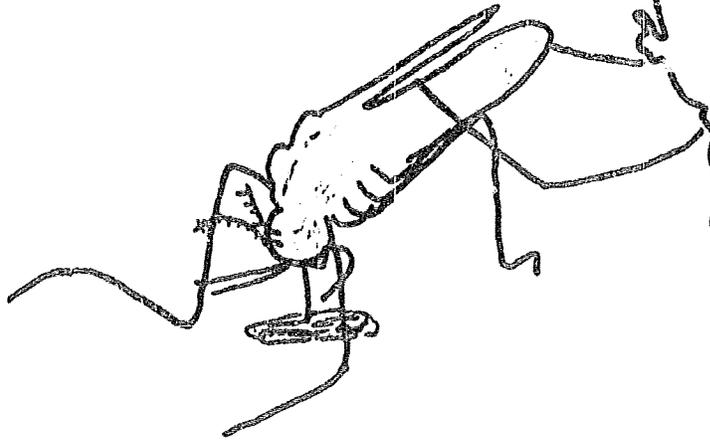


UNCLASSIFIED

MALARIA CONTROL
Project Paper Supplement
Amendment Number 2

383 - 0043



USAID/SRI LANKA

August 1983

ACTION MEMORANDUM FOR THE DIRECTOR, USAID/SRI LANKA

FROM : Ralph M. ^{WP} Singleton

SUBJECT: Malaria Control (Project No. 383-0043)

DATE : August 26, 1983

Problem: To authorize an increase in life-of-project funding of the Malaria Control Project of \$10,000,000 in loan funds and \$4,000,000 in grant funds from the Health Account, Section 104 of the Foreign Assistance Act of 1961 as amended.

Discussion: The current life-of-project funding for the project is \$16,000,000 in loan funds. USAID/Sri Lanka intends to amend the project to an eventual revised life-of-project level of \$30,000,000 in mixed loan/grant funds, together with an extension of the PACD to October 31, 1987. The PACD extension has already been authorized by AA/Asia on 5/17/83 subject to your approval of the Project Authorization Amendment (TAB A) and the PP Supplement (TAB B.)

AID/W has provided \$352,000 of FY1983 loan funds provided we can quickly obligate it, i.e., prior to 9/31/83. Since it will still take some time to negotiate the conditions and covenants (explained further below), we recommend that the Project Agreement be amended in two steps during the next two to three months: (a) a relatively small increase of \$352,000 in FY 1983 loan funds which will include no grant funds, no PACD extension and no new conditions or covenants; and (b) a mixed loan/grant amendment early in FY 1984 which will include the first tranche of grant funds for the project and additional loan funds (amounts not yet determined), the extension of the PACD to October 31, 1987, and all or most of the new conditions and covenants outlined in the PP supplement. Both of the amendment actions recommended in (a) and (b) above, may be made pursuant to the Project Authorization Amendment (TAB A).

The \$352,000 loan amendment (first step) will be used solely for an increase in the existing line item for insecticide procurement in the project budget. The GSL requests these funds now in order to initiate tenders in September 1983 for additional malathion needed in the first quarter of CY 1984. To accommodate this need, we propose that this amendment

be signed with no other changes to the existing loan agreement. Both the GSL and the USAID need more time (at least another four weeks, especially in view of the recent communal disturbances and resultant disruption of GSL operations) to negotiate fully the lengthy list of new conditions and covenants contained in the PP Supplement (pp. 58-61), which both sides intend to have apply to all grant funding under the project and all subsequent loan funding other than the \$352,000 in question.

The AA/Asia authorized the PACD extension on 5/17/83 (TAB C) subject to your approval of the PP Supplement and signing of the Project Authorization Amendment. By these actions you are also authorized to negotiate amendments to the Project Agreement and have flexibility to include, modify or exclude proposed conditions and covenants in the PP Supplement. Given the circumstances described above, the option of not adding any new conditions or covenants to the Project Agreement for purposes of the relatively small loan increase of \$352,000 is acceptable. However, as implicitly understood in the AA/Asia's authorization of the PACD extension, and anticipated by both the USAID and the GSL in the course of preparing the PP Supplement, all further amendments to the Project Agreement will (subject to final negotiation) include the new conditions and covenants.

A Congressional Notification covering the \$352,000 proposed obligation using FY 1983 funds expired on August 3, 1983 (State 229285, TAB D).

Recommendation: That you sign the attached Project Authorization Amendment and PP Supplement for the Malaria Control Project.

Attachments: TAB A. Project Authorization Amendment
TAB B. PP Supplement
TAB C. PACD Extension Authorization
TAB D. STATE 229285

Clearances: PROG: JMMiller JK CONT:KLBlanc Ker
RLA : TAMuntsinger _____ HPHR: WHJohnson _____

AWS
AID:PDSP:AShapleigh:gs

PROJECT AUTHORIZATION AMENDMENT

Sri Lanka

Malaria Control Project
 A.I.D. Project No. 383-0043
 A.I.D. Loan No. 383-U-019
 019A, 019B
 & 019C

Pursuant to Section 104 of the Foreign Assistance Act of 1961, as amended, and delegations of authority from the Assistant Administrator for Asia, the Project Authorization for the Malaria Control Project dated June 17, 1977, and amended on August 17, 1979, is hereby further amended:

- (a) to increase planned obligations over the Life of the Project from not to exceed \$16,000,000 to not to exceed \$26,000,00 in loan funds, and from zero to not to exceed \$4,000,000 in grant funds, both subject to the availability of funds in accordance with the A.I.D. OYB/allotment process; and
- (b) to revise the planned Life of Project by extending the Project Assistance Completion Date from October 31, 1984 to October 31, 1987; and
- (c) Except as A.I.D. may agree otherwise in writing, to limit the source and origin of goods and services financed with grant funds to the United States of America or the Co-operating Country; to limit, except for ocean shipping, the place of nationality of suppliers of commodities or services financed with grant funds to the United State of America or the Co-operating Country; and, for ocean shipping, to limit ocean shipping when grant-financed to vessels under flag registry of the United States of America.

In all other respects the Project Authorization remains in full force and effect.

Clearances:

A.W. Shapleigh, PDSP
 R.M. Singleton, Chief, PDSP
 W.H. Johnson, HPHR
 T.A. Muntsinger, Legal Advisor
 K.LeBlank, Controller's office
 J.M. Miller, Program Officer
 W.P. Schoux, Deputy Director

Date	Initials
<u>5/26/83</u>	<u>AW</u>
<u>8/26/83</u>	<u>RP</u>
<u>8/26/83</u>	<u>WJ</u>
<u>8/26/83</u>	<u>TAM</u>
<u>8/26/83</u>	<u>KL</u>
<u>8/26/83</u>	<u>JM</u>
<u>8/26/83</u>	<u>WPS</u>

Signature: _____

S. J. Littlefield
 S.J. Littlefield
 Director
 USAID/Sri Lanka

Date: August 30, 1983.

PROJECT DATA SHEET

I. TRANSACTION CODE

C
A = Add
C = Change
D = Delete

Amendment Number
2

DOCUMENT CODE

3

COUNTRY/ENTITY Sri Lanka

4. BUREAU/OFFICE Asia

3. PROJECT NUMBER 383-0043

3. PROJECT TITLE (maximum 40 characters) Malaria Control

6. PROJECT ASSISTANCE COMPLETION DATE (PACD) MM DD YY 1 0 3 1 8 7

7. ESTIMATED DATE OF OBLIGATION (Under 'B.' below, enter 1, 2, 3, or 4) A. Initial FY 7 7 B. Quarter 2 C. Final FY 8 5

8. COSTS (\$000 OR EQUIVALENT \$1 =)

A. FUNDING SOURCE	FIRST FY 1977			LIFE OF PROJECT		
	B. FX	C. L/C	D. Total	E. FX	F. L/C	G. Total
AD Appropriated Total						
(Grant)	()	()	()	(3,500)	(500)	(4,000)
(Loan)	(5,000)	()	(5,000)	(26,000)	()	(26,000)
Other U.S.						
1.						
2.						
Host Country		7,653	7,653	5,685	41,498	47,183
Other Donor(s)	3,397		3,397	9,790		9,790
TOTALS	8,397	7,653	16,050	45,475	41,498	86,973

9. SCHEDULE OF AID FUNDING (\$000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) HE	514B				16,000	4,000	10,000	4,000	26,000
(2)									
(3)									
(4)									
TOTALS									

10. SECONDARY TECHNICAL CODES (maximum 8 codes of 3 positions each)

11. SECONDARY PURPOSE CODE

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

13. PROJECT PURPOSE (maximum 480 characters)

To control the incidence of malaria and to institutionalize an effective malaria control system.

14. SCHEDULED EVALUATIONS

Interim	MM YY 0 1 8 6	MM YY	Final	MM YY 0 7 8 7
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15. SOURCE/ORIGIN OF GOODS AND SERVICES Insecticide 000: others 941. 000 941 Local Other (Specify)

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a 62 page PP Amendment.) (excluding Annexes)
This amendment provides an addition of \$10.0 million loan funding for insecticide and \$4.0 million grant funding for technical assistance, training, operational research, pilot projects, planning/management, information/education, laboratory equipment and evaluation.

17. APPROVED BY
Signature: *[Signature]*
Title: Director
USAID/Sri Lanka
Date Signed: MM DD YY 0 8 3 0 8 3

18. DATE DOCUMENT RECEIVED IN AID/W. OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION
MM DD YY

MALARIA CONTROL
Project Paper Amendment No.2
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1

GLOSSARY OF TERMS

Activated Hospital is a public medical institution in which a malaria control worker is stationed for case detection and treatment.

Active Case Detection is a part of surveillance activities in which the formal malaria project actively searches for malaria cases through the collection of blood slides and epidemiological investigations.

Active Passive Case Detection: the method of malaria surveillance wherein the malaria control personnel (APCD) are stationed within an activated medical institution.

Adulticiding: the killing of adult mosquitoes.

Annual Parasite Incidence (API) is the proportion of cases of malaria detected on an annual basis in relation to the unit of population (usually per 1000 of population).

Anopheles Culicifacies: the species of anopheles which is the known vector for malaria transmission in Sri Lanka.

Anopheles Mosquito: the genus of mosquito which includes all vectors of human malaria.

BHC is an abbreviation of the common name Benzene Hexa-chloride, a chlorinated hydrocarbon type of residual insecticide.

Biological Control is a method of controlling mosquitoes using living vertebrate or invertebrate predators, genetic control or parasites.

Chemoprophylaxis is drug prophylaxis which implies the use of drugs before infection with the aim of preventing disease.

DDT is an abbreviation of the common name Dichlorodiphenyl Trichloroethane, a chlorinated hydrocarbon type of residual insecticide.

Endemicity is a term applied to malaria when there is a constant measurable incidence both of cases and of natural transmission in an area over a succession of years.

Epidemic is a term applied to malaria when the incidence of cases in an area rises rapidly and markedly above its usual level.

Epidemiology is the study of the distribution and determinants of disease in human populations.

Falciparum Malaria is a severe type of malaria caused by plasmodium falciparum, a species of malaria parasite.

Fansidar is an antimalarial therapy combining sulphadoxine and pyrimethamine.

Fenitrothion is an organophosphorous residual insecticide.

Focal Spraying is residual insecticide house spraying around a malaria focus.

G-6PD Deficiency is the congenital deficiency of a red blood cell enzyme. Such cells may be damaged or destroyed when challenged with certain drugs, i.e., Primaquine.

Incidence is the number of cases of disease occurring during a given time period in relation to the unit of population in which they occur.

Larvicide is a substance used to kill the aquatic larva state of the malaria mosquito by ingestion, contact or respiratory blockage.

Malaria Control is an operation aimed at reducing the prevalence of malaria to a level at which it is no longer a major public health problem.

Malaria Eradication is the ending of the transmission of malaria and the elimination of the reservoir of infected cases in a campaign limited in time and carried out to such a degree of perfection that when it comes to an end there is no resumption of transmission.

Malaria Focus is a defined and circumscribed locality situated in currently or formerly malarious areas and containing continuous or intermittent malaria transmission.

Malaria Parasite is a colloquial term for any of the protozoan organisms causing malaria infections.

Malariogenic Potential is the degree to which an area is conducive to malaria based on cumulative epidemiological data collected from each area regarding the parasite load, vector density, water logging, climatic conditions, population movement and factors causing man-made malaria.

Malathion is an organo - phosphorus compound residual insecticide.

Parasite Rate is the percentage of persons showing malaria parasites by blood smear examination.

Passive Case Detection is a part of the surveillance activities in which the public health and medical services other than the regularly constituted malaria service assist surveillance activities by actively searching for malaria cases by the collection of blood slides and epidemiological investigations.

Presumptive Treatment is initial drug treatment given to a suspected malaria case at the time when a blood sample is taken for examination.

Prophylactic Treatment is administration of drugs for the purpose of preventing infection.

Radical Treatment is therapy aimed at the complete elimination of malaria parasites from the infected person. This involves using two different drugs for P.vivax.

Residual Insecticide is an insecticide which when suitably applied on a surface, maintains for considerable time insecticidal activity by either contact or fumigant action.

Source Reduction: the process of reducing mosquito populations through removal, reduction in area, or ecological manipulation of the bodies of water necessary to the early development of the insect.

Surveillance is that part of a malaria program aimed at the discovery, investigation and elimination of continuing transmission leading to prevention and cure of infections.

Total Spray Coverage is the application of residual insecticide during one spraying cycle to all sprayable surfaces in all sprayable houses within a given operational area.

Ultra Low Volume (ULV) Spraying is a method of insecticide dispersion by special air or ground equipment using very small amounts of finely dispersed particles of insecticide.

Vector in malaria is any species of mosquito in which the malaria parasite completes its sexual cycle in nature and which is thus able to transmit the disease.

Vector Control: the process of lowering the total population of a vector to below the level that will support disease endemia.

Vector Density is the number of female Anopheline mosquitoes in relation to the number of specified shelters or hosts or to a given time period specifying the method of collection.

Vector Susceptibility represents the degree to which a species of mosquito develops resistance to the effects of insecticides.

Vivax Malaria: a species of malaria which although not fatal causes morbidity and may recur without new infection.

Water Management : involves the reduction or elimination of sources of mosquito breeding through filling, draining, diking, changes in water level, flushing, canal trimming and other engineering methods.

