control Programme, 1983.

Recommendations made by the Assessment Team in 1983 mostly still stand, although some have been partially implemented. Any improvement in approach due to the particular positive actions taken has however been swallowed up in the rapidly deteriorating epidemiological situation in the course of the year. It is thus a case of too little, too late.

Under the circumstances there is little to be gained by once more reviewing recommendations which have been made several times in previous assessments. Only major points of emphasis are included in the recommendations arising from the present assessment.

1. BACKGROUND TO THE EVOLUTION AND PRESENT SITUATION OF THE AMC

Shortcomings of various types have been a common feature in the AMC during the last three years.

The shortcomings in staff at Central and Regional levels have led to lack of supervision. Shortcomings in laboratory services have affected parasitology and entomology. Shortcomings in supplies and equipment both for spraying operations and epidemiological surveillance together with shortcomings in transport services have led to deterioration of field operations as a whole. Some of the shortcomings mentioned have persisted throughout the last 3-4 years as can be verified by reading the repeated recommendations made by successive Annual Evaluation Teams and reviewing the degree of implementation from one year to the next.

The worsening of field operations efficiency during 1983 caused by decreasing spraying coverage, insufficient supervision and faulty malaria case detection activities has been a consequence of the shortcomings mentioned.

Unusual climatic and meteorological conditions during 1983 as a result of south-west monsoon failure caused suitable conditions for increased density of An.culicifacies which favoured the fast spread of the malaria parasite country wide, and build up of the malaria reservoir.

Increased population movement countrywide caused by accelerated development of road communications and various national development projects, which have augmented job opportunities in rural areas recently opened for agricultural production, was another favourable factor for the malaria transmission process.

The coincidence of all the above mentioned factors resulted in a diminished potential of AMC for maintaining the level of control of transmission of malaria reached in preceding years and the deteriorated situation resulted in epidemic outbreaks and general resurgence of malaria transmission countrywide. Frequent departmental inquiries also deviated AMC senior personnel from their technical duties.

Responsibility and power for solving the shortcomings affecting the AMC falls upon three levels of the national public administration :

Anti-Malaria Campaign
Ministry of Health
Higher Level of the Government.

The Director of the AMC has received authority for day-to-day management of the Campaign but has limitations for solving some of the shortcomings such as appointment of professional staff, procurement of supplies and equipment and setting up laboratory services, for example.

The Ministry of Health should expedite the processing of requests made by the Director, AMC but wither bureaucracy or limitations of power appears ^{to} prevent prompt solution of the problems or implementation of the requests. The higher level of the Government has all the power and attributions for taking action in the proper manner for solving existing shortcomings but it may happen that it is unaware of the actual needs because requests have not been submitted through the appropriate channels of the administration.

The manner of dealing with these bottlenecks and apparent lack of continuity in the appropriate linkage of the three administrative levels is exclusively the right and responsibility of national authorities. International organizations cooperating with AMC and Donor Governments contributing to the programme for malaria control have only the function of identifying the constraints, making recommendations and requesting the national Government to implement them. That has happened in the past but the situation of AMC at present has seriously deteriorated. That situation thus deserves a special treatment from the higher levels of the Government in order to maintain what remains of the past gains achieved in the control of malaria after significant financial investments both national and international.

The deteriorated current malaria situation is a result of administrative and managerial problems but not of technical problems which fortunately do not exist in Sri Lanka as yet. Such an epidemiological conclusion is supported by current entomological work. Soon, however, certain technical problems may occur as examples of incipient physiological changes of tolerance of the anopheline vector to the insecticide are being detected and the threat of development of drug resistance in the parasite is always present.

It is therefore essential to solve the existing administrative, managerial and operational problems with all speed before any such technical problems develop. Drastic changing of the current strategy of malaria control by introducing for example, an alternative insecticide or by putting undue reliance on possible other measures for vector control seems not to be best way, at present, for improving the current deteriorated situation. If the existing shortcomings in administration and management have prevented field operations from achieving the targets using the current measures of control (which have proved to be effective if properly carried out), the same shortcomings persisting in the future will also interfere with any other measure or control elements which could be employed.

2. Epidemiological and Malariometric Analysis

In 1983, 127264 positive cases were recorded which is 88693 cases more than in 1982 though the number of blood smears examined in 1983 was less by 71979 i.e. reduction of 6.4% of examinations.

The seasonal increase of cases in November and December 1982 began to subside slowly till April 1983 but from May-July 1983 there was a sudden upsurge of cases which was largely from health areas in the epidemic zone. Thereafter there was a lull in case incidence (August-October 1983) and with the onset of seasonal transmission a sharp increase of cases occurred in November 1983 which peaked in January 1984. The number of cases in 1983 would have been considerably more but for a shortage of glass slides in the late months of 1983 and which continued into the first half of 1984 in most regions, if not all. A comparison of health areas stratified by Annual Parasite Incidence (API) for 1982 and 1983 is in Table 1.

T A B L E - 1

API	Year	No. of health areas:	Population:	Blood smears Examined:	Positive:	P.f. Mixed:	ABER	Average SPR :	Average API
Above 10	1982	10	1465248	307951	22645	1087	21	7.3	15.5
	1983	40	4716827	686435	101926	3851	14.6	14.8	21.6
3.1-10	1982	11	1358837	243105	8418	271	17.9	3.5	6.2
	1983	23	3288215	252872	19305	542	7.7	7.6	5.9
2.1-3	1982	4	803863	58795	1939	99	7.3	3.3	2.4
	1983	2	190763	16109	399	14	8.4	2.5	2.1
1.1-2	1982	24	2594481	248182	3673	77	9.6	1.5	1.4
	1983	8	1302493	37458	1878	23	2.8	5.0	1.4
Below 1	1982	37	4744668	221723	1542	55	4.8	0.3	0.4
	1983	12	1605154	18175	573	21	1.4	3.1	0.3
Non-malarious	1982	23	4135354	47849	309	10	1.2	0.7	0.09
	1983	23	4209394	44587	3153	44	1.9	7.1	0.7
Total	1982	108	15102451	1127605	38566	1599	7.5	2.5	2.5
	1983	108	15372846	1055636	127264	4495	6.9	8.3	8.2

In 1983 the number of health areas with an API of over 3 per 1000 population has increased from 21(1982) to 63 of which 40 health areas have an API of over 10 and accounts for over 50% of the total population netting in 95% of total positives. What is disquieting is that 28 health areas in the epidemic zone show API-values similar to those in the hyperendemic zone even though the majority of these health areas had an ABER of under 8% whereas in the endemic zone the ABER generally exceeded 15%. This situation may be indicative of a high level of transmission which prevailed in the epidemic zone in the drought months. In the so called non-malarious zone there has been a 10 fold increase of cases in 1983, though there has been no change in the number of blood smears examined in 1982 and 1983. Significant numbers of cases have been recorded in Health areas Paddukka, Kandy Municipality and Nawalapitiya which is suggestive of local transmission in the lower reaches of the Kelani Ganga and the middle reaches of the Mahaweli consequent to pooling during the dry months. Had blood smear collections in more of the wet zone health areas particularly bordering the Intermediate zone been done it is likely many cases would have been picked up.

There has been no change in the proportion of P.falciparum through the number of P.falciparum infection in 1983 have increased three fold almost to the same extent as P.vivax. The shift of P.falciparum infections in recent years from the Eastern Foothills (Bibile, Moneragala, Badulla) to the Northern Dry Belt (Anuradhapura, Vavuniya, Trincomalee, Puttalam districts) has been maintained with nearly 70% of infections of this species in this epidemiological zone as against 8% in the Eastern foothills which in 1982 recorded nearly 15% of P.falciparum infections. In 1983 there have been deep inroads of this species from the Northern Dry Belt to neighbouring areas in the Intermediate zone particularly Chilaw, Kurumegala and Matale districts.

In 1983 the ABER was less than in 1982 which may be attributed to a shortage of glass slides in the late months of 1983.

However the ~~ABER has exceeded 15% in all health areas in the endemic zone and ranged between 5-10% in the health areas in the epidemic zone~~. In the Jaffna Peninsula the ABER has been under 5%. In the first half of 1984 there has been an acute shortage of glass slides which is reflected in the blood smear examinations which the team encountered in the areas visited.