LIST OF ABBREVIATIONS

ACD	Active Case Detection
AID	Agency for International Development
AMC	Anti-Malaria Campaign
APCD	Activated Passive Case Detection
API	Annual Parasite Incidence
BHC	Benzene Hexachloride (Insecticide)
CDC	Communicable Diseases Control
DDT	Dichlorodiphenyl Trichloroethane (Insecticide)
DMO	District Medical Officer
EA	Entomological Assistant
EPA	Environmental Protection Agency
ERT	External Review Team
GSL	Government of Sri Lanka
GR	Geographical Reconnaissance
LOP	Life of Project
LT	Long-Term
MCP	Malaria Control Program
MEP	Malaria Eradication Program
MOH	Ministry of Health
NMTC	National Malaria Training Center
OP	Organophosphorous
PCD	Passive Case Detection
PHI	Public Health Inspector
Plan Ops.	GSL Planning document similar to AID's Project Paper
p.mo.	Person Month
RMO	Regional Malaria Officer
SPR	Slide Positive Rate
ST	Short-Term
TA	Technical Assistance
ULV	Ultra-Low Volume
USAID	The Country Mission of AID
WDP	Water Dispersable Powder
WHO	World Health Organization

PART ONE: RECOMMENDATIONS AND SUMMARY

I. Recommendations

A. Borrower/Grantee and Implementing Agency

The borrower/grantee will be the Government of Sri Lanka. The executing agency for the Government will be the Ministry of Health and, within the Ministry, the Anti-Malaria Campaign (AMC).

B. Loan

1. Amount. Not to exceed \$26.0 million of which \$16.0 million has been authorized previously.
2. Terms. Payment within forty (40) years from the first disbursement with a grace period on principal repayment of ten (10) years. Interest is payable in U.S. dollars at two (2) percent per annum during the grace period and three (3) percent thereafter on the disbursed balance and unpaid interest.

C. Grant

Not to exceed \$4.0 million of which none has been authorized previously.

D. Project Activity Completion Date (PACD)

Extension of the PACD by thirty-six (36) months to October 31, 1987 for a new duration of nine (9) years.

E. Project Purpose

1. Higher level purpose* To control the incidence of malaria.
2. Lower level purpose* To improve the effectiveness of insecticide spray operations, institutionalize effective surveillance and introduce alternative malaria control activities which minimize the need for house spraying with insecticides.

*(See footnote at top of next page)

- * The objectives of this project are to control the incidence of malaria and to institutionalize an effective malaria control system. However, it will not be possible to complete the institutionalization process during the three year period of the project extension. For this reason, the purpose statement has been written to reflect what is achievable during the life of the project amendment.

II. Summary

A. Background

1. Malaria has been a serious health problem in Sri Lanka for centuries, causing widespread suffering and death and severely interfering with orderly social and economic development. It has been suggested that the ancient cities of Anuradhapura and Polonnaruwa were abandoned, in part, due to malaria epidemics.

These epidemics were facilitated by an extensive tank and irrigation system which assisted establishment of malaria carrying mosquitoes in the area. It is in these same areas that the Mahaweli development projects which will settle up to 1.0 million people in systems A,B,C,H and G are now being implemented. There is national concern that the ecological and climatological conditions which make Sri Lanka a natural incubator for this disease could again create a serious malaria problem and negate the Government's efforts in providing a new future for its landless citizens.

2. As late as 1975/1976, malaria epidemics which were unofficially estimated at well over a million cases per year were driving populations from the dry zone, resulting in agricultural lands being abandoned. In an effort to control malaria, the GSL prepared a plan of operations covering the 1977-1981 period and requested international assistance. The USAID along with WHO, the Government of the Netherlands and the British Government responded to this urgent problem by providing financial, material and technical

assistance over the period 1977-1983. With this assistance the GSL has been able to reduce the number of confirmed malaria cases by 85 percent (from 262,466 in 1977 to around 38,000 estimated for 1982). But more needs to be done to stabilize the newly instituted epidemiological surveillance and response systems of the Anti-Malaria Campaign (AMC), to lower the insecticide requirements, lower the likelihood of developing malathion resistance, and ensure the disease will not return again in yet another devastating epidemic. This institutional development requires technical assistance, support to operational research, increased training opportunities, sustained financing of commodity inputs and further development of community participation activities. A detailed background statement is found in the original Project Paper and Amendment No.1.

B. Implementation History

The on-going USAID Malaria Control Project provides \$16.0 million in loan assistance for training, local cost and commodity support. The loan was signed on February 28, 1978 for \$12.0 million, and an amendment for \$4.0 million was approved on August 30, 1979.

The purpose of assisting the GSL to bring malaria under control has been largely achieved. To a major extent, the malaria epidemic has been overcome. Large areas have been freed of severe endemic malaria and spray operations are being systematically reduced. AMC administration and management systems have begun a process of decentralization; a new epidemiological system has been developed; and more than 600 surveillance workers have been trained and are in place. The vehicle fleet is up to the required 200 and expanded warehouse and distribution systems for insecticides are largely operational. A village malaria volunteer system of more than 3,000 people is in place and functioning. These and other program gains have resulted in the reduction of malaria to approximately 38,000 cases in 1982.

The process of institutionalizing an effective malaria control system, the second project purpose, is behind schedule and will not be completed by present PACD of October 1984. The principal reason for this delay has been the heavier than anticipated emphasis on spraying as the result of: tenacity of the disease; widespread population movements; shortfalls in residual spray coverage; delay of more than a year in recruitment and training of surveillance personnel; and inadequate epidemiological data. Project obligations and disbursements have occurred on schedule with a balance of \$0.544 million uncommitted from \$16.0 million obligated. Additional procurement action consuming most of the uncommitted balance under the current project should be completed by the GSL in the near future, and final disbursements under the USAID loan should be completed by mid-1984. Other donor contributions of \$4.0 million from the Government of the Netherlands, \$2.0 million from the British Government and \$0.6 million from the WHO have been provided as agreed.

C. Proposed Changes and Justification

Due to the widespread epidemic conditions in Sri Lanka in 1978, the initial development loan and Amendment No.1 were largely allocated for insecticide and drug purchase (98 percent of total assistance, which has met total program requirements). Amendment No.2 projects a much greater component of assistance (about 28 percent of total additional funds) to institutionalize an integrated malaria program, including alternative methods of control designed to decrease reliance on house spraying as the primary control measure. It is proposed that this component be grant-funded to provide greater flexibility in implementation and to allow greater contractor involvement in input coordination. Although the proposed loan-funded contribution of insecticide still comprises more than 70 percent of AID's new funding, starting in 1985 the proportion of total required insecticide provided under the loan will be decreased with the expectation that the Government of Sri Lanka (GSL) will provide the remaining insecticide required in 1985 and 1986, and will assume responsibility for meeting all insecticide needs beginning in 1987.

The grant portion of the assistance provided under Amendment No.2 will include funds for: in-country and out-of-country training (\$340,000), improvement in malaria education/information programs (\$115,000), operational research (\$240,000), development and implementation of improved management information systems (\$260,000), technical assistance (\$1.130 million), some equipment and supplies for the regional laboratories (\$100,000), pilot projects (\$150,000), contingencies/inflation (\$1.505 million), multi-donor reviews (\$80,000), and USAID evaluations (\$80,000). Justification of the projected changes is based upon delays encountered to date in institutionalization of the malaria control program (see section IIB), the anticipated development of resistance of the vector to malathion (and succeeding insecticides) which will necessitate the use of alternative control measures, and the large outlay required for insecticide purchase which may be difficult for the GSL to indefinitely sustain.

D. Brief Project description

The Anti-Malaria Campaign (AMC), a large program to which about 15 percent of the total Ministry of Health recurrent cost budget is allocated annually, has been divided into three phases: (1) intensive spraying, (2) selective spraying with surveillance, and (3) surveillance with phased integration into the General Health Services. Although the incidence of malaria has been reduced dramatically, institutionalization of the program is seriously behind schedule, the surveillance system is still only partially effective and relatively little attention has been given to management information systems, malaria education and information, operational research on epidemiology, surveillance and alternative methods of control. The project will concentrate on improving the effectiveness of insecticide spray operations, institutionalizing improved surveillance and initiating alternative methods of control. Its principal components will include:

1. Gradually declining insecticide assistance and increasing GSL insecticide inputs to continue the spray program as planned until such time as development and implementation of alternative control measures justify reduction. (It is anticipated that some level of spraying must be continued indefinitely).
2. Strengthening the epidemiology/surveillance systems to improve cost effectiveness of control.
3. Introducing a comprehensive malaria education and information program to gain broader acceptance and support for program methods and goals.
4. Intensifying operational research related to effective vector control.
5. Developing and initiating programs for effective vector control.
6. Strengthening staff competence through training, including social and communications skills as well as technical skills.
7. Improving planning/management/evaluation capabilities of the AMC.
8. Continuing project evaluation.
9. Developing an inter-institutional malaria control network.

PART TWO - CONSTRAINTS TO PROGRESS

The constraints to progress have been carefully analyzed in the Technical Analysis, outlined by project output in Annex III L, and addressed in the proposed Conditions Precedent and Covenants.

The most critical constraint is AMC staffing. Twenty one percent of AMC sanctioned staff positions are vacant, and vacancies for selected AMC Headquarters professionals, and other key personnel such as Regional Malaria Officers, Microscopists and Entomological Assistants are much higher.

The second most important constraint is the AMC is totally dependent upon external assistance for insecticide. The third major constraint is that AMC to date has relied almost exclusively on residual insecticide spraying, and the staff lacks training and experience in the use of alternative methods of malaria control. The fourth major constraint is that the effectiveness of spray operations is inadequate due to: decreasing rates of household acceptance for insecticide spraying; inadequate and inefficient surveillance; insufficient operational research, information/education and community participation activities; aging and unserviceable vehicles; and relative lack of inter-institutional coordination.

All of these constraints and others outlined in the Technical Analysis and Annex III L have been carefully considered in project design.

PART THREE-PROJECT DESCRIPTION

The June 1983 multi-donor review of the malaria control program underscored the urgent need for additional AID assistance. After the AID assisted successful reduction of the incidence of malaria from over 262,000 cases in 1977 to around 38,000 cases in 1982, incidence is increasing in 1983. Due to the current, prolonged drought and other constraints, the transmission of the more dangerous *p. falciparum* malaria has increased sevenfold and *p. vivax* has increased threefold during the first four months of 1983 compared to the first four months of 1982.

The objectives of this project are to control the incidence of malaria and to institutionalize an effective malaria control system. However, it will not be possible to complete the institutionalization process during the three year period of the project extension. For this reason, the purpose statement has been written to reflect what is achievable during the life of the project amendment.

The beneficiaries of this assistance will be the eleven million (72 percent) of the Sri Lankan people who live in malarious regions. An additional project benefit will be protection necessary for achieving the goals of the two billion dollar investment in the Accelerated Mahaweli Development Program. Epidemic malaria would clearly result in significant abandonment of Mahaweli settlement areas. The 1982 incidence rate (cases per 1,000 population) of malaria in the Mahaweli system areas ranged from two to almost ten times the national incidence rate of 2.5. So there is cause for concern.

This Project Paper supplement requests authorization of an additional \$10.00 million loan funding for insecticide and \$4.0 million grant funding for technical assistance, training, operational research, pilot projects, planning/management, information/education, regional laboratory equipment, and evaluation with PACD extension of three years until October 31, 1987.

The grant funds will be necessary to improve spray operations, institutionalize surveillance and initiate alternative malaria control methods such as vector control which are considered essential to the long-term goal of institutionalizing effective malaria control in Sri Lanka. Plans call for \$3.840 million of the \$4.0 million grant funds to be administered by an institutional contractor. To speed technical assistance procurement and allow for the earliest possible arrival of technical advisors, USAID plans to request AID/Washington to enter into direct contract negotiations with a Small Business Administration approved 8A (i.e., disadvantaged or minority) firm that has a good performance record on similar undertakings.

The loan funds will continue insecticide assistance while phasing-in GSL financing for same. Insecticide spraying must be continued with improved efficiency and increased household acceptance until alternative methods of malaria control are locally tested and made operational; and the need for some insecticide spraying will probably always be necessary to control malaria in Sri Lanka.

I. Project Goal

The goal is to reduce morbidity and mortality from endemic diseases.

II. Project Purposes

A. The higher level project purpose is to control the incidence of malaria.

B. The lower level project purpose is to improve the effectiveness of insecticide spray operations, institutionalize effective surveillance and introduce alternative malaria control activities which minimize the need for house spraying with insecticides.

III. Detailed Description

The Plan of Operation for Malaria Control 1982-1986, approved by the Government of Sri Lanka and WHO, in which USAID concurred provided a detailed description

of the present AMC program. This is a large program, to which about 15 percent of the annual recurrent cost budget of the Ministry of Health (MOH) is being allocated annually. Its major component, house spraying with a residual insecticide, has been divided into three phases: (1) intensive spraying, (2) selective spraying with surveillance, and (3) surveillance with phased integration into the General Health Services. The plan of operation also calls for epidemiological and parasitological assessment, general operational assessment, field applied research and annual evaluations.

Although the incidence of confirmed cases of malaria has been reduced dramatically, (see Annex III A), institutionalization of the AMC program is seriously behind schedule, and the surveillance system is still only partially effective. Insufficient attention has been given to training, surveillance, malaria education and information, management systems and operational research on alternative methods of control. These areas must be strengthened to improve the cost-effectiveness of spray operations and eventually reduce the program dependence upon imported insecticides.

The project will concentrate on strengthening the program in these areas while continuing an improved spray program until such time as development and implementation of alternative control measures (e.g., vector control) justify its further reduction.

A. Project Outputs

The technical/institutional analyses indicate that it is unrealistic to expect to complete institutionalization of all components of the malaria control program or its integration into the General Health Services by the Amendment No.2 PACD.

During this period for which assistance is provided under Amendment No.2, improvement in spray operations and surveillance will reduce total insecticide needs, AID assistance to purchase insecticides will be phased down as GSL funding for this purpose is phased in, alternative control methods will be introduced and the process of institution-building will be accelerated. Follow-on assistance through a new project may be required to consolidate the institution-building process undertaken under Amendment No.2. Project outputs are defined in terms of progress toward reaching the ultimate purpose: to institutionalize the Sri Lankan malaria control system. The following outputs will be achieved:-

1. Insecticide Spray Program

A carefully targetted and stratified residual insecticide house spraying program to reduce the incidence of malaria, to control focal outbreaks, and to reduce total insecticide spraying.

2. Surveillance System

A functioning, effective and continuous epidemiological, parasitological and entomological surveillance system to:

- a. Provide requisite information for directing insecticide spraying operations promptly and accurately, and
- b. Monitor the impact of alternative control measures such as vector control.

3. Vector Control Program

An effective vector control program, supported by a viable, multi-institution, operational research program and monitored through the surveillance systems, to: reduce the vector population to a level that will not support endemicity of malaria; and reduce the need for house spraying operations in selected pilot areas with a plan for phased expansion.