The API and SPR in 1983 were 8.2% and 8.3% respectively which is more than 3 times that in 1982, clearly indicative that the malaria situation has regressed during the year largely owing to abnormal rainfall patterns - prolonged drought in the epidemic zone with failure of South West monsoon and excessive rainfall in the endemic zone during the North East monsoon which conditions have been favourable for continuous transmission. ~~The high precipitation has continued into 1984 and extended~~ beyond the normal North East monsoon months in the endemic zone maintaining transmission. This is reflected in the case incidence in the first 4 months of 1984 being 2.5 fold higher than in 1983 even though blood filming was severely hampered by an acute shortage of glass slides. This is further brought out in a comparison of SPRs for the first 4 months of 1983 and 1984 which were 6.25% and 20.4% respectively allowing for a higher selectivity in blood smear collections in 1984.

2.1. Functioning of Case Detection and treatment system

As in 1982, APCD remains the main source of blood smears collection and case detection in 1983 and 1984 (January-April) as shown below :

Source :	Year :	No. of blood smears examined:	No. positives:	SPR :
APCD	1983	787,061(74.5%)	108,824(85.5%)	13.8
	1984	204,893(76.0%)	45,333(84.9%)	22.0
ACD	1983	82,434(7.8%)	5,840(4.6%)	7.1
	1984	20,083(7.5%)	2,718(5.1%)	13.0
PCD	1983	43,097(4.2%)	3,637(2.9%)	8.4
	1984	13,827(5.2%)	1,503(2.8%)	11
Others	1983	143,034(13.5%)	8,943(7.0%)	6.3
	1984	30,542(11.3%)	3,866(7.2%)	13
Total	1983	1,055,626(100%)	127,264(100%)	12

In 1983, 74.5% of blood smears was the result of APCD ; in 1984 it was 76%. These figures were slightly less than the figure in 1982 which was 78.2%. With regard to total positives detected by APCD, the figures for 1984, 1983 and 1982 were 84.9%, 85.5% and 85.3% respectively. SPR in 1983 and 1984 is less useful as an indicator, since there was considerable shortage of blood slides throughout the island. It tends to shoot up as blood smear collection is becoming more selective. ... Even in these circumstances it has a higher indicator value than the API.

Participation of Voluntary Treatment Centres in blood filtering was negligible in the areas visited except in Moneragala Region where 786 blood smears were collected in 1983. The activity is also in progress in Matale Region from 1984. There is much variation in the number of functioning VTCs in the different regions. These appear to be concentrated and better organized in the Mahaweli Project Area. There seems to be a lack of information regarding these VTC at Regional and sub-regional offices.

- In 1983, P.vivax accounted for 96.5% of the infection whereas in 1984 it was 97%. It was a very slight increase compared to 1982, i.e. 95.9%.

- Most of the P.falciparum (P.f.) cases had been investigated whereas only a small proportion of P.vivax(P.v.) cases in some areas were so done. It will be of prime importance to know whether most of P.v. cases are new cases or just relapses, since this will determine further measures to be taken in the near future. This is further supported by the fact that most of the malaria cases do not complete the full course treatment.

- Health Division wise distribution of cases in 1983 and 1984 (up to May) is depicted below :

Health Division :	Year :	No.of blood smears Exd. :	No.posi- tived :	SPR :	P.v.:	P.f.:
1. Jaffna	1983	58,704	2,352	4.0	2,284	68
	1984	14,461	941	6.5	821	120
2. Vavuniya	1983	54,863	10,696	19.5	10,225	471
	1984	14,710	3,656	24.9	3,304	352

Health Division:	Years:	No. of blood smears Exd.:	No. posi- tives:	SPR :	P.v.:	P.f. :
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3. Anuradhapura	1983	121,557	21,579	17.8	20,193	1,386
	1984	29,604	8,926	30.15	8,609	317
4. Puttalam	1983	64,237	7,341	11.4	6,754	587
	1984	16,376	3,588	21.9	3,407	181
Kurunegala	1983	115,139	18,160	15.8	17,664	496
	1984	27,241	10,478	38.5	10,280	198
6. Matale	1983	97,362	9,145	9.4	8,521	624
	1984	28,643	5,439	18.9	5,310	129
7. Batticaloa	1983	56,141	6,511	11.6	6,452	59
	1984	18,265	3,043	16.7	3,041	2
9. Badulla	1983	21,301	1,854	8.7	1,788	66
	1984	10,492	1,052	10.0	1,024	28
9. Matara	1983	84,090	6,915	8.2	6,897	18
	1984	30,934	3,592	11.6	3,553	39
10. Galle	1983	2,027	144	7.1	143	1
	1984	556	58	10.4	58	0
11. Ratnapura	1983	65,088	4,163	6.4	4,117	46
	1984	23,619	1,631	6.9	1,626	5
12. Kegalle	1983	52,096	9,248	17.8	9,207	41
	1984	11,946	3,679	30.8	3,667	3
13. Kandy	1983	56,338	7,088	12.6	6,944	144
	1984	14,576	2,478	17.0	2,439	39
14. Colombo	1983	26,130	727	2.8	721	6
	1984	9,920	198	1.9	186	12
15. Kalutara	1983	4,964	205	4.1	204	1
	1984	1,358	125	9.2	121	4
16. Amparai	1983	52,157	3,293	6.3	3,283	10
	1984	20,125	4,425	21.9	4,423	2
17. Gampaha	1983	35,710	8,994	25.2	8,916	78
	1984	9,976	3,303	32.1	3,184	19
18. Nuwara Eliya	1983	7,684	921	12.0	887	34
	1984	2,310	298	12.9	286	12
19. Moneragala	1983	79,988	7,928	9.9	7,564	364
	1984	30,438	3,506	11.5	3,402	104

2.1.1. Indicator Institutions

From 31 indicator institutions collecting blood smears in 1983, 11,242 out of 107,796 were positives (SPR 10.4%) of which 10,892 P.v., 326 P.f., and 44 mixed infections. Proportion of P.v., (96.7%) detected was almost equal to all other institutions in case finding.

In 1984 (up to April) the breakdown by fever and non fever cases from 13 indicator institutions is available as follows. 4,519 blood films were collected from the non fever group 42 were positive (9.2%) for P.vivax. No P.f. was detected. From the fever group 2,795 were positive (18.12%) out of 15,460 blood films collected, of which 2,701 (96.6%) were P.v., 86 were P.f. (3%) and 8 mixed infection (0.4%).

It was also observed from the available records that the indicator institutions in the areas visited were functioning more as AFCD institutions as blood smears from non fever cases were minimal or such cases not blood filmed at all. In fact, many fever cases were being missed for blood filming. These indicator institutions need to be fully revived to provide the epidemiological information which was required of them when they were established at the time of the Intensified Control Programme.

It might be worthwhile to have a study on the carrier status of malaria among the adults, since this is the segment of population which has higher mobility, thus having better chance for spreading the disease.

2.1.2. Treatment

There has been no change in treatment regimens which consist of a combination of Chloroquine/Amodiaquine and Primaquine in all forms of treatment. Radical treatment has been given to all positive cases and fever cases suspected of malaria.

Pyrimethamine is not used in presumptive treatment. Mass Drug Administration has been carried ^{out} for one or two cycles but in some villages and project sites it has extended to more cycles depending on coverage. Prophylactic treatment has been used largely in project sites. On the distribution of Chloroquine and Primaquine in 1983 by the State Medical Stores and AMC more than 1.5 million population has had anti-malarial treatment.

2.2. Laboratory Performance

Blood smears collected through various sources were examined at Regional Laboratories and at Central Laboratory at Colombo. There was a shortage of 49 microscopist against the 233 sanctioned in 1983, though 27 additional microscopists were added to the cadre. The number of blood smears examined in 1983 was slightly less i.e. 1.05 million compared to 1.13 million in 1982, although the number of positives in 1983 was almost four fold. This is due to the shortage of blood slides mentioned in point 2.1.

In 7 existing regional laboratories in 1983 and 1984 (Jan - May), cross checking done at the central laboratory in Colombo reveals (Table 2 and Table 3) that the error rate for both positive to negative and negative to positive are very low (average less than 1%).

The percentage of positive blood films received and re-examined in 1983 and 1984 are 12.5% and 5.9% respectively whereas for the negative blood films the figures are 30.9% and 46.7%.

The error in species recognition is significantly low for 1983 (0.01%) and 1984 (0.005%). The error rate of positive and negative slides is confounded by the parasite prevalence among slides examined. A more unbiased basis for comparing the performance of laboratories could be obtained by using

Table 2

LABORATORY PERFORMANCE IN 1983

Name of Region	Total examined	No. of B/F received by cross checking	Total no. of +ves	No. of +ves exd	+ve to -ve	No. of -ves exd	-ve to +ve	Specimen difference
Colombo	326126	83984	38282	3056	Nil	26709	137 (0.5%)	03
Kurunegala	124842	86491	18987	1807	Nil	19245	89 (0.5%)	-
Batticaloa	104474	83861	9379	2991	Nil	18205	117 (0.6%)	02
Anuradhapura	109518	86877	15397	1447	Nil	23860	342 (1.4%)	11
Hambantota	87952	84101	6937	1076	Nil	19670	68 (0.3%)	01
Jaffna	122783	81085	13906	1221	Nil	17710	43 (0.2%)	01
Badulla	116709	81471	10891	1880	Nil	23215	118 (0.5%)	-
Natale	106135	83981	9571	1885	Nil	21385	128 (0.6%)	01
Total	1098539	671851 (61.2%)	123350 (18.4%)	15363 (12.5%)	Nil	169995 (30.9%)	1042 (0.6%)	19

T A B L E - 3

LABORATORY PERFORMANCE IN 1984 (JANUARY-MAY)

Name of Region	Total Examined :	No. of B/F received by Cross-checking:	Total No. of Positives:	No. of positives Exd.:	+ve to Neg.:	No. of -ves Exd.:	-ve to +ve :	Specimen difference:
Colombo	98364	46001	17971	698	-	9775	92 (0.9%)	01
Kurunegala	28252	25007	10836	513	-	6840	40 (0.6%)	-
Batticaloa	41490	16278	8439	680	-	10035	88 (0.9%)	02
Anuradhapura	35871	27511	10578	677	-	9460	100 (1.0%)	-
Hambantota	31933	28356	3264	193	-	8385	25 (0.3%)	-
Jaffna	31714	26367	5090	293	01 (0.3%)	7965	44 (0.6%)	-
Badulla	63273	23888	7220	609	-	9700	61 (0.6%)	-
Matale	29525	27689	5567	467	-	8845	59 (0.7%)	-
Total	360422	221097 (61.3%)	68965 (31.2%)	4130 (5.9%)	01 (0.02%)	71005 (46.7%)	509 (0.7%)	03 (0.003%)

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sensitivity and specificity indicators instead. Sensitivity and specificity are measures expressing the degree by which a laboratory test excludes false negatives from true cases and false positives from non-cases, respectively. In Anuradhapura for instance, the team was able to determine a specificity of 100% (1981/82/83) and a sensitivity of 95.6% (1981), 9.4% (1982) and 94.5% (1983). Considering these excellent results and to a certain extent to relieve the central laboratory of recycling of slides, it is worthwhile to consider that only a proportion of slides should be sent by the R.M.O. Suggest 10% of the positives, which should include all P.f. cases, and 25% of the negatives.

2.3. Collaboration of Health Services

Most of the Family Health Workers (FHW) have now been trained in blood filming and administration of antimalarial drugs. However they could not be utilized owing to a shortage of glass slides and drugs. In Medical Institutions, not activated, the blood smears examination were about 4% of total examinations. Even in activated institutions blood filming in the absence of the APCD agents is minimal or not done.

The withholding of primaquine therapy by some Medical Officers particularly in the MCP owing to a concern about possible side effects in patients with G 6 P D deficiency is an issue which needs to be resolved as a matter of urgency. There is much scope in technical and operational areas for coordination to be strengthened between AMC and the General Health Services.

2.4. G 6 PD deficiency

The AMC has had to contend over the years with the hospital authorities especially in Anuradhapura Health Division regarding the administration of Primaquine because of the occurrence of Intra Vascular Haemolysis (IVE) attributed to

this drug. This has led to it being referred to the Sri Lanka Medical Association and the withdrawal of the drug from paramedical and voluntary workers in the NCP for a trial period of 6 months when the situation would be reviewed. Limited studies on G 6 PD deficiency have been carried out by the AMC in 1980, 1981 and 1982 especially in Anuradhapura District and this defect was detected in 8.2% of the population tested (712) whereas in a survey in Bibile only 3% of the population tested (139) showed this defect.

There is an increasing incidence of P.falciparum in the Health Areas Anuradhapura, Kekirawa, Kahatagasdigiliya, Hingurakgoda, Polonnaruwa in North Central Province and withdrawal of Primaquine from paramedical personnel in the treatment of P.falciparum would be prejudicial to interruption of transmission of P.falciparum where a drastic reduction of P.falciparum is one of the objectives of the Programme. During the trial period cases of IVH should be thoroughly investigated by the hospital authorities and records maintained which could be reviewed by the review committee.

It would be in the interest of the AMC to undertake surveys of G 6 PD deficiency throughout the country and more extensively in the North Central Province where the problem appears to be somewhat overstated by some physicians. With the information from these surveys the AMC would be in a position to defend itself in the use of primaquine for radical cure of malarial infections. The availability of a simple, rapid field test enables the AMC to carry out these surveys without too much strain on its resources.

2.5. Research and Monitoring Activities of P.falciparum sensitivity to 4 aminoquinolines (chloroquine)

Only a limited number of tests had been carried out up to 1982 under the WHO Regional Collaborative Study on P.falciparum sensitivity to 4 aminoquinolines since its commencement in 1978. These limited tests shown that there is no

evidence of lowered sensitivity of P.falciparum to chloroquine. In 1983, 16 tests (in vitro) were carried out in Puttalam, Nochchiyagama, (Anuradhapura District) and Bingiriya (Kurunegala) where P.falciparum was found to be highly sensitive to chloroquine. This activity has gathered momentum in 1984 where 31 successful in vitro (micro) and 6 (in vivo) tests have been carried out in Puttalam (January, February (24), Bingiriya (2) January 1984), Anuradhapura (5) (April) and Moneragla (May). Tests carried out in 1984 have confirmed the sensitivity of P.falciparum to chloroquine. However in discussions with the District Medical Officer Puttalam he referred to a few cases which had not responded to chloroquine and which required in addition antibiotics for fever to subside and for parasite clearance. As the first indication of diminished sensitivity to chloroquine would be from the physicians the AMC should respond to such notifications by instituting prompt investigations. This activity needs to be extended to all P.falciparum areas to determine the sensitivity levels of P.falciparum and to monitor these levels at regular intervals (annually). Sri Lanka is fortunate that the local P.falciparum strains are sensitive to 4 aminequino- lines but close monitoring of the sensitive levels is needed particularly as resistant P.falciparum infections have been encountered in some South Indian States which poses a serious threat to its introduction to Sri Lanka.

3. Entomological Aspects

In preparing this account on the entomological programme in 1983/84 the team was enormously helped by being provided with numerous files and documents. The following three comprehensive documents were particularly useful:

- Report on "Meeting of the Entomological Assistants of the Anti Malaria Campaign" held on 24.01.83 - 25.01.83 at A.M.C. Headquarters and Entomological Programme for 1983.
- Entomological programme requirements, available facilities and work plan for 84/85.
- Results of entomological work, 1983. (comprehensive quantitative tables, untitled document).

Because of the availability of these papers there is no need to go into great detail on staffing, field or research activities and quantitative data. Instead, an outline of outstanding developments in the past year will be treated.

3.1. Operational monitoring and epidemiological participation

Entomology continues to play a vital role in the execution of the Anti Malaria Campaign, despite the substantial criticism levelled at the section. Most of this criticism stems from a misunderstanding of the generally acknowledged importance of entomology in vector-borne diseases control. The contribution of entomology to the A.M.C. in 1983/84 was hampered by staff shortages (another two E.A.A left the country on overseas employment), lack of administrative support and continuing adverse publicity.

As far as accomodation is concerned it is extremely disturbing to find that no progress has been made in the past year in the completion of laboratory facilities in Colombo. It is particularly disturbing to note that the temporary accomodation provided earlier by the Microbiology Department has had

to be vacated. At the regional level it was observed that the need for adequate office and store space for entomological teams was not always recognized and not always provided for.

The present staffing allows seven teams (five stationed in the field, two operating from Colombo) to operate in the operational monitoring and epidemiological participation. In addition, there are three teams, headed by post-graduate research assistants recruited on WHO/TDR - supported grants.

As the methods employed are much the same in operational monitoring, epidemiological participation and spot-checks, it is intended to discuss these aspects simultaneously in the following. Research activities will be addressed in paragraph 3.2.

Standard procedures employed and results acquired in 1983 were as follows.

3.1.1. Pyrethrum spray catches ;

These show that in 50% of houses sampled which were either unsprayed or overdue catches yielded 66% of all An.culicifacies. The remainder came from houses sprayed within the previous 1-90 days. This suggests that the quality of spraying leaves much to be desired. As expected, An.subpictus seemed to be little affected by the spraying, whereas other anopheline species (largely exophilic) were found in very small numbers.