4. Drug Treatment Program

Effective presumptive, prophylactic, and radical drug treatment system in place and responsive to surveillance data.

5. Malaria Education and Information Program

An ongoing program carried out, for example, in conjunction with schools, PHC workers, hospitals, community organizations, that effectively utilizes various media to reach targetted audiences and potential beneficiaries in the malarious regions with relevant information about malaria prevention and control.

6. Training Program

A revised, better planned, intensified training program for AMC staff and other relevant organizations that incorporates training in social and behavioral change skills and broader technical skills (e.g., alternative control methods) into the conventional technical training program.

7. Program Planning, Management and Evaluation

AMC organization and management with capability for effective forward planning, rapid problem solving and institutional learning through evaluation (including operational assessment), such that outputs 1 through 6 are achieved in a timely, effective manner.

B. Project Inputs

1. Training (Grant-funded)

The project will provide both in and out-of-country training to strengthen AMC staff capabilities in all major components of the malaria program and support for a series of seminars and workshops that will involve other organizations to be integrated into the inter-institutional network.

A revised training plan will be developed with project technical assistance to ensure that needs are carefully identified, training is properly scheduled, and linkages are established between out-of-country and in-country training to maximize cost effectiveness. WHO and AID advisors will participate in both the planning and execution of training events, and one person month of short-term technical assistance will be utilized to assist the Training Center staff in analysis of training needs and development of the revised plan.

A major objective of this assistance will be to prepare staff to serve as trainers. The details of the training component, for which an estimated \$340,000 (excluding technical assistance) will be required IOP, are as follows:

a. National Malaria Control Seminar

A national seminar for upper-level staff and administrators of MOH, AMC, other relevant ministries (e.g. Agricultural Development and Research, Lands and Land Development, Mahaweli Development, Finance, Plan Implementation, Education and Higher Education) will be organized in 1984 to enhance understanding concerning malaria and its control, the need for inter-institutional collaboration and the potential contribution of each institution in the network, and the importance of a malaria information and education program in achieving community support and participation. The estimated cost associated with organizing and conducting this seminar is \$45,000, including the cost of bringing in outside authorities on malaria for major presentations and to serve as resource people to the seminar.

b. Annual Malaria Control Workshops

Annual Workshops (3) of approximately one week duration each will be organized to reinforce topics discussed at the national seminar with primary focus on vector control and other program components in accordance with priorities to be established by the AMC in conjunction with technical assistance personnel, USAID, and WHO. Workshop participants will include AMC senior headquarters staff, RMOs, other regional staff as appropriate, and representatives of collaborating institutions. The estimated IOP cost is \$50,000 including the cost of providing one to two outside resource people per workshop.

c. In-Service Training In-Country

Support in the form of short-term technical assistance will be provided to the National Malaria Training Center to introduce social, communication and alternative control skills training into its curriculum. Cost of this assistance is given below under Technical Assistance.

f. Unspecified Short-Term Out-of-Country

A total of 30 person months (LOP) of short-term training (1-11 months per award) will be provided for upgrading the competence of senior AMC headquarters/regional staff in the various program components being strengthened (see Part Three, III A), through the project. The specific areas of specialization, and duration and location of the training, will be determined by the AMC in conjunction with technical advisors, USAID and WHO (an illustrative list of such areas would include epidemiology, entomology, data and information management, logistics and supplies, social and communications skills, preparation of educational materials, malaria program management, evaluation - including attitudinal and motivational, operational research, specialized techniques and alternative control methods. The LOP cost of these 30 person months of training is estimated at \$102,000.

2. Operational Research (Grant-Funded)

Operational research related to epidemiological assessment, surveillance, vector control and economic and social factors important to the malaria program will be supported through a series of grants to AMC and other institutions with appropriate research capabilities. Although the number and distribution of such projects will ultimately be determined by need, opportunity and expected value toward project purpose, the following distribution is projected: epidemiology-1; surveillance-8; vector control-7; economic and social-5. A suggested list of needed operational research studies is included in Annex III B. The estimated LOP cost for operational research, including local costs and equipment but excluding technical assistance which is indicated below, is \$240,000.

d. Study Tours Out-of-Country

Study tours of approximately one month each, to visit other malaria programs and relevant institutions in the Asian region will be provided for six Public Health Inspectors (PHIs) and four Entomology Assistants (EAs) annually. The principal objective of the study tours will be to visit and study the organization of malaria control programs in similar areas to gain insights into approaches and techniques used successfully in programs of the countries visited. The PHIs will focus on the program as a whole; and the EAs will concentrate on entomological aspects, including vector control, spray programs, operational research, and taxonomy. The estimated LOP cost for the 30 study tours is \$102,000.

e. Vector Control Short Courses

To build AMC capability in the area of vector control, the project will fund the participation of one medical officer annually in the 8-week Comprehensive Vector Control Short Course conducted by the International Center for Public Health Research at the University of South Carolina. After their return these staff will, with the assistance of the long-term vector control specialist, organize and conduct short courses for AMC staff, and those from other organizations collaborating in the vector control program. The estimated LOP cost for the six participants is \$41,000.

3. Pilot Projects (Grant-Funded)

Implementation seed money is provided for testing, on a pilot project basis, new methods and techniques resulting from the operational research projects or from technology developed and proven abroad but not previously used in Sri Lanka. The exact nature of such projects will be determined from results of the operational research projects and review of experience in malaria control programs in other countries. Pilot projects will be approved only if the GSL is prepared to allocate funds to expand all efforts that prove to be successful.

The institutional contractor will be primarily responsible for managing this input based on sub-agreements for each pilot project approved by USAID.

A LOP total of \$150,000 is projected for pilot projects.

4. Malaria Education/Information (Grant-Funded)

Equipment will be provided to build AMC capability to produce malaria education materials and to supplement audiovisual facilities already available. In addition, support will be provided for local costs associated with social marketing research and development, production and field testing of various types of educational programs and materials. It is anticipated that social marketing research will be conducted by private sector firms engaged by the project. The estimated LOP cost for support to the education/information program is \$115,000.

5. Planning, Management, Evaluation (Grant-Funded)

In addition to short and long-term technical assistance for which costs are included under Technical Assistance, the project will provide a 2-way radio system to link all regions with headquarters, a microcomputer with appropriate peripherals and software for information storage, analysis and quick retrieval and other small equipment items (e.g., calculators and microfiche reader) required to develop a viable management information system.

In addition, some support will be provided for local costs related to installation and initial use of that system. The estimated LOP cost for strengthening planning, management and evaluation is \$260,000.

6. Technical Assistance (Grant-Funded)

Eighty-six person months of long and short-term technical assistance will be provided to AMC, distributed as follows:

a. Long-Term (60 person months) Person Months

Epidemiologist/project coordinator	36
Vector control specialist/malariologist	24

b. Short-Term (26 person months)

Operational research	10
Information/education	8
Training	1
Surveillance/data management	3
Other	4

The technical assistance is for the purpose of bringing to the AMC outside expertise in areas in which it is presently deficient, coordinating implementation of the various inputs to be provided by the project, and orchestrating progress toward project purposes in the most cost effective way. Technical assistance is the sine qua non of the grant portion of project assistance. Preliminary job descriptions for the two long-term positions are attached as Annexes III C and III D. Two project vehicles will be provided to give mobility to the two long-term and various short-term people. The estimated LOP cost for technical assistance, including vehicles and support costs, is \$1,130,000. AMC will provide office space. Secretarial and other TA support expenses will be from the Project.

7. Equipment and Supplies for Regional Laboratories
(Grant-Funded)

To enable the AMC to establish laboratory capacities in all regions (at present, only 7 of the 16 regions have labs) and to assure that surveillance programs will not be constrained by lack of sufficient glass slides for blood smears during this critical stage in their development, provision of glass slides and 20-25 microscopes with accessories and spare parts is projected. The estimated cost will be \$100,000 (\$25,000 for microscopes, accessories and replacement parts, which will meet approximately one half of the requirements for installing the new regional laboratories; and \$75,000 for glass slides, which will meet approximately 40 percent of the AMC requirements for the life of the project).

8. Insecticide (Loan-Funded)

The project will provide insecticide for the malaria control program on a decreasing scale - 100 percent of estimated requirements in 1984, 80 percent in 1985, and 50 to 60 percent in 1986. Estimated LOP cost for insecticide, based on the assumptions that malathion will continue to be the insecticide of choice and that prices will escalate at the rate of ten percent per year is \$10.0 million.

C. Summary of Project Inputs and Related Costs

Grant Funding (\$ 000s)

a. Training		340
National seminars	45	
Annual workshops (3)	50	
Study tours (30 p.mos.)	102	
Vector control courses (12 p. mos.)	41	
Unspecified short-term (30 p. mos.)	102	
b. Operational Research		240
Local costs	215	
Equipment	25	
c. Pilot Projects		150
d. Malaria education/ information		115
Local costs - AMC	35	
- social marketing research	30	
Equipment	50	
e. Planning, management, evaluation		260
Local costs	10	
Equipment	250	
f. Technical assistance		1,130
Long-term (60 p. mos.)	720	
Short-term (26 p. mos.)	390	
Vehicles (2)	20	
g. Regional laboratories		100
h. Contingencies/inflation		1,505
i. Multi-donor reviews		80
j. USAID evaluations		80
Grant subtotal		\$4,000

Loan Funding (\$ 000s)

a. Insecticide		10,000
Loan subtotal		10,000
Grand total		14,000

Notes:

Items a,f: Standardized cost figures used for estimating cost. TA costs include local support costs.

Item h: \$100,000 for contingencies, plus inflation at 10 percent per year for the 2nd and 3rd years for TA, equipment and contingencies, plus overhead.

Grant funded: Items a through h will be administered by an institutional contractor under an AID contract and items i and j will be administered directly by USAID.

PART FOUR: PROJECT ANALYSIS

I. Technical Analysis

A. General

The project purpose of reducing malaria cases by FY 1982 to a maximum of 1,000 cases per million population nationally has been revised to 2,000 per million population (API 2.0). Within this national target, however, no individual region should have an incidence of higher than 5,000 cases per million population (API 5.0). These targets appear realistic and achievable and are targets which should be maintained by the AMC. At the same time, there should be a reduction of perennial and seasonal spray areas and an increase in non-spray on focal spray areas as follows:

Area	1982	EOP
Perennial	26	13
Seasonal	39	29
Non or Focal	42	65
	---	---
Total	107	107

B. Surveillance/Epidemiology

The surveillance program has epidemiological, parasitological and entomological components. All are essential to achieve and maintain the malaria reduction objective cited above. Relevant ongoing operational research and operational assessment should be integral parts of each of these components.

The function of the epidemiological service is to assess the malaria situation as it exists, as well as to provide important trend observations that may be associated with technical changes due to insecticide and therapeutic drug resistance or with conditional changes such as migration, meteorological patterns, or vector change patterns. Epidemiological assessment is presently based on active case detections (ACD) and activated positive case detections (APCD) by AMC staff, and passive case detections (PCD) by the Ministry of Health and other public medical institutions. Of these, PCD accounted for about one percent of the cases identified in 1982, inevitably resulting in a biased sample. Needed epidemiological surveys are seldom conducted, as the AMC is not presently capable of conducting such surveys, particularly outside of presently designated malarious areas. Furthermore, it is reported that a significant proportion of cases are not detected due to self-treatment by many who contract the disease.

The function of parasitological surveillance is the finding of active cases of malaria for the purpose of providing treatment, initiating other control activities, and monitoring parasite resistance to drugs. Positive blood smears obtained through ACD, APCD and PCD are presently used as the primary source of such data. Information is also needed on the number of cases of fever that are clinically suspicious and treated where no smear is made.

The function of entomological surveillance is to monitor: changes in population and habits of *A. Culicifacies*; potential vector capacity of other *Anopheles* mosquitoes; current resistance status of malathion and all other potential or reserve insecticides; infective rate of *A. Culicifacies*; special circumstances in focal outbreak areas; entomological factors related to increased *P. Falciparum* cases; and geographic distribution of *Anopheles* mosquitoes in Sri Lanka. Limited activity is underway on most of the above, but this can in no way be considered adequate to meet program needs.

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Major constraints to implementation and institutionalization of an effective surveillance program include:

1. Many sanctioned staff positions are vacant (see Institutional Analysis) - lack of sufficient microscopists, entomologists, regional malaria officers and central management staff are the most serious;
2. There is household resistance to spraying and very little active community participation in other aspects of the malaria control program;
3. Surveillance information is received only after long delays by those who need to act on it;
4. Operational research and operational assessment are inadequate;
5. Other MOH agencies contribute very little surveillance information to the AMC;
6. Shortages of slides are frequently experienced by the laboratories;
7. Laboratories have been established in only 7 of 16 AMC regions - some laboratory capacity is needed in all regions.

With assistance to be provided as described under Project Inputs, establishment and institutionalization of an effective surveillance/epidemiology program are judged to be feasible provided the staffing situation is improved significantly, and other MOH entities participate actively in close collaboration with the AMC.

C. Vector Control

Malaria will continue to be endemic in Sri Lanka, so a permanent malaria control program will be essential to contain incidence of the disease to acceptable levels. Continued reliance on massive use of insecticides for residential spraying as the primary control measure is not a satisfactory long-term solution for several reasons:

1. the quantity of insecticides required for such a program requires large annual foreign exchange allocations that are not feasible for the GSL to finance indefinitely;
2. the half life of any insecticide's effectiveness in killing the vector mosquito is a few years only for malathion and other known insecticides of choice, and each succeeding insecticide tends to be more expensive and more toxic;
3. social acceptance of residential spraying becomes an ever-increasing problem over time, particularly when malaria incidence is low and people become complacent about the disease.

Stratified residential spraying supported by an effective surveillance program (see foregoing section) is a partial solution, but is still subject to the same constraints regarding insecticide effectiveness and social acceptance described above.

Ultimately, it will be essential to incorporate alternative methods of control into the program that will reduce costs, minimize the mosquito vector resistance to insecticide problem, be socially acceptable, and that can be carried out at least in part by communities. Of the presently known methods, vector control to reduce the total vector population to a level that will not support endemic transmission of the disease is the most viable.

Three approaches are used in the normal vector control program:

Source Reduction: removal of potential mosquito breeding places through removal of water (or changing its ecological balance) required by the mosquito larvae during their first week of development. This semi-permanent approach is the preferred vector control method.

Larviciding: controlling the numbers of vector larvae while they are concentrated in relatively small areas. Chemical, biological and mechanical methods are available for this purpose. This approach retains the advantage of having to treat only relatively small areas. However, because of a one week aquatic development period, most techniques used for this purpose require frequent inspections of the sources and repeat treatment.