3.1.2. Hand collections (indoor resting) ;

Data collected all confirm the conclusion reached in section 3.1.1.

3.1.3. Window (exit) trap collections ;

The occurrence of numerous gravid specimens in these catches suggests significant survival of An.culicifacies and An.subpictus. The 24 hours delayed mortality figures (probably considerably less than 50%) confirm this continuing survival.

3.1.4. Human bait collections :

These collections, both indoors and outdoors, showed that An.culicifacies and An.subpictus were the two predominant species. The finding of An.annularis, An.vagus, An.varuna, An.nigerrimus, An.pallidus and An.barbirostris in outdoor catches lends some support to the hypothesis of possible extradomiciliary transmission by species other than An.culicifacies.

3.1.5. Insecticide-susceptibility tests :

Table 4 shows anopheline species which have survived discriminating dosages of organochlorines, organophosphates and carbamates. It can be seen that multiple resistance is already common in a number of these species. For the first time, malathion-resistance in the vector, An.culicifacies, has become evident in six health areas in 1983/84. The map in figure 1 shows where surviving An.culicifacies have been observed after 60 minutes' exposure to 5% malathion. A disturbing feature is the already relatively widespread occurrence of malathion resistance in the island.

There is no evidence as yet of resistance to any other organophosphate compound or carbamate. The only other insecticide to which An.culicifacies remains resistant is DDT. As in other years, there have been no survivors at 0.4% dieldrin for one hour.

3.1.6. Bio-assay tests :

The few tests done show a much lower mortality than would be expected if the insecticide had been adequately applied. Persistence of malathion on non-absorbent materials continues to be superior to that on mud walls or bricks.

3.1.7. Precipitin tests :

In spite of the finding of several species biting man out of doors in biting catches, none of the bloodmeals tested from resting specimens were found positive for human blood (An.culicifacies was not tested).

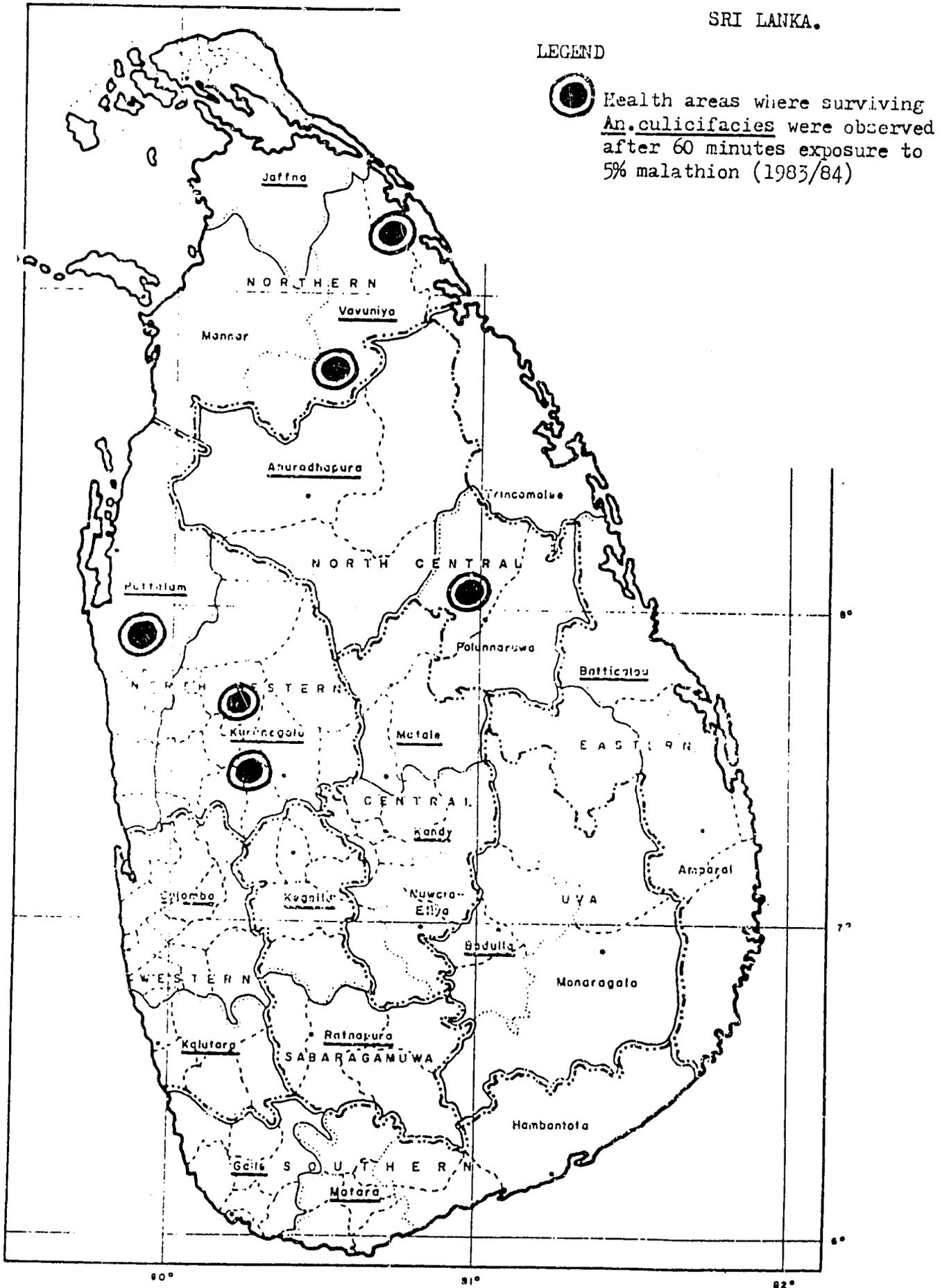
Table 4

SUMMARY OF RESISTANCE STATUS OF THIRTEEN
SPECIES OF ANOPELES TESTED UP TO JUNE,
1984

Species	WHO-recommended discriminating doses								
	malathion	fenitrothion	chlorphoxim	propoxur	bendiocarb	DDT	dieldrin	permethin	deltamethrin
<u>An.culicifacies</u>	+	-	-	-	-	+	-	+	-
<u>An.subpictus</u>	+	+	+	+	0	+	+	0	-
<u>An.aconitus</u>	-	0	0	0	0	0	0	0	0
<u>An.annularis</u>	+	0	0	0	0	0	0	0	0
<u>An.barbirostris</u>	+	0	0	0	0	0	0	0	0
<u>An.jamesi</u>	+	0	-	0	0	0	0	0	0
<u>An.karwari</u>	-	-	-	0	0	0	0	0	0
<u>An.maculatus</u>	-	0	0	0	0	0	0	0	0
<u>An.nigerrimus</u>	+	+	+	+	0	+	+	0	0
<u>An.pallidus</u>	-	0	-	-	0	+	+	0	0
<u>An.tossalatus</u>	-	0	-	-	0	0	+	0	0
<u>An.vagus</u>	-	-	0	0	0	+	0	0	0
<u>An.varuna</u>	+	-	0	-	0	+	-	0	0

LEGEND : + Survivors found
- no survivors to date
0 not tested to date

Figure 1. Malathion-resistance in SRI LANKA.



3.1.8. Larval collections :

These catches showed the predominant species in breeding places surveyed to be An.culicifacies and An.subpictus.

3.1.9. Cow bait collections :

Cow-baited collection huts attracted fewer specimens of most anophelines than did cow-baited net traps (except An.amblyus and An.culicifacies), confirming that most of these species are exophilic as well as zoophilic.

3.1.10. General comments on the collaboration between the entomology section and other A.M.C. sections:

In order to efficiently identify any possible technical failures which may have an entomological component, it is essential that entomological studies be carried out in areas where persistent malaria transmission is not solely due to insufficient or poor quality spraying. This can only be accomplished on the basis of the provision of adequate, up-to-date, local epidemiological background information. The direction of field teams to specific localities for spot-checks is therefore primarily the responsibility of RMOO or equivalent staff. It is noted with some concern that this is still not the normal procedure.

3.2. Research Activities

There are at present three major areas of research activity :

- insecticide resistance
- vector status and competence
- supplementary vector control measures

As exhaustive details of research activities are available in various documents, the following sections will

highlight only the essential feature in each of the areas mentioned above.

3.2.1. Insecticide resistance :

Malathion resistance in An.culicifacies needs to be studied closely. Priorities recognized include the testing of progeny of specimen surviving the discriminating dosage. The isolation of homozygous resistant population and the characterization of resistance (s) selected has to be carried out in order that decisions on alternative compounds can be made before the complete failure of malathion, should it occur.