Adulticiding: used when the first two approaches fail, this method is aimed at destruction of the adult mosquito. It involves use of special equipment and coverage of large areas, and is therefore usually reserved for human population centers. Like larviciding, adulticiding requires repetitive treatments to meet each vector population.

Vector control has not been a part of Sri Lanka's national malaria control program to date, although some methods, particularly biological techniques, have been investigated. Nonetheless, vector control techniques developed and refined elsewhere should require only some adaptive research and trials for operational use in this country. (The Sarvodaya volunteer movement plans to make widespread use of vector control methods in a program just getting underway in many villages).

Major constraints to successful widespread use of this method for malaria control include:

- AMC staff lacks training and confidence in the use of vector control methods;
- many sanctioned AMC staff positions remain unfilled—vacancies in entomological positions are particularly serious in relation to vector control;
- present job descriptions of spray machine operators, the most logical group to carry out vector control activities in the communities, make it difficult for the AMC to use them for that purpose;
- operational research needed to adapt known vector control techniques for use in the Sri Lanka program has been limited and inadequate to date;
- active community participation in the malaria control program, essential to the success of vector control, is currently minimal at best.

Introduction and institutionalization of an effective vector control program is considered feasible with the assistance of inputs to be provided through the project, if the AMC staffing situation is significantly improved.

D. Drug Treatment

Radical treatment with chloroquine and primaquine is the mainstay treatment for *P. Vivax*. Chloroquine alone is used for radical treatment of *P. Falciparum*. A variety of dosages has been arrived at for the following categories: (1) presumptive treatment - seasonal and focal areas, perennial regions; (2) radical treatment - unsprayed areas (confirmed cases only); seasonal areas (confirmed and strongly suspected cases), perennial areas (all suspected cases); (3) prophylaxis - new settlers in malarious areas, mass drug treatment (in instances of outbreak and in difficult localized areas such as chena cultivation and gemming regions). A detailed description of the different types of treatment administered is attached as Annex III E.

The administration of anti-malaria chemo-therapy is accomplished through various channels including: (1) AMC-ACD, ACPD, Public Health Inspectors; (2) medical institutions - public and private - and private doctors and clinics; (3) volunteers - community volunteer health and malaria workers and centers; (4) traditional healers distributing anti-malarial drugs; (5) village health workers where established; and (6) private purchase.

Problems associated with the therapeutic programs include:

- AMC staff attempt at all times to obtain a blood film when presented with fever cases, or requests for drugs for fevers. Unfortunately, films are not taken at most other distribution levels listed. This negates the possibility of achieving better epidemiological surveillance data. It also leads to medicating when not indicated (i.e., false positive). This plus the problem of probable non-compliance with the full dosage requirement may contribute to the development of resistance or, at the least, to an increase in the relapse rate of P. Vivax.
- There is evidence that samples of chloroquine purchased from the lowest bidder vary in chloroquine base content.
- Definitive research has not been completed to determine whether the G-6PD deficient population (estimated at up to 10% in some regions) is in danger of experiencing intravascular hemolysis from primaquine intake. Should this be proven, the concept of giving primaquine to prevent relapse to these people makes the cure more dangerous than the disease.

Sri Lanka has a highly educated, motivated, and medically sophisticated population. Most people correctly associate fever and chills with malarial infection, drugs are widely available, and most people are treated as attested to by the very low death rate.

Although widespread resistance to 4-aminoquinolines is found in south and southeast Asia, there is as yet no evidence of the spread of this problem to Sri Lanka. However, it is beyond reason not to expect resistance to develop eventually in Sri Lanka. Technical capacity and techniques are now available to continue close monitoring of this potentially devastating event. This is essential. In addition, routine work should be conducted on the resistance potential of *P. Falciparum* to other drugs. The procedure for comprehensive testing of drug resistance should be formalized (new micro kits that require minimum technical skills are available from WHO and should be incorporated into such a procedure).

Drug treatment has been found to be generally effective at present. Further improvement is feasible and anticipated provided the staff vacancy problem is resolved, coordination problems are alleviated, and operational assessment and research activities are stepped up.

E. Malaria Education/Information

The first step toward achieving greater residential spray acceptance and community participation in the malaria control program is to provide the people in malarious regions with information about malaria and the ongoing control program, the need for their cooperation and participation to achieve satisfactory control and containment of the disease, what they can and should do, and the benefit they will realize from active cooperation and participation in the program (the importance of education, training and information to community participation is highlighted in the attached Annex III F).

The present situation with respect to malaria education is highly unsatisfactory. Information about malaria in the health education curricula taught in the schools is minimal. Educational materials about malaria are inadequate with most being out of date and not written for specific target audiences. The National Malaria Training Center curriculum includes little training in alternative control methods and no training related to social, communications or educational skills, although the need to add these to the technical training now being provided is felt keenly by senior AMC staff.

Major constraints to improvement in this area include:

- The health educator assigned to the AMC has been transferred to the Health Education Department, and no one has specific interest or responsibility for this critical component of the malaria control program in either AMC or Health Education;
- It has proved difficult to get the Health Education Department to prepare new educational materials related to malaria;
- Resistance has been encountered to the use of radio and other media for disseminating information regarding malaria control.
- As the result of having few educational materials available, no staff training in social and communications skills, and no one responsible at headquarters to provide malaria information and education, there is little motivation for AMC periphery staff to carry out educational activities with the people in their regions;
- The AMC presently has virtually no in-house capability to develop, reproduce or evaluate the impact of educational materials concerning malaria.

Rapid progress in reaching the people in malarious areas with relevant information can be made with no significant increases in AMC personnel. A small core staff will be required at headquarters - the AMC Superintendent states that this can be provided through transfers of presently existing staff. Existing periphery staff are adequate for fulfilling this function within the AMC, provided they receive leadership from the RMO, appropriate training, and good educational materials. However, the AMC cannot do the job alone. It is essential that other facilities of MOH such as PHC workers, hospitals, and other GSL ministries should also be involved (e.g., Education, Mahaweli Development, etc.).

More than 3,000 local volunteers are reported to be working in the Anti-Malaria Campaign. Their principal functions at present are to dispense drugs for malaria treatment and, to a limited extent, collect blood smears. Over time, the volunteers' contribution to the program could be increased immeasurably by involving them in information dissemination and education.

With assistance provided by the project, all of the above cited constraints can be alleviated. Provided the suggested actions are taken, institutionalization of a viable malaria education/information program will then be feasible. Significant progress toward achievement of this objective is achievable by the EOP.

F. Training

The National Malaria Training Center is now under the direction of an AMC Medical Officer, although resident WHO consultants assist in teaching the various courses given at the Center. One additional national staff member is also assigned to the Center. Training in anti-malaria operations is provided to not only AMC staff but also other health and medically-oriented groups. During the 1983-1987 period, the Center proposes to offer courses to nine categories of participants at headquarters and to nine additional categories of trainees through a decentralized field program. The details of the Center's projected training program are given in Annex III G.

The Training Center program is reasonably well established and facilities are fair. A number of needed innovations were introduced in 1982, e.g., annual in-service training. It remains to be seen whether or not such innovations can be sustained. The redirected AMC program with greater emphasis on vector control, malaria information and education, and new surveillance techniques will place additional demands on Center staff. Some present courses will require significant revision, and new content in the aforementioned areas of emphasis must be added - areas in which Center staff have had little or no previous training and experience. The problem will be most acute in the areas of alternative methods of control, and social, communications and educational skills, as training offered by the Center to date has been spray operations-oriented and technical in nature.

The Training Center and malaria information/education program are closely related, and they should operate in close association, if not combined into a single unit with reinforced staff and improved facilities.

Implementation and institutionalization of the new concepts being introduced into the AMC program will require new or additional training of both headquarters and periphery staff. Field staff, including laborers, will require specific training in the techniques used for source reduction and larviciding which should be conducted by those who have received vector control training in the University of South Carolina short course. Training abroad for selected staff, and exposure of other staff to experiences in other Asian malaria control programs will be the most effective way to meet some of these needs. (Institutionalization of the AMC program has been hampered to date by AMC's failure to fully utilize funds for training previously allocated in the project, a situation that is now being rectified).

Additional significant improvements in quality and institutionalization of training are feasible and expected.

G. Insecticide Spray Program

The mainstay of Sri Lanka's present malaria control program is a targetted and stratified insecticide program to reduce the incidence of malaria. This must be continued and made maximally efficient and socially acceptable until alternative methods of malaria control such as vaccination, improved drugs, or institution of vector control methods are developed and operational.

At present, the predominant method for malaria prevention is to spray malathion (a residual insecticide) on the inner surfaces of houses. The female mosquito which transmits malaria is primarily a night feeder that rests on interior house surfaces while digesting its blood meal. If the mosquito lands several times on a properly treated wall on which the insecticide is still chemically active, it will die before the parasite has developed to the transmission stage, but not necessarily before having produced hundreds of off-spring. Thus, residual spraying is a specific procedure to prevent transmission of malaria. It does not aim to reduce the total mosquito population in the area.

Decisions as to which areas and which houses to spray, and how frequently, are made on the basis of epidemiological data and specific findings from parasitic and entomologic surveillance. From such information, four general classifications of malaria incidence have been established by the AMC:

- 1) Highly malarious, with a 1982 population of 1.5 million, involving the greater part of the dry and intermediate zones.
- 2) Medium malarious, 1 million population mainly in the intermediate, but partly in the dry zone.
- 3) Unstable malarious area, population 10.5 million, for the most part in the intermediate zone.
- 4) Non-malarious, population 2.2 million located mostly in the wet zone.

The same sources of information are utilized to determine which areas have year-round transmission and which are at risk only part of the year. This is for the purpose of replacing four-cycle, year-round house spraying (perennial spraying) with a twice-annual application (seasonal spraying) which is timed to coincide with the peak transmission periods whenever conditions permit. It is hoped that as a result of the project (and possibly the disappearance of the parasite from some localities), perennial spray areas will be reduced by about 50%, seasonal spray areas will be reduced by about 25% and the non or focal spray areas will increase by more than 50% to over 60% of all health areas in Sri Lanka. House spraying in 60% of the health areas would be done only in the case of focal outbreaks. This differentiation of spray areas is referred to as stratification.

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The projected population and numbers of houses in each category to be sprayed, as shown in the AMC 1982-1986 Plan of Operation are as follows:

	Actual				Planned	
	1982	1982	1983	1984	1985	1986
Perennial (000s)						
Population	2,000	1,886	1,922	1,958	1,495	1,121
Number of houses	540	530	540	550	420	315
Seasonal (000s)						
Population	1,500	1,139	1,161	1,185	1,406	1,460
Number of houses	360	320	326	333	395	410
Non or Focal (000s)						
Population	-	712	726	740	1,121	1,534
Number of houses	-	200	204	208	298	410

Malathion poundage requirements for the 1984-1986 period have been estimated by the AMC on the basis of their data and experience. Three estimates are presented for each year, which may be categorized as high (A), medium (B), or low (C), depending upon the following factors: extent of area, frequency of spraying by householders, and historical transmission patterns. The first (A), is calculated on the basis of an average rate of 2 lbs. malathion per house. It allows for four treatments per year in perennially sprayed areas, two in seasonally sprayed areas, and includes all houses in the malarious areas. The second estimate, (B), is based on Plan of Operations projections adjusted for partial coverage or non-spraying of some houses as well as new house construction, and most nearly represents actual consumption of malathion in 1983 to date. The third estimate, (C), is based on actual 1982 consumption, taking into account non-spraying, partial spraying and stratification. This is a "minimum requirement" estimate that is considered risky to use in projecting malathion needs. All three estimates include a small reserve for focal spraying.

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Malathion prices have declined sharply in recent years as the result of diminishing demand. It is considered likely that the price will stabilize at approximately its current level except for inflation. The price paid for the March 1983 procurement inflated at the rate of ten percent per year has been used to estimate annual insecticide costs.

Estimated malathion requirements and costs at the three levels discussed above are as follows:

Malathion Requirements (000s)

		A	B	C
1984	lbs	5,968	4,234	3,268
	\$	6,087	4,319	3,333
1985	lbs	5,132	3,650	3,859
	\$	5,748	4,088	3,202
1986	lbs	4,358	3,110	2,467
	\$	5,360	3,825	3,034

LOP	lbs	15,458	10,994	8,594
	\$	17,195	12,232	9,569

Taking all known factors into consideration, requirements presented in estimate B are considered to be the most realistic in terms of meeting AMC needs.

Major constraints to continued effectiveness of the house spraying program include:

- Acceptance by householders is low as shown below for 1982

	Full complete house	Partial house	House closed or householder refused
	%	%	%
Perennial areas	57	25	18
Seasonal areas	64	23	13

45

- The level of acceptance has decreased to the minimum considered acceptable. Further erosion of support will render the program virtually useless.
- Field observations indicate that spray coverage, timing and quantity may not always be closely controlled, and that sprayers are not always taking adequate safety precautions nor applying consistent dosages.
- It is probable that the vector will develop resistance to malathion and succeeding insecticides over time (the major question is when rather than whether).
- Operational assessment and research on the use and efficiency of malathion to kill the vector is far from adequate.

Increased acceptance of house spraying by householders is unlikely to improve in the absence of a strong educational effort or substantive community participation, unless households receive some type of incentive, e.g., simultaneous spraying with other insecticides to rid the house of bedbugs, roaches, etc. Training of spray team members in how to approach and communicate with the householders could help to reverse the trend toward refusals.

There is as yet no concrete evidence of resistance by *A. Culicifacies* to malathion in Sri Lanka. If such resistance should develop to significant proportions prior to 1987, it would be necessary for the AMC to switch to another insecticide, and the LOP requirements for malathion would be reduced accordingly. The most likely insecticide of choice, fenitrothion, is considerably more expensive. Thus, emergence of verified malathion resistance would require a new financial and technical analysis.

The present technical analysis is based on the technical judgement that malathion will remain the primary insecticide during the LOP. However, malathion resistance will eventually appear. Meanwhile, every possible action from epidemiological surveillance through constant entomological testing must be taken to insure detection in time to permit the eventual switch to fenitrothion before the control program is jeopardized.

For the present, the malathion insecticide spraying program should and can be strengthened. Withdrawal should not be contemplated until resistance is firmly established or other control measures have been introduced and are operational.