3.2.2. Vector status and competence :

All anopheline species used in these investigations have now been shown to support the development of P.vivax to the sporozoite stage (reference : table 5)- Natural sporozoite infections have been found in An.culicifacies, An.jamesi, An.karwari, An.subpictus and An.vagus. While these data are indicative of the possibility of secondary vectors being involved in transmission, more information on actual man-biting habits and longevity under field conditions would be necessary for a proper assessment of vector status.

3.2.3. Supplementary vector control measures :

While the utility of fish as a biological agent for controlling anopheline breeding has been recognised, there are many limitations to their use. The general constraints which apply to almost all species are the need for massive breeding facilities, distribution and periodic re-introduction if the fish should fail to establish natural populations. The development of the use of larvivorous fish for malaria control requires considerable devotion and, in spite of technical skill, enthusiasm and administrative support it may take some time to achieve satisfactory results.

Table 5

Summary of results of laboratory infection of 15 species of Anopheles by feeding on gametocyte carriers of P.vivax, March 1982 - May 1984.

Species	nos-fed	nos dissected (10-20 days)	percentage positive for sporozoites
<u>An.aconitus</u>	316	38	2.6
<u>An.annularis</u>	782	134	61.2
<u>An.barbistrostris</u>	345	202	5.4
<u>An.culicifacies</u>	2,006	366	10.9
<u>An.elegans</u>	55	15	20.0
<u>An.jamesi</u>	3,621	1,042	24.5
<u>An.karvvari</u>	3,605	716	26.8
<u>An.maculatus</u>	769	312	25.0
<u>An.nigerrimus</u>	1,829	972	1.4
<u>An.pallidus</u>	1,195	672	36.9
<u>An.ramsayi</u>	167	5	40.0
<u>An.subpictus</u>	1,699	184	30.4
<u>An.tesselatus</u>	1,156	395	22.5
<u>An.vagus</u>	4,720	181	10.5
<u>An.varuna</u>	384	55	25.4

20

The proposed trial of Bti* against An.culicifacies is noted with interest. Other additional measures, such as those proposed from time to time by the Sarvodaya movement and others need to be scientifically evaluated before their incorporation into an integrated vector control programme. In fact, some of the methods proposed could well be more harmful than beneficial.

3.3. Comparative budgetary aspects

Table 6 provides a summary of total annual A.M.C. expenditure and the proportion of this spent on the Entomology Section in 1981/82/83. It shows that A.M.C. expenditure for entomology in the first two of these years was around 1.7% of the total budget, while in 1983 this even dropped to 0.6%. Evidently, W.H.O./T.D.R. grants negotiated by the Chief Entomologist are saving on A.M.C. budget contributions for entomology.

Current allegations that Entomology takes up a high proportion of ^{AMC} money allocated for subsistence allowances (around 10%) do not take into account the arduous nature of field entomology or the long and irregular hours, which include considerable periods of unpaid overtime. Similarly, entomological work requires a high degree of mobility, as reflected by expenditure on fuel (above 4% of A.M.C. ^{fuel} budget). These, and other provisions, are no more than intrinsic consequences of any vector-borne disease control programme and should be regarded as such by those concerned.

* Bti = Bacillus thuringiensis israeliensis, a potentially lethal pathogen of mosquito larvae (also referred to as B.TR.14).

Table 6

Expenditure incurred for Entomology section out of 1981, 1982 and
1983 A.M.C. budgets (rupees)

Year		Salaries	Fuel	Subsistence allowances	Total *
1981	A.M.C.	29,000,000	2,900,000	6,000,000	94,607,162
	Ento	769,374	126,844	704,324	1,600,542 (1.7%)
1982	A.M.C.	36,822,163	2,220,572	8,157,750	118,024,607
	Ento	590,892	94,166	645,968	1,331,026 (1.1%)
1983	A.M.C.	unknown	unknown	unknown	144,863,595
	Ento	119,055	104,081	622,151	845,287 (0.6%)

*includes other budget items such as equipment,
insecticides, drugs, etc.

sk.

4. OPERATIONAL ASPECTS

4.1. Staffing

In the seventeen regions and sub-regions reported upon, there exist twelve R.M.O. positions. Of these, five are filled, at present, and seven remain vacant with no prospects of the latter being filled in the near future. Meanwhile, the duties of the R.M.O. are being assumed by a P.H.I., with a degree of success which varies from region to region. It was reported that two of the five incumbent RMO's were new to their jobs and more interested in finding a way out of them than in learning their duties. It is hoped that the situation will change now that a start has been made on recruitment of science graduates to RMO posts.

Eighty to ninety percent of the remaining vacancies in the regions are at the sprayman level.

4.1.1. Training

The current over-all training status of the regional staff was reported as good or sufficient in eight of the team reports and poor or insufficient in five, with four not recorded.

Spraymen were universally reported as in need of training, both in application of the insecticide and in their persuasion of the householders to permit the spraying.

Some drivers were observed who, through a lack of knowledge of the basics of routine maintenance and operation of the vehicles were placing undue strain on them and running undue risk on the road.

Microscopists appeared to be well-trained in all cases reported. New microscopists will have to be trained for additional laboratories planned for 1984.

4.2. Logistics

4.2.1. Transport

The general state of transport was reported as fair or adequate in eight of the areas checked, poor or insufficient in four areas, two vehicles were reported as out of service, requiring repairs. Most of the fleet has seen long and hard use. It is hoped that the new vehicles scheduled for arrival this year will replace some of the older ones and increase the total fleet to allow more operational and supervisory mobility.

4.2.2. Equipment

Sprayers were reported in poor condition by all units of the team, with repair parts availability varying between regions. It is doubtful if there would be, at present, sufficient operative sprayers to supply a full complement of spraymen. Apparently there is no routine practice of changing nozzles periodically in order to maintain some semblance of correct output and pattern, and the practice of checking pressure regulators by measuring the timed output of a sprayer is worthless unless the nozzle is uneroded.

Safety equipment was in stock in most of the regional warehouses, but in more cases than not, the spray teams did not have helmets, rubber gloves, aprons, etc.

Microscopes were found to be sufficient for the current demand, and in good condition for their age. As demand increases, of course, more instruments will be required.

Calculators were lacking or permanently out of service in most of the regional offices, resulting in a great deal of lost time and a high risk of error in the compilation of both statistical data and in cost accounting.

4.2.3. Supplies

Microscope slides are in short supply throughout the country, resulting in a slow down of diagnoses and an inadequate epidemiological sample. It is understood that this situation is being partially alleviated this week with the arrival of 300,000 slides from WHO, and AID has program an emergency shipment of 800,000 more this year, as well as 300,000 additional in 1985 and the same in 1986.

Malathion seemed to be in good supply for the moment in all regional warehouses except in Kekirawa where spraying has stopped for lack of this material. Ampara's stock was not large. The Puttalam warehouse has eight drums of "actellic" in stock.

Drugs appear to be in good supply except in Ampara where there are no reserves in storage. In four of the regions visited the supplies of Primaquine and Daraprim appeared to be of doubtful quality.

Vehicle Fuel : It was expressed in all regions that the monthly fuel ration should be increased in order to allow a higher degree of operational and supervisory mobility.

4.3. Operational Performance

4.3.1. Spray Operations

Achievement of house coverage targets was generally found to be poor, ranging from 0% in Kekirawa (blamed on lack of malathion) to 93% claimed in Embilipitiya and Badulla. No attempt will be made here to list and compare the various rates of achievement of the regions because the figures provided were admittedly unreliable in many cases and some regional figures included partially sprayed houses while others did not.

Spraying techniques are not according to WHO standards, but, as noted elsewhere, the state of the sprayers and degree of erosion of the nozzles would make correct and consistent dosages doubtful even if correct techniques were in use.

It was noted that the characteristic strong smell of malathion was absent in houses just sprayed or even in the process of being sprayed, leading one to wonder if the material being applied was, in truth, full strength material.

The practice of spraying up to the ridge-pole (often as high as five meters) is apparently based upon an entomological study of An. culicifacies resting habits, and, therefore not disputable. However, we note that in some regions the eaves and outer walls from the top to a line even with the bottom of the eaves were sprayed, while in others only the eaves and not the outer walls were covered. There should be some consistency in this practice, based upon entomological findings.

Spraymen and spray team leaders did not appear to be attempting very hard to persuade refusing householders to permit total treatment of their houses.

4.3.2. Health Education

The only malaria posters seen were in a clinic where blood samples were being taken and anti-malarials being dispensed. Obviously the people who had reached that point needed no persuasion. Such educational material should have a wider dispersal and be used to direct the public to the clinics and volunteers.

4.3.3. Blood sampling

While impossible to implement until the slide shortage is alleviated, it appears that a valuable source of malarimetric data is being lost by having the volunteers distribute drugs without taking blood samples. Training such people in this technique has proven to be entirely practical in other programmes, and Sri Lanka's excellent postal service should make this system even more feasible than in many of these other programmes.

5. TRAINING

5.1. Training Carried out.

Training activities carried out by AMC training staff during 1983 are summarised in Tables 7, 8 and 9. Outside the training centre these were mainly of one day's duration only, and were for the public health personnel attached to various health areas. Categories of personnel included Public Health Inspectors, Public Health Nurses and Family Health Workers. This training included Sarvodaya and other Volunteers, and consists of lectures and a demonstration of blood filming and treatment. The high incidence of malaria in certain areas in 1983 stimulated Volunteers to take up this work, but since then there has been a certain falling-off in enthusiasm.

Training carried out at the Training Centre (Table 8) was mainly for the benefit of students, postgraduates, medical officers and various categories of AMC staff such as microscopists, regional malaria officers and public health inspectors.

5.2. Health Education & Public Relations Activities

These are summarised in Table 9. Intercycle conferences are held after each spraying round. Apart from technical operational aspects, these conferences are also utilised to impress upon the workers the necessity of maintaining good public relations.

Production of a pamphlet in Sinhalese dealing with malaria be intended for field distribution, is under way.

5.3. Training Required

Well motivated and trained personnel is one of the basic requirements of a dynamic anti-malaria campaign, and introductory, in-service refresher and special training are all-important components of the training process. Appropriate training in the context of operational efficiency and career development repays its cost many times over in terms of operational impact, technical efficiency and staff morale.

T A B L E - 7

Training conducted outside the training centre 1983

<u>Category</u>	<u>No.</u>	<u>Date</u>	<u>Venue</u>
Rural Volunteers	45	27.04.83	Thanamalwila Sarvodaya Centre
Rural Volunteers	19	28.04.83	Sugar Factory Sevanagala
Public Health Inspectors	35	08.07.83	MOH's Office, Negambo
Public Health Nurses			
Family Health Workers			
Public Health Inspectors	25	08.07.83	MOH's Office, Kochchikade
Public Health Nurses			
Family Health Workers			
Family Health Workers	30	29.07.83	MOH's Office, Panadura
Public Health Inspectors	37	08.09.83	MOH's Office, Dehiowita
Public Health Nurses			
Family Health Workers			
Public Health Inspectors	45	08.09.83	MOH's Office, Ruwanwella
Public Health Nurses			
Family Health Workers			
Public Health Inspectors	27	08.09.83	MOH's Office, Warakapola
Public Health Nurses			
Public Health Workers			
Public Health Inspectors	79	09.09.83	MOH's Office, Mawanella
Public Health Nurses			
Family Health Workers			
PHII 07, PHNW 03, FEHW 50	60	09.09.83	SHS Office, Kegalle
PHII 07, PHNW 04, FEHW 51	62	12.09.83	MOH's Office, Mirigama
PHII 06, PHNW 10, FEHW 59	75	13.09.83	MOH's Office, Minuwangoda
PHNW (Diploma in Nursing) 35	35	23.12.83	NIES, Kalutara

T A B L E - 8

Training conducted at the M.E.T.C. in 1983

Category	Period	No.	Duration
Microscopists	17.11.82 - 14.02.83	20	06 weeks for 1983
Medical Officers under public health training at NIHS Kalutara	21.01.83	08	01 day
Personnel attached to Assessment Branch AMC Has.	23.02.83 - 24.02.83	09	02 days
PHII/AMC (Refresher Training) Batch 1	02.03.83 - 04.03.83	14	03 days
AMC Laboratory Staff MLT 06)			
Microscopists 04)			
F.A.(Clerical)Lab. 12)			
PHII/AMC (Refresher Training) batch 02	07.03.83 - 08.03.83	22	02 days
(-do-) 03	09.03.83 - 11.03.83	18	03 days
(-do-) 04	16.03.83 - 18.03.83	18	03 days
Medical Officers (MD Community Medicine)	21.03.83 - 23.03.83	14	03 days
AMP students group No.1	05.05.83 - 06.05.83	06	02 days
-do- No.2	27.06.83 - 01.07.83	17	05 days
-do- No.3	04.07.83 - 08.07.83	16	05 days
PHII/AMC (newly appointed to AMC))	11.07.83 - 15.07.83	15	05 days
PHII/Range)	14.11.83 - 05.12.83	08	03 weeks
Regional Malaria Officers 05)	14.11.83 - 05.12.83	02	03 weeks
Parasitologist 01)			
Entomologist 01)			
	01.12.83 - 29.02.84	07	03 weeks

Table : 9

Exhibitions, participated in by the AMC - 1983

<u>Date</u>	<u>Place</u>	<u>Estimated att.</u>
23.02.83 - 27.02.83	St. Benedicts College, Colombo	28,500
09.10.83 - 11.10.83	Kamburupitiya Maha Vidyalaya	5,000
20.10.83 - 23.10.83	Nivithigala Maha Vidyalaya	25,300
12.12.83 - 14.12.83	Milagiriya St. Pauls Girls School	2,700

Cinema shows conducted - 1983

<u>Date</u>	<u>Place</u>	<u>Health Area</u>	<u>Estimated att.</u>
07.03.83	Minnana Temple	Ehaliyagoda	900
08.03.83	Kolombuwewa play ground	-do-	1,300
09.03.83	Napawala State Plantation	-do-	1,000
10.03.83	Amugoda Temple	-do-	1,500
11.03.83	Iddamaligoda Temple	-do-	2,000
12.03.83	Kaluandura Temple	-do-	800
27.04.83	Thanamalwila Sarvodaya Centre	Embilipitiya	150
28.04.83	Kiribbanara	-do-	1,000
29.04.83	Kotaweheramankada R.D. hall	-do-	1,200
07.05.83	Bombuwala Women's Society Health	Kalutara	2,000
09.05.83	Etiliwewa Central College	Moneragala	2,500
10.05.83	Waguruwela Central College	-do-	1,500
11.05.83	Maligawila Govt. School	-do-	5,000
12.05.83	Kotiyagala Govt. School	-do-	800
13.05.83	Mutukandiya Govt. School	-do-	2,000
14.05.83	Maha Kalugolla Govt. School	-do-	1,500
16.06.83	Kotadeniyawa Maha Vidyalaya	Mirigama	2,000
17.05.83	Keenadeniya Maha Vidyalaya	-do-	1,800
18.06.83	Halugama Maha Vidyalaya	-do-	1,700
17.09.83	Angulugaha Pattarama Temple	Galle	1,500
18.09.83	Imaduwa Maha Vidyalaya	-do-	1,800
19.09.83	Pinnaduwa Govt. School	-do-	900
10.10.83	Hakuruwela Govt. School	Hambantota	500
11.10.83	Binkama Govt. School	-do-	100
12.10.83	Yodakandiya Govt. School	-do-	800
13.10.83	Kataragama Govt. School	-do-	1,500
13.10.83	Regional Laboratory	-do-	30
14.10.83	Suriyawewa Govt. School	-do-	1,000
15.10.83	Anugumukolapelessa Police Station	-do-	1,000
16.11.83	Intensive Health Education Programme conducted		
20.12.83	in Mahaweli Development area in Anuradhapura		
	Film shows and lectures were conducted in 36		
	places during which there was an estimated		
	attendance of		

22,600

All campaign staff should be given the opportunity of remaining abreast with new technical developments in their field, and so maximum use should be made of training opportunities from whatever source. Malaria control is now becoming an increasingly complex operation, with new materials, methods and techniques becoming available for operations, monitoring and epidemiological evaluation. It is essential that an anti-malaria campaign such as Sri Lanka's on which so much depends, shall be enabled to keep up with such new developments.

6. Community Involvement, Intersectoral Cooperation and Primary Health Care.

6.1. Community involvement :

So far this factor remains largely in an exploratory stage in Sri Lanka. The main organization involved as such is the Sarvodaya Shramadana movement. Here the drive is for vector control, aimed primarily at malaria control, at the village level. Certain NGOs have joined with Sarvodaya in promoting this venture, although the AMC is also nominally involved at the advisory level.

Unfortunately the proposed methods to be utilised in this endeavour, although possibly of some efficacy in certain foreign locations, have not yet been demonstrated to have any reliable effect against the local Sri Lanka mosquito fauna. Some of the proposed techniques may even increase the reproduction of certain mosquito species under Sri Lankan conditions and thus bring the whole approach to community involvement into disrepute.