H. Transport, Spraying, Operational Equipment

The AMC currently has 205 usable vehicles (including jeeps and lorries), of which 86 percent are in service and the remainder being repaired or awaiting repair. Motorcycles have been made available to spray machine operators through Japanese assistance, and a plan has been proposed for providing loans to ACD agents for the purchase of vehicles. However, staff mobility for operations and supervision remains a constraint for several reasons:

- 135 of the 205 vehicles are more than 15 years old and need replacement.
- Virtually all repair work is done in Colombo, resulting in delays in returning the vehicles to service.
- The fuel budget is inadequate, with the result that vehicles are frequently grounded during much of the month.
- Per diem is reportedly too low to cover subsistence and lodging, with the result that some staff are reluctant to travel. This is most serious for headquarters staff.

The AMC has anticipated that ten replacement vehicles will be obtained annually through other donor assistance, but none have been provided during the last two years. The 135 vehicles more than 15 years old should be replaced as soon as possible, and other donor support should be sought for this purpose.

Plans are being made to make the central workshop unit mobile to help decrease vehicle down time. More flexibility should also be provided to permit minor repairs to be made locally. Fuel allocations should be increased to permit month-round travel by all field staff as required for the program.

The number of sprayers appears to be adequate for present program needs. However, many need replacement of worn out parts such as nozzle tips and hoses to permit their safe use and accurately metered, uniform application of the insecticide. The number of microscopes is adequate for present needs, and a reserve supply is available to meet at least half of the requirements for needed additional regional laboratories. Microscope maintenance is satisfactory. Replacement lenses may become a problem in the future.

I. Planning, Management, Evaluation

The degree of success achieved by AMC in reducing the need for spraying houses through alternative control methods with effective surveillance will be influenced significantly by the program's capacity to receive, analyze, store, retrieve and transmit information promptly and adequately. The present system is archaic, slow, and woefully inadequate.

The present lack of a viable management information system is also a serious constraint to effective planning, management and evaluation which are essential to institutionalization of the malaria control program.

(Other program management factors are discussed in the Institutional Analysis).

It is feasible to reverse the above situation rapidly through technical assistance, appropriate training, installation of appropriate management information systems and equipment as projected in the project. Periodic reviews of progress are made through the annual multi-donor evaluation. There is recognition both within and outside the AMC that continual operational evaluation (assessment) will also be required to ensure the quality and quantity of output from all levels of the organization. This primarily must be done within AMC utilizing their own resources. Although such activities are in progress, they have to date been inadequate to meet the need and should be strengthened. (A list of necessary operational assessment activities is attached as Annex III - H). This is considered feasible, taking into account assistance to be provided to other components of the AMC program.

J. Community Participation/Acceptance of Household Spraying

Permission of families to spray the interiors of their residences has been the principal type of community participation sought by the AMC. The increasing resistance of the people to accepting such spraying is a major constraint to success of house spraying operations. Because of the insecticide's bad smell, the inconvenience, the duration of spray activities (since 1953) and the recent reduction of the malaria risk, household rejection is to be expected in the absence of an on-going education/information program.

More recently, the AMC has introduced a system of local volunteers to assist in the malaria program, and more than 3,000 such volunteers are now working in the Anti-Malaria Campaign. Although their effectiveness varies greatly among individuals and regions, they are dispensing drugs for malaria treatment and, to a limited extent, collecting blood smears. Their contribution to the total program can be enhanced immeasurably by involving them in dissemination of information, education, and development of community participation. By so doing, their credibility and status as malaria volunteers can be enhanced, which will in turn make them more effective in performing their present functions.

Imaginative program leadership at the regional levels, training, a logistic system that keeps them well-supplied with supplies and materials, and a means of giving them appropriate recognition for the services they are performing to the malaria campaign and their communities are requisites for success in recruiting, keeping and effectively utilizing volunteers in the malaria program. All are achievable, and it is reasonable to expect that both the number of volunteers and their contributions to the program will increase during the LOP.

The need for community participation will become increasingly critical as the malaria program moves into vector control and other alternative methods of control. Both individual and group action will be required. An example of how such involvement could be obtained is attached as Appendix III F. Although it is not feasible to expect countrywide implementation and institutionalization of a viable community participation program before the EOP, establishment of such programs in pilot areas that can later be expanded is achievable.

K. Conclusions

On the basis of the technical analysis presented above, it is concluded that the project is technically sound and the objectives realistic. The most difficult problem will be removal of the constraints identified in the analysis.

II. Social Analysis

A. Social Soundness

The social analysis and social soundness conclusions presented in the Project Paper are still considered to be generally valid. The implementation problems related to acceptance of house spraying and various social patterns relating to the treatment of outsiders (AMC personnel) have been encountered, especially the former which has been discussed earlier.

As discussed in the section on Community Participation, the need for extensive community participation will become increasingly critical as the malaria program moves more strongly into alternative control methods such as vector control. Sri Lanka has a tradition of "Shramadana" which may be loosely translated as the sharing of energy for communal benefit. The Sarvodaya Movement has been highly successful in taking advantage of this tradition to accomplish major community development and improvement. The keys to success have been inspired leadership, education, training, motivation and group action. Thus, it may be concluded that the community participation on which the malaria program must increasingly rely in the future will be feasible from the standpoint of social soundness.

B. Beneficiary Impact

The potential beneficiary impact is graphically illustrated by the magnitude of population at risk of malaria infection as shown in Annex III-I. If the current prevalence of the disease remains unchanged, by 1990 between 12.3 and 13.1 million people will be living in areas where malaria infection is a potential hazard. (Note: without the project, the disease is likely to significantly increase in prevalence).

The beneficiary impact issue is discussed further in the Economic Analysis. In more general terms, the assessment of benefit incidence and spread effect in the Project Paper is valid for Amendment No.2.

III. Institutional Analysis

A. Organizational Structure

The present organizational structure of the AMC, shown in Annex III J, is generally sound. There appear to be some opportunities for strengthening it, however, as outlined below.

1. The headquarters staff is small in relation to its responsibilities.
2. There is need for an operational research officer position at headquarters to coordinate operational research and assessment and collaborative research with other institutions.
3. The two layers of administration between the MOH and AMC Superintendent make it difficult for the AMC to coordinate well with entities such as the Mahaweli Authority, and to take decisions required to meet changing program needs.
4. A closer linkage between the headquarters entomology group and regional staff is needed for effective coordination and implementation, particularly with introduction of vector control into the program for which some restructuring of the headquarters entomology unit may also be required.

5. An additional section for information management is needed.
6. The structure lacks a mechanism for inter-institutional coordination at both the headquarters and periphery level.
7. The present organizational structure shows no linkages with communities, community organizations or ultimate beneficiaries. The absence of viable linkages, particularly at the community level, is presently a constraint to the entire malaria control program and should be rectified.

With the above modifications, the AMC organizational structure is considered adequate for institutionalization of the malaria control program.

B. Personnel and Staffing

The sanctioned AMC staff cadre (itemized in Annex III K), with the exceptions noted below and in the foregoing section, is considered to be adequate; and distribution among categories is reasonable. Nonetheless, staffing and personnel problems constitute a serious and continuing constraint to achievement of program objectives.

In 1982, 890 of 4849 positions (18 percent) were vacant. This situation has since deteriorated further, and 1035 (21 percent) of the positions are now vacant. The staff vacancy situation takes on added significance when examined by job category.

Eleven of the 16 Regional Malaria Officer positions are presently vacant. Decentralization of operations and field leadership for technical, educational, information and community involvement activities depend upon these key positions being filled.

Seventy-five of 233 microscopist positions are currently unfilled. As a result, delays are encountered in checking blood smears, and overflow slides must be sent to Colombo for reading. It will obviously be impossible to establish laboratories in the other regions so long as this situation persists.

Lack of sufficient entomological staff at various levels is seriously hampering the work of the entomology division.

Present job descriptions for various categories of staff need major revision to reflect responsibilities to be assigned in the redirected malaria control program.

The AMC Superintendent needs the flexibility to modify job responsibilities and change assignments in accordance with program needs as they change over time. Among the categories for which revision of job description and responsibilities are needed, the most critical at the moment is the spray machine operators.

Needs for selected additional staff to manage and implement the malaria control program during the next several years are identified in the Technical Analysis and earlier in this section. The AMC Superintendent has agreed to seek sanctions for new positions where essential, and to fill other positions from presently existing staff.

To alleviate the Regional Malaria Officer staffing problem, the AMC has been granted permission to employ science graduates rather than doctors. Although the positions have recently been advertised, to date none have been filled. Consideration is being given to other measures that would provide incentives for promising applicants to accept appointments in the AMC, but none are as yet operational.

It must be concluded that success in institutionalization of the Sri Lankan malaria control program (and effective utilization of AID inputs other than insecticide) will be possible only if the personnel and staffing constraints described above are significantly alleviated.

C. Training

The National Malaria Training Center capability and needs are discussed in the Technical Analysis, and its projected training plan is given in Annex III G.

From an institutional standpoint, selective shifting of appropriate training programs from headquarters to the field is warranted. Significant improvement in quality and institutionalization of the AMC training program through the already established Training Center is feasible and expected.

D. Inter-Institutional Network

Relatively little progress has been made to date in developing or institutionalizing a viable inter-institutional network (including other entities in MDH) to collaborate and share responsibility for malaria control. The inter-ministerial committee has not met for approximately two years, and coordination is limited primarily to that achieved through personal relationships.

The AMC should continue as a vertical program until such time as surveillance and alternative control measures greatly diminish the need for spraying. However, other MDH divisions and GSL ministries such as Agricultural Research and Development, Lands and Land Development, and Mahaweli Development must be brought into the malaria control network, as the AMC program projected in the project will require continuing inputs, better collaboration, and active participation of these organizations.

The operational research projects offer opportunity to develop better collaboration with relevant research institutions, although such may not be formally institutionalized. Finally, intersectoral advisory groups should be established at both national and regional levels to facilitate development of a viable network.

All of the foregoing are considered to be feasible, and will represent substantive progress toward eventual institutionalization of inter-institutional coordination and integrated action.

E. Alleviation of Institutional Constraints

The AMC is well aware of the constraints cited above, and is desirous of making the changes necessary to improve management, administration and program operations. A number of innovative approaches will be required.

As cited earlier, provision has now been made to employ science graduates as Regional Malaria Officers, although none have as yet been recruited. Their eventual placement in these positions may not completely resolve the leadership problem as they are unlikely to be regarded as co-equals with medical officers in the region. One possible solution to this potential problem that should be explored is appointment of Medical Officers at a super-regional level to have primary responsibility for providing overall field leadership and development of collaborative and/or cooperative work with those in the medical services (e.g., participation of hospitals in obtaining blood smears and improving their overall reporting to the AMC surveillance system).

Decentralization of authority for planning and action will become imperative in the long range. Although some steps have been taken in this direction, too much responsibility for decisions still remains with headquarters. Resolution of this problem will require further intensive training and orientation of regional staff to provide the capability for such actions, and AMC/MOH flexibility to delegate appropriate responsibility and authority.

Although the malaria program will be expanded significantly (particularly in the areas of education/information, vector control and community participation), the need for additional staff can be minimized through redeployment of existing staff, redefinition of job responsibilities in several staff categories (to reflect the changing needs of the program), greater and more effective use of volunteers, establishment of a viable inter-institutional network, taking advantage of the capabilities of other MOH departments (e.g., Health Education), and utilization of other institutions (including those in the private sector) for research and studies not within the capability of the AMC. To accomplish these, the AMC will require greater flexibility in administration and management than is exercised at present.

Another factor critical to the success of the project will be the active support of the AMC and the MOH. The AMC is strongly supportive of the project as proposed and is highly desirous of moving in the directions indicated. Similar strong support will be required at the MOH level, and preliminary discussions with the Secretary and Deputy Director of Health Services indicate that such support can be anticipated.

F. Conclusion

The major constraint to achieving projected project outputs is the present staffing situation. If this constraint can be alleviated to a significant degree, the projected outputs are achievable. If not, they are unrealistic. In other aspects, the project is considered to be feasible from the institutional standpoint.

IV. Financial Plan and Analysis

A. Project Cost Analysis

The financial plan remains valid. The projected total (GSL and donor) cost of the malaria control program for the three year period covered under Amendment No.2 is \$ 30.31 million. The foreign exchange component is expected to be about \$ 15.8 million or 52.1 percent. The majority of the balance is provided by the GSL through the MOH budget. Total expenditures for the malaria control program including GSL, USAID and other donor inputs since 1978, and as projected through 1986 are as shown below. Of the total for the years 1983 and onwards, recurrent expenditures (including insecticide) are projected at 97-98 percent of the total. This is consistent with the level of recurrent expenditures in prior years. The project will not introduce major new recurrent costs. As outlined in the economic analysis, the major recurrent expenditure, insecticide spraying, will decrease as recurrent expenditures increase for alternative control methods. However, the total increase in recurrent costs will be minimal.

Year	Rs. (000s)	1 U.S.\$ = Rs. (Rate of Exchange)
1978	86,349	15
1979	121,627	15
1980	81,481*	16
1981	94,607	20
1982	123,574	20
1983	150,922**	20
1984	222,082***	23
1985	197,785***	23
1986	192,102***	23

* Lower due to reduced procurement of malathion.

** Funds available for current year.

*** Projected.

Resource estimates for the period covered in Amendment No.2, distributed by source, are as follows:

Description	Total (\$ 000s)
1. AID Grant	4,000
Loan	10,000
2. Government of Sri Lanka	15,330
3. World Health Organization (WHO)	690
4. Government of Japan	300
	<hr/>
TOTAL	30,320

The AID LOP contribution includes funds provided through the original loan, the supplemental loan in Amendment No.1, and the grant and loan funds to be provided in Amendment No.2.

Dollars (000s)

Loan	Grant		
Original		12,000	-
Amendment No.1		4,000	-
Amendment No.2*		10,000	4,000
		<hr/>	<hr/>
TOTAL		26,000	4,000
TOTAL Loan plus Grant:		30,000	

* The programmatic distribution of these funds is given in the Project Inputs section.

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B. Annual Funding Schedule

Projected annual distribution of funding requirements and proposed AID obligations are shown below.

Projected Requirements by U.S. Fiscal Year (in \$ 000)AID Grant Funds:

	<u>FY 1984</u>	<u>FY 1985</u>	<u>FY 1986</u>	<u>TOTAL</u>
Technical assistance	356	453	321	1,130
Training	141	102	97	340
Operational research	50	90	100	240
Pilot projects	-	50	100	150
Education/information	60	30	25	115
Planning, mgmt., Evaluation	225	25	10	260
Regional laboratories	50	50	-	100
Contingencies/inflation	335	676	496	1,505
Multi-donor reviews	20	20	40	80
AID evaluations	-	40	40	80
TOTAL GRANT FUNDS	1,235	1,536	1,229	4,000

AID Loan Funds:

Insecticide	4,319	3,286	2,395	10,000
TOTAL AID FUNDS	5,554	4,822	3,624	14,000

Government of Sri Lanka Funds:

Personnel	2,701	2,375	2,568	7,644
Travelling expenses	497	425	425	1,347
Supplies & requisites*	1,217	2,220	1,909	5,346
Repairs/maintenance	25	20	25	70
Transport/communications, services	100	125	130	355
Capital expenditures	200	125	243	568
TOTAL GSL FUNDS	4,740	5,290	5,300	15,330

* Includes insecticides.