For example, one proposed method is the pollution of river-bed pools. While this may discourage breeding of the main malaria vector, apart from possible hazard to users of river-water, this method may well provide ideal conditions for certain other mosquito species which can either be a nuisance or even vectors of other diseases. This would have to be investigated under Sri Lankan conditions. Another proposed method is the wearing of a repellent or insecticide-impregnated jacket. Again this does not appear to have been evaluated under Sri Lankan conditions, particularly as regards public acceptability.

In such a situation, where well meaning NGOs and local communities are making an attempt to reduce the risks of vector-borne disease they certainly deserve every encouragement on the part of the authorities. Laudable zeal should however be tempered with technical acceptability for use under Sri Lankan conditions, otherwise the result may be disillusionment and the community participation approach to primary health care may well fall into disrepute through lack of appropriate technical guidance.

With this in mind it would be useful to have a Government body to examine such proposals and give appropriate technical advice to community efforts. The AMC and other vector-borne disease control bodies such as the Anti-Filariasis Campaign and DHF Campaign should be represented on such an advisory panel.

6.2. Intersectoral Cooperation

The main intersectoral activity in which the AMC is involved is with the Mahaweli Development Authority. However this cooperation does not function nearly so well as it should. Much closer planning control is required, and it should be realised by the Mahaweli authorities that cooperation is a reciprocal activity. There is no point in the AMC training voluntary collaborators in Mahaweli areas if the Mahaweli authorities cut off drug supply to these volunteers.

Some small amount of intersectoral activity appears to exist also with the Irrigation and Forestry Departments. However here also most of the cooperation appears to be one way. Intersectoral meetings appear to be held fairly regularly in some areas; however the impact of these on malaria control is not at all clear. It is obvious that the full potential of intersectoral cooperation remains to be exploited in Sri Lanka, and the broad field of environmental management for malaria control is one of the most promising areas. In this field PEEM* is now prepared to co-operate in stimulating such intersectoral activities in Sri Lanka.

6.3. Primary Health Care

There appear to be two main categories of primary health care worker in Sri Lanka.

- (a). Family Health Workers, and
- (b). Voluntary collaborators.

* Panel of Experts on Environmental Management (WHO/FAO/UNEP)

The former category has more formal health duties than the latter, but is also supposed to treat malaria cases and could even take blood films, thus acting as an important supplement to the malaria surveillance system.

The voluntary collaborators are more informal and can also treat a variety of diseases other than malaria such as eye and gastro-intestinal infections. They can also stimulate environmental sanitation. Being located in the village the volunteer is in the forefront of any disease episodes which occur and is thus worthy of close support in training and materials. Enthusiasm for community service brought on by an epidemic situation tends to wane during inter-epidemic periods, and particular efforts must be made to maintain the interest of the voluntary workers during this period.

Unfortunately, during the course of the present assessment the Team saw instances where Family Health Workers and Volunteers were not being provided with appropriate support. This is a situation which deserves to be remedied immediately, not only because of the real danger of a very serious malaria episode, but also because the country cannot afford to have the concept of primary health care by volunteers brought into disrepute and the volunteers themselves demoralised.

7.

RECOMMENDATIONS

Epidemiology

7.1. The present system for the processing and statistical digestion of blood examination results no longer provides efficient operational guidance. A more up to date, epidemiologically sound tabulation according to a standard layout would considerably enhance the identification of problem areas/foci, as well as streamline supervision and evaluation work.

It is therefore recommended that serious consideration should be given to the possibility of computerisation of this system at the laboratory level as a first step.

7.2. The indicator institutions did not appear to have functioned as envisaged because of logistic constraints and frequent changes in criteria for blood filming. The team considers that these institutions would provide useful epidemiological information if functioning properly and recommends that one indicator institution for each region be maintained, at the same time ensuring that blood filming is not interrupted. Indicator institutional sampling should be of all OPD attendances, both fever and non-fever cases and both children and adults.

To make this feasible, institutions should be selected which have typically less than 100 OPD attendances per day.

Entomology

7.3. The scattered appearance in 1983/84 of malathion resistant An.culicifacies calls for an immediate analysis of cross-resistance patterns in order to select suitable alternatives in the event of widespread malathion failure should it occur at a later stage. It is therefore strongly recommended that the completion of the insectory/laboratory, under construction at Colombo since 1981, should be undertaken as a matter of extreme urgency.

In addition, field trials should be undertaken to study the potential of BHC or insecticide mixtures, for example BHC/ACTELIC, in preventing or delaying the development of resistance.

7.4. Since the cross-resistance pattern of the developing malathion resistance in An. culicifacies is still unclarified, the team recommends that both malathion and fenitrothion should continue to be reserved for public health use until such time as the situation with regard to cross resistance has been investigated. The matter should then be subjected to review.

Operations

7.5. The Team, alarmed by the evidence for diversion of AMC malathion stocks for use by farmers, and concerned at the probable serious effect of this in reducing the dosage level in houses, and in selection for malathion resistance in the anopheline vector, - both with extremely serious operational consequences for the AMC - recommends that the position be fully investigated and legally supported deterrent action be taken against those responsible in order to prevent any further misuse.

7.6. The evaluation team is extremely concerned at the situation which has resulted in a shortage of such essential supplies as microscope slides and drugs. The shortage of microscope slides has had serious repercussions. Among other things, it has produced exaggeratedly high slide positivity rates and has delayed the-very-much-hoped-for contribution of PHC services to the campaign, especially through the participation of PHW in case detection and treatment.

It is therefore urgently recommended that adequate stock-piles and smooth distribution of these commodities, as well as insecticides, spraying machinery and spare parts be assured for the future.

7.7. Shortage of fuel has in many cases a serious effect on operational efficacy and supervision.

It is therefore recommended that the required supply of fuel be ensured and the imprest replenished promptly.

7.8. In order to improve standards of insecticide application it is recommended that new spray nozzles should be used for each spray cycle.

Parasitology

7.9. Recognizing that the testing of P.falciparum sensitivity to 4-aminoquinolines has finally started to progress satisfactorily from late 1983, the team recommends that the activity be extended to cover all P.falciparum areas so that base line data on sensitivity levels is available for a monitoring system expected to be in operation by 1985.

Chemotherapy

7.10. In view of the reluctance of some physicians especially in NCP to administer primaquine in the treatment of malaria because of the occurrence of IVH in some cases and the danger that this reluctance may spread elsewhere, which would be prejudicial to the Programme, the team recommends that the AMC undertake a countrywide survey of G.6.P.D. deficiency to determine the extent of this defect in the population and its influence in IVH. The Team further recommends that all cases of IVH encountered in medical institutions be thoroughly investigated, reported on a form designed for this purpose and records carefully maintained for review by a Committee.

7.11. Health Education and Public Relations

Adverse publicity has continued to damage the reputation and goodwill of certain sections of the AMC, and has deviated energy and attention from the objectives of the campaign. In order to restore confidence with administrators, politicians, the public and the scientific community, the AMC and the Ministry should more vigorously promote positive publicity, highlighting the Campaign's aims and achievements by means of Press Conferences/press releases and scientific publications.

7.12. Coordination of the approach to malaria control within the public health service leaves much to be desired. In order to improve case finding and treatment it is recommended that -

(a). The use of posters, pamphlets etc, be expanded so that they may be found wherever there are congregations of people in malarious areas and that the posters direct the public to the nearest blood sampling and treatment centres.

(b). A manual on malaria should be prepared and distributed for the use of general health personnel.

7.13. For the encouragement of personal protection aspects of malaria control in the context of primary health care, it is recommended that each family in the development areas be provided with bed-nets, sufficient for the size of the family, by all development agencies in malarious areas - especially the Mahaweli Development Authority.

7.14. Staffing

In view of the persistent difficulties encountered in filling the key positions of Regional Malaria Officers, and the favourable impression gained by the Team of the few science graduates seen who were already in this position, and taking into account the existing coordination difficulties and misunderstandings between entomology field teams and some Regional Malaria Officers - also the strong likelihood that this situation will improve as regional posts are taken over by science graduates,

again recommends that all Regional Malaria Officer posts be filled by specially trained science graduates as soon as possible.

Training

7.15. Conscious of the need for the AMC staff to keep abreast of current technical developments, in the interest of operational efficacy and programme planning flexibility, recommends that the continuous training of all AMC staff at all levels be maintained and expanded, and that all training opportunities, both national and international be fully utilised by the appropriate staff.

Laboratory

7.16. Since the error rate of the regional microscopists is extremely low (less than 1%) and in order to reduce loss and delay of slides in transit, it is recommended that only a proportion of negatives and positives (P.v.) should be sent by the SMO for cross-checking. All P.f. slides should continue to be cross-checked. The proportion of slides to be cross-checked should be established according to the performance of the regional laboratory concerned.

Primary Health Care

7.17. In view of the important role of volunteers in case detection and treatment, and especially their front-line situation in an epidemic outbreak, the Team recommends that they be given the fullest encouragement and support, both in training and materials.

It is further recommended that the volunteers be enabled both to give treatment and to take blood slides.

7.18. Non Governmental Organizations are becoming increasingly involved in projects or trials with a health component, for example in vector control activities as part of community participation. In order to provide appropriate technical support for such endeavours, and to prevent them from falling into disrepute, the Team recommends that all such NGO involvement should be channeled through a government committee which would advise on technical feasibility of methods proposed, and on which the Ministry of Health and in particular AMC should be represented.

Field Applied Research

7.19. Since more than 95% of the cases reported from 1982 onwards are P.vivax it is recommended that an investigative follow-up should be carried out on a sample of P.vivax cases to the extent feasible. If many relapses are detected possible changes may have to be introduced in treatment schedules.

7.20. It seems that daily administration of radical treatment by volunteers may not be feasible. If so, it is recommended that a trial be carried out of weekly or bi-weekly schedules using appropriate drug regime. Such schedules should co-incide with the health/AMC personnel's cycle of activities.

General

7.20. In view of the outstanding economic importance of the Mahaweli Development Area, and the serious consequences which would be provoked by a crippling malaria epidemic - to the risk of which the area is exposed at the present time -

the Team recommends that some financial provision should be made by the Mahaweli Authority for anti-malaria activities. This may be regarded as a form of worthwhile insurance.

7.21. Much loss of valuable working time, petrol wastage and transport wear and tear results from the fact that senior staff on supervisory visits and technical investigations cannot afford to stay overnight in appropriate locations. This situation has been identified as one of the main reasons for inadequate levels of supervision. The Team therefore recommends that for the sake of both operational efficiency and economy such senior staff should receive adequate field allowances to enable overnight stay. The figure of Rs. 500/= per night is regarded as reasonable at the present time.

7.22. The AMC accommodation is unsuitable for meetings due to the poor acoustics and extraneous noise. Misunderstandings can easily arise under such conditions. It is therefore recommended that future evaluation team deliberations be held in a more suitable venue.

8. A C K N O W L E D G E M E N T S

The Review Team wishes to express its sincere thanks to the Ministry of Health for facilitating the work of the Team, and for the kind reception received.

The Team is particularly grateful for the frank and cooperative attitude shown by the Director of the Anti Malaria Campaign and all his staff, both at Headquarters and in the field. Field visits were smoothly organised.

The Team greatly appreciated the continued support and assistance of the WHO Programme Co-ordinator and Representative in Sri Lanka, and the WHO Malaria Staff.

The active participation of the representatives of the Ministries of Finance, Plan Implementation and External Resources was most welcome.

The capable typing assistance of Mrs. Anne Therese Xavier and Miss. Senehalatha Kathriachchi together with the help of Mr. A. Pathmanathan is acknowledged with thanks.

AMC BUDGET 1983(1) Recurrent Expenditure

(a) Personal Emoluments	-	51,030,000
(b) Travelling Expenses	-	8,945,000
(c) Supplies and Requisites	-	86,347,000
(d) Repairs and Maintenance of Capital assets	-	100,000
(e) Transportation, Communication Utility and other services	-	1,500,000
		<u>147,922,000</u>

(2) Capital Expenditure :

(a) Building for Central Stores 16 Regional Offices & Stores	-	750,000*
(b) Insectory for Entomology	-	500,000x
(c) Spraying Equipment	-	2,000,000
		<u>3,250,000</u>

* Grant from Netherlands.

x USAID

A/-

ANNEXURE : 2A.M.C. FISCAL POSITION FOR PERIOD 1977 - 1983 (IN Rs.)

<u>Specific Year</u>	<u>Total Health Ministry Budget</u>	<u>Total Approved AMC Budget</u>	<u>Total Budget Allotted</u>	<u>Total Budget expended</u>	<u>Budget Amount provided by Donor Sources</u>	<u>% of Budget from Donor Sources</u>	<u>Yearly Value of Rs. \$</u>
1977	512,734,900	100,855,700	100,855,700	79,151,733	13,202,000	13.08%	14 : 1
1978	528,298,409	107,256,565	107,256,565	86,348,750	75,351,274	70.25%	15 : 1
1979	861,924,898	136,531,100	136,531,100	121,627,093	102,000,000	74.70%	15 : 1
1980	882,082,097	82,763,100	82,763,100	81,481,350	39,200,000	47.36%	16 : 1
1981	997,155,640	105,543,300	105,543,300	94,607,162	56,550,000	53.58%	20 : 1
1982	975,910,000	123,508,000	123,508,000	118,024,607	72,219,460	61.1%	21 : 1
1983	1,827,107,000	151,172,000	151,172,000	148,275,728	79,993,718	53.9%	24 : 1

DISTRIBUTION OF VEHICLES AND SPRAY MACHINES

<u>Regions and Sub Regions</u>		<u>No. of vehicles</u>		<u>No. of spray machines</u>	
01.	Jaffna	03	06	36	201
	Kilinochchi	03		165	
02.	Vavuniya	04	09	50	150
	Mulativu	02		57	
	Manner	03		43	
03.	Anuradhapura	08	12	174	289
	Kekirawa	04		115	
04.	Trincomalee	06	10	126	206
	Kahatagasdigiliya	04		80	
05.	Puttalam		04		120
06.	Colombo		25		18
07.	Kurunegala	06	11	126	541
	Gokerella	02		185	
	Bingiriya	01		80	
	Wariyapola	02		150	
08.	Maha	02			146
09.	Matale	07	09	77	182
	Dambulla	02		105	
10.	Kandy	05	07	89	174
	Kegalle	02		85	
11.	Hingurakgoda	03	07	79	169
	Polonnaruwa	04		90	
12.	Batticaloa	07	12	92	180
	Valachchenai	05		88	
13.	Amparai	03	08	104	163
	Thirukovil	05		59	
14.	Moneragala		09		174
15.	Badulla	04	11	21	159
	Bibile	07		138	
16.	Embilipitiya	12	13	173	203
	Balangoda	01		30	
17.	Hambantota	07	09	211	302
	Matara	02		91	
T O T A L :			<u>162</u>	<u>2227</u>	

TRANSPORT POSITION IN A.M.C.(A). TOTAL NUMBERS OF AMC VEHICLES
(as of June 30, 1984)

<u>Category :</u>	<u>In service :</u>	<u>Repairable :</u>	<u>Condemned Status :</u>	<u>Total :</u>
Jeeps	49	13	07	69
Land Rovers (Diesel)	67	09	01	77
Land Rovers (Petrol)	47	04	04	55
UNIMOG	-	-	02	02
WV Pick up	02	-	09	11
WV Micro Bus	-	01	01	02
Trucks	07	-	-	07
Car	01	-	-	01
TOTAL :	173	27	24	224

(B). HEADQUARTERS

<u>Category :</u>	<u>In Service :</u>
Jeeps	04
Land Rovers (Diesel)	08
Land Rovers (Petrol)	02
WV Pick up	02
Trucks	07
Car	01
TOTAL :	24

sk.

SUPPLY POSITION OF AMC DRUGS INSECTICIDE AND OTHER ITEMS (AT HEADQUARTERS)

	Balance as at June 1983	Received up to 31.12.83	Issued up to 31.12.83	Balance as at 31.12.83	Received up to 01.06.84	Issued up to 01.06.84	Balance as at 01.06.84
A. DRUGS							
Chloroquine Tablets	587000	3160000	3430000	609000	2731000	1688000	1652000
Bayers	292000						
Other	292000						
Primaquine Tablets	494000	3102000	2527000	1069000	1750000	594000	125000
B. INSECTICIDES							
Malathion 50% w.d.p.	523865 Kgs.	786510	828420	481955	1086672	148852	719775
Malathion 96%	500 Kgs	-	-	500	-	-	500
Abate	635 Liters	-	60	575	-	-	575
Pyrethrum	9.5 Kgs	-	-	9.5	-	2.5	7
C. PROTECTIVE CLOTHING							
(Spray personnel)							
Helmets	596	-	250	346	-	-	346
Khaki Shirts	1666	2448	3148	966	1400	90	2276
D. SPRAY MACHINES							
					300	299	01