Proposed AID Obligations (in \$ millions) by U.S. Fiscal Year

	<u>Total</u>	<u>FY 1983</u>	<u>FY 1984</u>	<u>FY 1985</u>
AID Grant Funds	4.0	1.2	2.8	-
AID Loan Funds	10.0	4.3	3.4	2.3
TOTAL	14.0	5.5	6.2	2.3

The GSL bears all recurrent costs at present except for insecticide. The support provided the current year is Rs. 23.22 million in excess of that projected in the AMC Plan of Operations for 1982-1986 (Rs. 127.77 million projected, Rs. 150.99 million allocated, including donor assistance). Thus, the GSL is supporting the malaria program at present at a higher level than earlier projected, and it is reasonable to expect that this trend will continue.

Details concerning allowance made for contingencies, inflation and basis on which overhead was estimated for the AID funded grant are included in Project Inputs, page 18. Insecticide costs were derived through inflating current prices by 10 percent per year.

The USAID is requesting FY 1983 funding of \$5.5 million (\$1.2 million grant and \$4.3 million loan) to cover the first year's institutional contract and insecticide costs. In FY 1984, \$6.2 million (\$2.8 grant and \$3.4 million loan) would be obligated to cover the remaining costs of the institutional contract, review and evaluation, and 1985 insecticide requirements. The balance of AID's project funding of \$2.3 million would be obligated in FY 1985 to permit the timely procurement of insecticide requirements for 1986. If FY 1983 funding is unavailable, of course, the amounts required during the FY 1984-1985 period would need to be increased accordingly.

It is essential that an obligation be made in FY 1983 or first quarter FY 1984 to prevent a serious interruption of the insecticide pipeline (additional arrivals are required around March 1984). While early insecticide funding is essential, the grant funded technical and other grant assistance is the sine qua non of progress toward institutionalization, and it should not be delayed.

C. Other Donor Support

1. World Health Organization (WHO)

WHO is at present providing three long-term advisors to the project - malariologist, entomologist, and sanitarian. The number of advisors is expected to be reduced to two at the end of 1983 and to one a year later. These advisors are provided on a grant basis. In addition, WHO provides approximately \$30,000 a year for supplies, equipment and training.

2. Japan

It is expected that Japan will provide replacement vehicles to the program in the near future, and some experimental quantities of fenitrothion. This assistance has not yet been finalized, however. Vehicle assistance possibilities are also being explored with the Government of Great Britain (O.D.A.).

V. Economic Analysis

This amendment will extend the life of the malaria control project through 1986. For the purposes of the economic analysis, the project has been reviewed as a single entity and the entire nine year duration of the project (1978-1986) has been analyzed. Benefits of the project for which monetary values can be calculated include medical treatment costs avoided, anti-malarial drug procurement avoided and the value of avoided labor loss due to illness. A summary analysis is presented in this section; the details of the calculations and the assumptions are contained in the economic annex.

During the time period 1978-1986, the project will result in the avoidance of: 22,619,000 cases of malaria, 11,080,000 in-patient days at the hospital, 7,539,666 out-patient visits to health facilities, the loss of 34,045,000 days of employment, and the importation of Rs. 298,150,000 worth of anti-malaria drugs.

The internal rate of return for the project is 33.49, the net present value amounts to Rs. 25,201,000 when discounted at 15% interest, and the benefit-cost ratio is equal to 1.04. All of these measures indicate that the project is economically viable.

In addition to the quantifiable economic benefits, the project is also absolutely necessary to protect the current \$2 billion plus investment in the Accelerated Mahaweli Development Program. The historical record for Sri Lanka shows ancient kingdoms being abandoned due to malaria epidemics. In more recent times, malaria has caused transmigration areas in Indonesia to be abandoned. There is clearly potential for this to happen again in Sri Lanka if malaria does not continue to be effectively controlled. As the table below clearly shows, the incidence of malaria in the Mahaweli zones is well above the national average incidence of 2.5 in 1982.

Incidence of Malaria in the Mahaweli Area, 1982

Health Area	Mahaweli Area	API
Kahatagasdigiliya	System H	24.00
Valaichchenai	System B	16.25
Bibile	System C/E	15.01
Anuradhapura	System I/H	12.57
Trincomalee	System D/A	11.04
Polonnaruwa	System D/B	7.67
Kekirawa	System H	5.86

In addition to this project being soundly economically viable, it is also attractive from the cost-effectiveness point of view. Heavy emphasis will be placed in the project on increasing alternative malaria control activities and decreasing the level of spraying activity. Alternative malaria control activities are much less expensive than spraying, and a diminishing use rate of malathion will increase the length of time that malathion will be an effective insecticide in Sri Lanka. Insecticide alternatives to malathion are more expensive. Thus, success of the proposed activities should decrease future cost of the Anti-Malaria Campaign.

A summary of the economic analysis appears on the following page and details are contained in Annex III N.

SUMMARY ECONOMIC ANALYSIS

<u>Year</u>	<u>Treatment Costs Avoided</u>	<u>Income Loss Avoided</u>	<u>Drug Cost Avoided</u>	<u>Total Benefits</u>	<u>Total Costs</u>	<u>Net Benefits</u>	<u>Net Present Value</u>
1978	14,783	40,810	18,060	73,653	111,466	- 37,813	- 32,881
1979	23,908	57,357	20,820	98,085	116,373	- 18,288	- 13,828
1980	25,374	72,754	23,180	121,308	91,281	30,027	19,743
1981	26,815	92,162	26,040	145,018	94,607	50,411	28,823
1982	27,453	105,021	33,718	166,174	134,775	31,399	15,611
1983	39,722	115,950	42,874	198,546	170,272	28,274	12,224
1984	40,365	118,050	43,654	202,069	237,826	- 35,757	- 13,442
1985	41,128	120,300	44,486	205,914	200,058	5,856	1,914
1986	41,902	122,550	45,318	209,770	185,016	24,754	<u>7,037</u>
							25,201

Internal Rate of Return = 33.49

Net Present Value at 15% Interest = Rs.25,201,000

Benefit Cost Ratio at 15% Interest = 1.038

VI. Environmental Analysis

The IEE is attached as Annex I E. Materials and methods now in use by AMC are those commonly used in malaria programs throughout the world and thus have repeatedly demonstrated their favorable risk-benefit ratio.

A shift to fenitrothion for wall-spraying when malathion resistance in the vector occurs, while also shown to be of positive risk-benefit impact in other countries, would require a strengthening of the spraymen's safe-handling training and greater attention to protective equipment and the cholinesterase testing program (since this is a more toxic chemical).

The contemplated shift in emphasis from house-spraying to vector control would have a positive environmental impact. The proposed emphasis on source reduction and the use, wherever possible, of indigenous parasites and pathogens, rather than chemicals, for larval control of the vector is environmentally much sounder than the continual application of ever more toxic materials to human dwellings, as well as a large step toward self-sufficiency of the AMC and reduction of its dependence upon AID-supplied insecticide. When chemical larvicides or adulticides are the only resort, an arsenal of environmentally safe, EPA tested and approved materials exists. Assistance in the choice and local testing of such materials would be a responsibility of the long-term consultant. Selection of any alternative AID-supplied chemical agents or other materials than those already, properly approved for Agency use will be conducted in accordance with Section 216.3(b) of the AID Environmental Procedures.

PART FIVE. PROJECT IMPLEMENTATIONI. Implementation Schedule

A. PP supplement approved by USAID Director	August 1983
B. Grant/loan authorization	NLT October 1983
C. Project grant/loan agreement signed with GSL	NLT November 1983
D. IFB for initial insecticide procurement	NLT December 1983
E. IFB issued for technical services	NLT December 1983
F. Conditions precedent (CPs) met for first year of Project Agreement	January 1984
G. First insecticide arrival	NLT March 1984
H. Contractor Chief of Party arrival in Sri Lanka	NLT March 1984
I. Annual evaluation (multi-donor)	March/April 1984
J. Detailed LOP Plan of Implementation approved by GSL and USAID	September 1984
K. Annual Project report and updated Plan of Implementation approved by USAID and GSL	March 1985
L. Second year CPs met	March 1985
M. Second disbursement on loan portion	April 1985
N. Annual evaluation (multi-donor)	April 1985
O. Mid-term USAID evaluation	January 1986
P. Annual project report and updated Plan of Implementation approved by GSL and USAID	March 1986
Q. Third year CPs met	April 1986
R. Third disbursement on loan portion	May 1986
S. Annual evaluation (multi-donor)	June 1986
T. Annual report and final update on Plan of Implementation approved by GSL and USAID	April 1987
U. Annual evaluation (multi-donor)	June 1987
V. EOP USAID evaluation	July 1987

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II. Disbursement Procedures

Disbursement of the \$ 3.840 million grant portion of the project will be administered through an AID Contract. The balance of \$ 160,000 grant funds will be administered directly by USAID. Disbursement of the \$ 10.0 million loan portion of the project will be as described below, with each disbursement contingent upon prior satisfaction of the conditions precedent for that year.

III. Procurement and Contracting Procedures

Procurement of insecticide will continue to follow the procedures used in the original Project Agreement and Amendment 1, following standard AID regulations for country contracting of materials and equipment (Handbook 11). An AID-approved IFB including AID specifications for malathion (technical grade, 50 percent WDP and packing) is used by the GSL, and AID approves the awards. These transactions are financed by the AID Direct Letter of Commitment.

An AID Cost-Reimbursable Technical Services Contract will be negotiated with an "8A" Small Business Administration qualified U.S. disadvantaged or minority institution to provide all inputs, excluding multi-donor reviews and AID evaluations, included in the grant portion of the project. The contract will be administered and monitored by USAID/Sri Lanka.

IV. USAID Monitoring Requirements

Close AID monitoring of the program and AID's assistance to it will be particularly crucial as the AMC begins to shift toward alternative methods of malaria control, institutionalization of its various component programs and shared responsibilities with MOH and other institutions.

The monitoring functions are:

1. Maintain liaison with MDH, AMC, other GSL officers, other foreign donors, and the AID Contractor as appropriate, and advise on AID regulations, policies and procedures.
2. Prepare required documentation for AID project financing.
3. Monitor all Contractor activities and approve disbursement of funds for project inputs as specified in the Contract and in accordance with AID regulations.
4. Review material submitted in fulfillment of Conditions Precedent and advise GSL and AID as to whether these materials fulfill the conditions. If not, advise on measures needed to satisfy them.
5. Review project reports (operational, procurement and financial) and make periodic field visits to keep informed of progress toward performance targets and project covenants.
6. Participate in the annual multi-donor evaluations and the mid-term and EOP AID evaluations.

The monitoring workload will be decreased significantly through engaging a Contractor to coordinate project inputs. The Contractor will be responsible for preparing documents in a form that meets AID requirements for approval and will be required to submit quarterly and annual reports, the latter of which are to be prepared jointly by AMC and the Contractor. In addition, the Contractor will be required to keep the USAID Project Officer informed of project progress at all times.

In order to monitor the project adequately, a senior FSN staff member or contract employee well versed in AID project documentation and implementation will be assigned to work full-time on this project. Alternatively, a U.S. PSC might be considered.

V. Evaluation Plan

A. Multi-Donor Assessments

The project requires a formal, annual, multi-donor evaluation plus mid-term and EOP AID project evaluations. The annual evaluations, arranged by AMC, will be done by representatives of GSL including the AMC, WHO, other donors assisting the program, and appropriate external specialists proposed by the AMC and approved by WHO and USAID. Funds for 4 person months for four multi-donor reviews are included in the project budget.

The annual evaluations will address the following questions:

1. Progress toward selected program and plan of action targets, national and regional, and reasons for shortcomings or unsatisfactory performance;
2. Physical operational problems and solutions recommended in such areas as insecticide availability, vehicle and sprayer maintenance;
3. Management problems such as communications, procurement and distribution, jurisdictional disputes, program staffing and personnel problems, reporting, funds availability and utilization;
4. Adequacy of epidemiological activity;
5. Progress in vector control activity;
6. Progress on research, surveillance and health education objectives;
7. Training progress toward meeting manpower requirements;
8. Progress toward eventual integration of malaria services into the General Health Services system including training of General Health Services personnel and case treatment;

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9. Socio-cultural problems relating to program acceptance by target groups;
10. Environmental health problems associated with the use of insecticides;
11. The level of services available to development and settlement areas.

B. USAID Evaluations

The mid-term and EOP USAID evaluations will be arranged by USAID in conjunction with the AMC and Contractor.

The USAID evaluations will consider the results of the annual evaluations, and will focus specifically on progress toward EOPs and program components to be strengthened through the project.

Results of both multi-donor and USAID evaluations and actions taken to correct program problems will be taken into account by USAID in approving project implementation/procurement actions.

Funds required for 2 person months of consultant participation in both the mid-term and EOP evaluations (i.e., 4 person months) are included in the project budget.

VI. Conditions Precedent, Covenants and Special Provisions

In addition to the standard provisions, the following program specific conditions and covenants should be included in the Project Agreement Amendment:

A. Conditions Precedent to First Disbursement Under the Loan Portion of the Project Agreement Amendment.

Prior to initial year disbursement of the loan, the Cooperating Country shall, except as AID may otherwise agree in writing, furnish to AID in form and substance satisfactory to AID:

1. Evidence that the Cooperating Country has made its best effort to promptly implement the recommendations resulting from the June 1983 multi-donor review.
2. Evidence that the Cooperating Country has filled with qualified personnel at least fifty percent of each category of the following key vacancies and has plans for filling the remaining fifty percent of each category within six months.
 - a) Professionals for AMC Headquarters:
 - 1 Medical Officer
 - 1 Entomologist
 - 1 Parasitologist
 - 3 Staff Officers
 - 1 Public Health Inspector
 - b) 11 Regional Malaria Officers
 - c) 75 Microscopists
 - d) 9 Entomological Assistants
 - e) 5 Medical Laboratory Technicians
3. Evidence that the Cooperating Country agrees to provide GSL funds required and procure at least 20 percent of insecticide requirements in 1985, 40 to 50 percent of insecticide requirements in 1986, and 100 percent of insecticide requirements in 1987 and subsequent years.

B. Conditions Precedent to Second and Third Disbursement Under Loan Portion of the Project Agreement Amendment.

Prior to second and third year disbursements of the loan, the Cooperating Country except as AID may otherwise agree in writing, furnish to AID in form and substance satisfactory to AID:

1. Evidence that the Cooperating Country has made its best effort to promptly implement the recommendations resulting from the annual multi-donor program reviews of 1984 (second year CP) and 1985 (third year CP).
2. Evidence that the Cooperating Country has continued to make satisfactory progress in filling vacant staff positions, revising job responsibilities in accordance with program needs, and adding additional staff as required to carry out the approved Plan of Operations.

C. Special Covenants

1. The Sri Lanka Malaria Control Program. The Cooperating Country shall maintain continuing and effective malaria control program after the termination of AID assistance.
 2. Annual Plans of Action. The Cooperating Country agrees to implement the Plan of Operations through annual Plans of Action reviewed and approved by the Ministry of Health, WHO, and USAID. The Ministry of Health shall have authority to amend, modify or alter annual plans with the approval of WHO and USAID.
 3. Vehicles. The Cooperating Country shall seek funding from other donors to replace all vehicles in its fleet that have been in service 15 years or more. If donor funding is not available, the GSL will provide replacement vehicles.
- 71

4. Equipment Maintenance. The Cooperating Country shall assure that an effective control, repair and maintenance system for vehicles, equipment and other supplies is initiated and carried out.
5. Environmental Health. The Cooperating Country will take appropriate safety measures as specified in an annual health safeguards plan approved by MOH, WHO and USAID. The Cooperating Country will also maintain rigid control over the quality of the insecticide procured for the malaria control program to ensure that it meets WHO and AID technical requirements.
6. Review and Evaluation. The Cooperating Country shall cause to be held monthly internal review meetings with MOH, WHO and USAID and annual multi-donor reviews by Ministry of Health officials, WHO, AID, and other donors to the program as appropriate.

D. Project Description

The Amplified Project Description in Annex I of the Project Agreement will be revised to reflect the new budget and changes in the project. Special attention will be given to the following points:

1. Spray Operations. The GSL shall carry out sufficient perennial, seasonal and selective spray operations in areas of malariogenic potential to achieve the program's objective to reduce malaria incidence to a level where it is no longer a significant health program.
2. Surveillance Operations. It is understood that malaria surveillance operations provide the necessary information for proper program planning, execution and evaluation and are essential to the effective administration of the malaria control program. The GSL agrees to take necessary actions to assure institutionalization of continuing, effective surveillance operations.

3. Vector Control Operations. It is understood that alternative malaria control methods must be incorporated into the malaria control program to: minimize use of insecticides for house spraying and the need for drug treatment; delay the likely, eventual development of mosquito resistance to insecticides of choice and of parasite resistance to drugs to choice.

The GSL agrees to introduce vector control operations into pilot malarious areas and to later expand coverage to include all malarious regions of Sri Lanka.

4. Research Activities. It is understood that research related to the field of malaria is essential to successful development and implementation of a comprehensive malaria control program. The GSL shall assure that essential operational research projects and activities are carried out in a timely and effective manner.
5. Training. The GSL agrees to provide adequate funds for in-service and refresher training as required for present and new malaria control program staff.
6. Health Education. The GSL shall provide adequate funds and otherwise assure efforts are undertaken to involve the general public in the malaria control program and to obtain their cooperation and participation in carrying out the necessary surveillance, spraying and vector control activities.
7. Regional Laboratories. The GSL shall establish additional laboratory capacities as necessary to have one in each AMC region, and will take appropriate measures to assure that glass slides and other supplies are available in adequate amounts at all times in all laboratories.
8. Inter-Institutional Network. The GSL shall take appropriate measures to involve other divisions of the Ministry of Health and other institutions actively in the malaria control program at local, regional and national levels and to selectively experiment with the transfer of appropriate responsibilities to the general health services.

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சிடி, திட்டமிடல் அமைச்சு

DEPARTMENT OF EXTERNAL RESOURCES
 Ministry of Finance and Planning

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 Inland Revenue Building (15th Floor)

ක. පො. 277, කොළඹ 2.
 த. பெ. இல. 277, கொழும்பு 2.
 P. O. Box 277, Colombo 2.

OFFICIAL FILE COPY 6th August 1983

Miss S J Littlefield
 Director
 US AID

REFERENCE NO... 83/914
 DATE RECEIVED... 8/16/83
 ACTION.....

Dear Miss Littlefield,

Malaria Control Programme

This has reference to our letter of 5th October 1982, detailing the need for continued donor support for the ongoing Malaria Control Project.

The recent unfortunate civil disturbances in Sri Lanka, added to the commitments of the Government to the large development projects undertaken with the multi-fold objectives of increasing agricultural production and employment opportunities, and improving the overall living standards of the people, make it all the more imperative that we look to foreign sources for supporting the Malaria Control Programme.

In this connection I might mention that the need for fresh commitments for the purchase of Malathion is critical since the balance of funds available under the existing aid programme for insecticide (US AID Project No. 383-0043) is barely sufficient to meet the requirements upto the first quarter of 1984.

To finance the balance of our insecticide requirements in 1984 through 1986, and to initiate technical assistance, training, operations research, pilot projects, education and information and other activities aimed at introducing alternative malaria control measures which will lower future dependence on foreign aid, we request the following assistance from US AID : a sum of US \$ 4.0 Million in grant funds and a sum of US \$ 10.0 Million in loan funds.

Your best efforts in this connection will be greatly appreciated.

Yours sincerely,

S. Kuruppu

(Mrs) S L Kuruppu
 for Director of External Resources.

DIR	AD	LA	EA	PRO	PDSP	CONT	MWRD	HPRK	ARD	DUE	Action Taken

Annex IBDraft Project Authorization and Request
for Allotment of Funds

Sri Lanka

Malaria Control
Project No. 383-0043
Amendment 2

Pursuant to Part I, Chapter I, Section 104 and Chapter 2, Title I of the Foreign Assistance Act of 1961, as amended, and Delegation of Authority No. 133.1 dated April 15, 1982, I hereby authorize a loan of U.S. dollars 10,000,000 and a grant of U.S. dollars 4,000,000 for a total of U.S. dollars 14,000,000 (the "Authorized Amount") to the Government of Sri Lanka (the "Cooperating Country") to help in financing certain foreign exchange and local currency costs of goods and services required for the project as hereinafter described. The project consists of a program to reduce the annual incidence of malaria to fewer than 35,000 cases by 1967 and to make substantial progress toward institutionalizing an effective, self-sustaining malaria control program. Plans call for \$5.5 million of the A.I.D. financing herein authorized for the Project to be obligated in FY 1983 when the Project Agreement is executed. The balance will be obligated FY 1984 and FY 1985 when a Project Agreement Amendments are executed.

I approve the total level of A.I.D. authorized funding of U.S. dollars 30,000,000, including the increment authorized above, during the period FY 1977 through FY 1986. This represents a three year extension of the project PACD which was approved by AA/Asia in the attached memorandum dated May 11, 1983 and confirmed in State 139173 (Annex IC of PP Supplement).

I hereby authorize the initiation of negotiation and execution of the Project Agreement - by the officer to whom such authority has been delegated in accordance with A.I.D. regulations and Delegations of Authority subject to the following essential terms and covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate.

A. Interest Rate and Terms of Repayment

The Cooperating Country shall repay the Loan to A.I.D. in United States Dollars within forty (40) years from the date of first disbursement of the Loan, including a grace period of not to exceed ten (10) years. The Cooperating Country shall pay to A.I.D. in United States Dollars interest from the date of first disbursement of the Loan at the rate of (a) two percent (2%) per annum during the first 10 years, and (b) three percent (3%) per annum thereafter, on the outstanding disbursed balance of the Loan and on any due and unpaid interest accrued thereon.

B. Source and Origin of Goods and Services

Except as A.I.D. may otherwise agree in writing, goods and services financed by A.I.D. under the Project shall have their source and origin as follows: in Code 000 (U.S.) for insecticides and drugs; in Code 941 countries and in Sri Lanka for equipment and training.

C. Prior to the initial disbursement or the issuance of the initial commitment document under the Project Agreement, the Cooperating Country shall furnish in form and substance satisfactory to A.I.D.: an opinion of council acceptable to A.I.D. that the Project Agreement has been duly authorized and/or ratified by, and executed on behalf of, the Cooperating Country, and that it constitutes a valid and legally binding obligation of the Cooperating Country in accordance with all its terms.

D. Prior to disbursement for each year of the program, the Cooperating Country shall furnish the following in form and substance satisfactory to A.I.D.:

1. Conditions Precedent to First Disbursement Under the Loan Portion of the Agreement

Prior to initial year disbursement of the loan, the Borrower/Grantee shall, except as AID may otherwise agree in writing, furnish to AID in form and substance satisfactory to AID:

1. Evidence that the Borrower/Grantee has made its best effort to promptly implement the recommendations resulting from the June 1983 multi-donor review.
2. Evidence that the Borrower/Grantee has filled with qualified personnel at least fifty percent of each category of the following key vacancies and has plans for filling the remaining fifty percent of each category within six months.
 - a) Professionals for AMC Headquarters
 - 1 Medical Officer
 - 1 Entomologist
 - 1 Parasitologist
 - 3 Staff Officers
 - 1 Public Health Inspector
 - b) 11 Regional Malaria Officers
 - c) 75 Microscopists
 - d) 9 Entomological Assistants
 - e) 5 Medical Laboratory Technicians
3. Evidence that the Borrower/Grantee agrees to provide GSL funds required and procure at least 20 percent of insecticide requirements in 1985, 40 to 50 percent of insecticide requirements

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in 1986 and 100 percent of insecticide requirements
in 1987 and subsequent years.

2. Conditions Precedent to Second and Third Disbursements Under Loan
Portion of the Agreement

Prior to second and third year disbursements of the loan, the Borrower/Grantee shall, except as AID may otherwise agree in writing, furnish to AID in form and substance satisfactory to AID:

1. Evidence that the Borrower/Grantee has made its best effort to promptly implement the recommendations resulting from the annual multi-donor program reviews of 1984 (second year CP) and 1985 (third year CP).
2. Evidence that the Borrower/Grantee has continued to make satisfactory progress in filling vacant staff positions, revising job responsibilities in accordance with program needs, and adding additional staff as required to carry out the approved Plan of Operations.
3. Evidence that the Borrower/Grantee is complying and planning to comply with its agreement to provide GSL funds required and procure at least 20 percent of insecticide requirements in 1985, 40 to 50 percent of insecticide requirements in 1986, and 100 percent of insecticide requirements in 1987 and subsequent years.

3. Special Covenants

1. The Sri Lanka Malaria Control Program. The Borrower/Grantee shall maintain continuing and effective malaria control.
2. Funding Requirements. The Borrower/Grantee shall provide all necessary funds, in addition to the loan and grant, for the timely and effective execution of the malaria control program.
3. Annual Plans of Action. The Borrower/Grantee agrees to implement the Plan of Operations through annual Plans of Action reviewed and approved by the Ministry of Health, WHO, and USAID. The Ministry of Health shall have authority to amend, modify or alter annual plans with the approval of WHO and USAID.
4. Review and Evaluation. The Borrower/Grantee shall cause to be held monthly internal review meetings with MOH, WHO and USAID and annual multi-donor reviews by Ministry of Health Officials, WHO, AID, and other donors to the program as appropriate.

Signature _____
Mission Director

Date

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Annex I C

ACTION

TELEGRAM

AMERICAN EMBASSY COLOMBO

AID

INFO

AMB	/
CHARGE	/
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 SUBJ: MALARIA CONTROL PROJECT PAPER AMENDMENT
 REFS: (A) COLOMBO 2350, (B) STATE 8861, (C) COLOMBO 1415

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1. SUMMARY: ASIA PROJECT ADVISORY COMMITTEE MET ON APRIL 21, 1982, TO REVIEW THE PROPOSED PP AMENDMENT AND REQUEST FOR THREE (3) YEAR EXTENSION OF PACD. EXTENSION OF MALARIA CONTROL PROJECT APPROVED BY AA/ASIA, SUBJECT TO USAID AUTHORIZATION OF THE PROPOSED AMENDMENT TO THE PROJECT. SUGGESTIONS FOR DEVELOPMENT OF PP AMENDMENT PRESENTED BELOW. END SUMMARY.

2. AA/ASIA HAS APPROVED AN EXTENSION OF THE MALARIA CONTROL PROJECT UNTIL OCTOBER 31, 1987, SUBJECT TO THE PROPOSED PROJECT AMENDMENT BEING APPROVED BY THE MISSION DIRECTOR UNDER THE DELEGATION OF AUTHORITY NO. 133.1 DATED APRIL 15, 1982. THE EXTENSION OF THE PACD IS NOT EFFECTIVE UNLESS THE MISSION DIRECTOR APPROVES THE PROPOSED AMENDMENT TO THE PROJECT. REQUEST MISSION SUBMIT COPIES OF COMPLETED PP SUPPLEMENT, AUTHORIZATION AND PROJECT AGREEMENT AMENDMENT DOCUMENTS FOR OJR INFORMATION AND FILES.

3. FINANCING. APAC CONCURS IN MISSION PLAN TO ANALYZE FINANCIAL REQUIREMENTS FOR MALARIA PROGRAM AND ESTABLISH PHASE-IN PLAN FOR GSL ASSUMPTION OF INSECTICIDE AND OTHER PROGRAM COSTS. WE SUGGEST THAT PHASE-IN OF GSL CONTRIBUTIONS FOR INSECTICIDE BE INITIATED AS SOON AS POSSIBLE, PREFERABLY IN FY 84-85 AND THAT FUTURE SCHEDULED PERIODIC EVALUATIONS ASSESS GSL PROGRESS TOWARD FULL ASSUMPTION OF INSECTICIDE AND OTHER PROGRAM COSTS BY FY 1987. AS PART OF PP SUPPLEMENT FINANCIAL PLAN, APAC REQUESTS THAT MISSION CONDUCT A THOROUGH RECURRING COST ANALYSIS FOR MALARIA PROGRAM. SUGGEST THIS ANALYSIS ASSESS SUBSTANTIAL PROGRAM VARIABLES THAT WILL AFFECT RECURRENT COSTS, I.E., EPIDEMIOLOGICAL STRATIFICATION AND DECENTRALIZATION OF MALARIA CAMPAIGN AS WELL AS OTHER KEY FACTORS THAT MAY AFFECT THE RECURRING COSTS.

4. INSTITUTIONAL AND POLICY CHANGES. APAC DISCUSSED INSTITUTIONAL AND POLICY CHANGES AT LENGTH WITH ST/HEALTH MALARIOLOGIST LARRY COWPER. PP AMENDMENT SHOULD ADDRESS ISSUES OF HOW TO BUILD THE CAPACITY OF THE AMC TO CARRY OUT EFFECTIVE EPIDEMIOLOGIC STRATIFICATION OF SPRAYING OPERATIONS, SUPPLEMENTARY AND ALTERNATIVE CONTROL MEASURES,

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AND IMPROVED SURVEILLANCE. IN ADDITION, MISSION SHOULD CONTINUE THE PROCESS OF POLICY AND INSTITUTIONAL CHANGES THAT WILL PERMIT A MORE DECENTRALIZED AND EFFECTIVE APPROACH TO COMBATING MALARIA OUTBREAKS. MEASURES SHOULD INCLUDE THE DEVELOPMENT OF HEALTH AREAS AND REGIONAL OPERATIONAL PLANS, INCREASED COMMUNITY VOLUNTEERS, IMPROVED INSTITUTIONAL STRUCTURES FOR CARRYING OUT OPERATIONAL PLANS AND PROGRAMS, INCREASING STAFFING ESPECIALLY IN THE AREA OF EPIDEMIOLOGY AND IMPROVING THE OPERATIONAL STRUCTURE THROUGH TRAINING AND INCREASED SUPERVISION OF THE INSTITUTIONAL AND VOLUNTEER STAFF INVOLVED. APAC REQUESTS MISSION DESCRIBE THESE INSTITUTIONAL PLANS THOROUGHLY IN PP AMENDMENT AND IDENTIFY INSTITUTIONAL AND POLICY OUTPUTS TO BE ACCOMPLISHED BY END OF PROJECT WITH PLANNED PERIODIC EVALUATIONS TO ASSESS PROGRESS.

5. TECHNICAL ASSISTANCE AND MONITORING. IT WAS APAC'S VIEW THAT PP AMENDMENT WITH PROPOSED PHASE-IN OF GSL BUDGET SUPPORT FOR INSECTICIDE, INSTITUTIONAL AND POLICY CHANGES, RESEARCH, TRAINING AND TECHNICAL REQUIREMENTS IS A MANAGEMENT INTENSIVE ACTIVITY. ALSO, CONCERN WAS AGAIN RAISED ABOUT SIZE OF MISSION HEALTH STAFF AND AMOUNT OF TIME AVAILABLE TO MONITOR MALARIA ACTIVITIES PROPERLY GIVEN OTHER RESPONSIBILITIES (PREVENTIVE HEALTH SERVICES AND KALITARA PROJECTS AS WELL AS CENTRALLY SUPPORTED FAMILY PLANNING ACTIVITIES). THEREFORE, WE SUPPORT AND STRONGLY ENCOURAGE MISSION PLAN TO RECRUIT ADDITIONAL ASSISTANCE. TECHNICAL ASSISTANCE NEEDS WILL BECOME MORE APPARENT AFTER MISSION DESCRIBES INSTITUTIONAL, TECHNICAL, IMPLEMENTATION AND OTHER ACTIVITIES MORE CLEARLY. SRI LANKA LOCAL HIRE CONTRACTOR FOR FIELD SURVEILLANCE AND ADMINISTRATIVE REQUIREMENTS SEEMS APPROPRIATE. APAC ALSO STRONGLY SUPPORTS ADDITIONAL SHORT AND LONG-TERM TECHNICAL ASSISTANCE TO ADVISE MISSION AND GSL ON INSTITUTIONAL AND POLICY CHANGES REQUIRED TO BRING ABOUT THE OPERATIONAL REORIENTATION OF AMC. THIS TA, AS MISSION INDICATED, WOULD BE PROVIDED THROUGH LONG TERM INSTITUTIONAL CONTRACT WHICH WOULD CALL FOR REGULAR REVIEWS OF INSTITUTIONAL AND POLICY CHANGES. REQUEST MISSION DESCRIBE THOROUGHLY IN PP SUPPLEMENT PROPOSED TECHNICAL ASSISTANCE AND MONITORING PLANS AND STAFF RESPONSIBILITIES.

6. EVALUATION. MISSION SHOULD PROVIDE BENCHMARKS FOR MEASURING FUTURE PROGRESS IN INSTITUTIONALIZING EPIDEMIOLOGIC STRATIFICATION OF SPRAYING OPERATIONS AND OTHER ALTERNATIVE NON-SPRAYING CONTROL METHODS, AS WELL

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AS PROGRESS IN GSL ASSUMPTION OF MALARIA INSECTICIDE AND PROGRAM COSTS AND THE IMPLEMENTATION OF OPERATIONAL AND INSTITUTIONAL CHANGES ESSENTIAL FOR THE EFFECTIVE PERFORMANCE OF THE AMC. REQUEST THESE BENCHMARKS BE INCORPORATED INTO PERIODIC WHO, GSL AND AID EVALUATION PLANS. MISSION SHOULD ALSO INCLUDE FUNDING FOR EVALUATIONS IN PROJECT. WE RECOGNIZE THAT THIS MAY REQUIRE HIGHER G

JNT BUDGET THAN PLANNED REF A. PLEASE INFORM US IF GRANT FUNDS ARE INCREASED FOR PROJECT EVALUATION PURPOSES. SHULTZ

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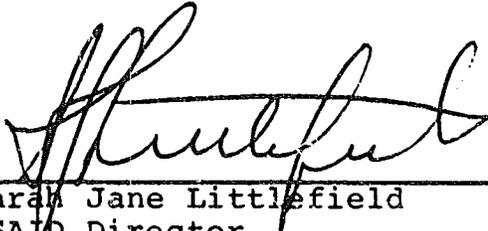
INITIAL ENVIRONMENTAL EXAMINATION

<u>Project Location</u>	Sri Lanka
<u>Project Title and Number</u>	Malaria Control, Amendment 2
<u>Funding Planned</u> - Amendment 2	\$13,996,000
- LOP	\$29,996,000
<u>Life of Project Amendment 2</u>	Three Years
<u>Project Assistance Completion date</u>	October 31, 1987
<u>IEE Prepared by</u>	Lawrence T. Cowper, AID/W, ST/Health Health Science Administrator
<u>Date Prepared</u>	October 15, 1982

Threshold Decision: Pursuant to the authority delegated to the USAID Director and based on an Initial Environmental Examination for the proposed use of AID project funds to support a targeted comprehensive anti-malaria program involving intradomiciliary spraying, drug distribution, larviciding, source reduction and natural biological controls as described herein, I recommend the following negative determination:

"The proposed action is not an action which will have a significant effect on the human environment over and above that described below and is, therefore, not an action for which a more detailed Environmental Impact Statement or Assessment will be required under this project."

Mission Director's Concurrence


 Sarah Jane Littlefield
 USAID Director

August 30, 1983

Date

INITIAL ENVIRONMENTAL EXAMINATIONI. Project Description

This project will provide technical assistance, support for applied research in malaria control, training, and commodities to assist the GSL to implement its Plan of Operations for a nationwide malaria control program. The Project will provide funding to be used in an effective malaria control program focusing primarily on the rural population of Sri Lanka, thus enhancing economic and social development in the fields of health and agriculture. The project will enhance the quality of the environment in those areas where source reduction and water management practices are made a part of the program. Insecticides will be used in the program, but these chemicals which have been used in Sri Lanka with no adverse effects over the last five years, will be applied in a manner which is not detrimental to the environment. Health safeguards are in place in the field program, and careful attention will be paid to training and supervision in the handling of insecticides. The Anti-Malaria Campaign (AMC) has applied over 14.0 million pounds of O.P. insecticides over the last five years without one serious case of insecticide intoxication.

II. Evaluation of Environmental Impact

The A.I.D. Environmental Impact Statement (EIS) included an in-depth review of the impact of malaria programs on the environment. The conclusions of the EIS were that the major insecticides used in world-wide malaria control programs have a favourable risk-benefit impact on the environment due to their method of application in public health programs. In 1977, a comprehensive Environmental Assessment undertaken in Sri Lanka concluded that malathion was an acceptable insecticide for use in malaria control efforts. This project is an extension of that project and the same techniques of applying the O.P. insecticides will be continued as in the past. However, it is expected that a reduction in the amount of insecticide will be occurring over the project's life. One of the purposes of the comprehensive EIS submitted by A.I.D. and accepted by the Environmental Protection Agency (EPA) was to avoid duplicating environmental review efforts for projects of a similar nature in countries with comparable conditions. Environmental studies have been made on malaria control programs in the last four years in India, Thailand, Nepal, and Pakistan with a similar favorable risk-benefit conclusion. The points of similarity between this project and previous environmental studies, both of O.P. insecticide use and other methods of malaria control, should obviate the need for another analysis. All the above reports are available in AID/Washington.

In addition to malathion, the Sri Lanka malaria program may be applying the organophosphorus (O.P.) insecticide fenitrothion in its spray operation program in limited areas of the country. Under this project, the GSL does not plan to use the insecticide DDT during the life of the project. The project will be continuing the large-scale application of malathion. Both of these O.P. insecticides are bio-degradable. The environmental impact of malathion has been reviewed in previous environmental documentation for Sri Lanka and hence is not repeated in this IEE.

Fenitrothion has gone through the seven stage trials of screening by the World Health Organization (WHO) and is one of the compounds recommended by WHO for residual spraying in malaria control programs. Fenitrothion like malathion does inhibit cholinesterase activity. However, Sri Lanka has not experienced any health problems in its pilot spray operations with this insecticide due

to the safeguards built into the program of protective clothing, frequent testing of cholinesterase levels in personnel, adequate supervision, regular and refresher training, and proper storage and distribution practices. Fenitrothion has been used in Haiti, and Pakistan in their operational malaria programs and has been scheduled for use in Thailand in 1982. All three of these malaria control programs are also being assisted by A.I.D. Fenitrothion is registered in the U.S.A. with the Environmental Protection Agency (EPA) for a variety of uses. There have been numerous significant studies on the environmental impact of fenitrothion since it was reported as a chemical in 1956. These studies include tests on man, cows, dogs, rats, rabbits, fish, birds, steers, and sheep. In a WHO program using fenitrothion as a residual insecticide in Kisumu, Kenya, only one mild case of intoxication was reported in 2000 man-days of spraying. Fenitrothion was applied widely as a residual spray in the Pakistan in 1981, and no intoxication problems with sprayer or villagers were reported.

As fenitrothion is a wide-spectrum insecticide, it is apt to kill a number of non-target organisms in the areas where it is used unless accurate operational techniques are adopted. This insecticide is highly toxic to bees, but as its primary use in malaria control is as an indoor residual spray, this should not cause environmental problems. Additional information on fenitrothion is available in various EA's prepared for other malaria control programs in Asia and Latin America (Haiti). (Pg. 67 - 71 of Sri Lanka EA, August 1977).

The project does foresee the use of larvivorous fish in the project as a supplemental biological control measure in mosquito control in selected areas. It is planned to use only indigenous fish for this purpose in the operation. There may be experimental use of non-indigenous larvivorous fish, but all such trials will be carefully controlled and cleared with GSL environmental offices.

In the previous EA of the Sri Lanka Malaria Program prepared in August 1977, the larvicide Abate (trademark) was not covered and a brief environmental review is included in this IEE to insure understanding of this compound. The larvicide, Abate, an organophosphate, may be used as a supplementary control measure during the life of the project in some focal locations during the drier periods of the year. This compound has been shown in studies to be low in toxicity if taken orally and applied dermally. Normal application concentrations of Abate in water under field conditions is about 0.5 ppm. Even if an adult were to drink the water treated directly and if 2 litres were consumed, the maximum amount of Abate imbibed daily would be about 1 mg. This compares with a dosage of 256 mg/man/day fed to human volunteers for 5 days and 64 mg/man/days for four weeks without clinical symptoms or side effects. Through the dermal route, Abate was found to be even less toxic. Abate has a short half-life, is not stored in the body, and produces no known chronic or residue effect. Abate offers little potential for harm to human health (Pg.244, AID, EIS).

III. Recommendation

In view of the above examination of the environmental issues of this project, it is recommended that a negative determination be made for this program.

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Environmental Impact Checklist

IMPACT IDENTIFICATION AND EVALUATION FORM

- N - No environmental impact
- L - Little environmental impact
- M - Moderate environmental impact
- H - High environmental impact
- U - Unknown environmental impact
- ± - Positive impact
- - Negative impact

Impact Areas and Sub-areas

A Land Use

- 1. Changing the character of the land through :
 - a. Increasing the population N
 - b. Extracting natural resources N
 - c. Land cleaning L
 - d. Changing soil character N
- 2. Altering natural defenses N
- 3. Foreclosing important uses N
- 4. Jeopardizing man or his works N
- 5. Other factors increase agricultural productivity L

B Water Quality

- 1. Physical state of water N
- 2. Chemical and biological states N
- 3. Biological balance N
- 4. Other factors

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IMPACT IDENTIFICATION AND EVALUATION FORM

C	<u>Atmosphere</u>	
	1. Air additives	<u>N</u>
	2. Air pollution	<u>L</u>
	3. Noise pollution	<u>N</u>
	4. Other factors	<u> </u>
D	<u>Natural Resources</u>	
	1. Diversion, altered use of water	<u>N</u>
	2. Irreversible, inefficient, commitments	<u>N</u>
	3. Other factors	<u> </u>
E	<u>Cultural</u>	
	1. Altering physical symbols	<u>N</u>
	2. Dilution of cultural traditions	<u>N</u>
	3. Other factors	<u> </u>
F	<u>Socioeconomic</u>	
	1. International impacts	<u>M</u>
	2. Change in population	<u>L</u>
	3. Changes in cultural patterns	<u>N</u>
	4. Other factors	<u> </u>
G	<u>Health</u>	
	1. Changing a natural environment	<u>L</u>
	2. Eliminating an ecosystem element	<u>N</u>
	3. Risk of intoxication of SNEM staff	<u>M</u>
	4. Other factors	<u> </u>

A SUMMARY OF OBSERVATIONS OF

INSECTICIDE HANDLING PROCEDURES IN SRI LANKA

Major attention was devoted to the question of health safeguards in the AMC field program. A review was made of the GSL guidelines for testing, handling, and storing insecticides and observed the actual practices in the field operation.

The findings and conclusions of this review are reported below as a part of the IEE.

1. Only insecticides meeting Environmental Protection Agency and A.I.D. specifications and standards are used in the project.
2. Procurement procedures do include testing of insecticides at the time of manufacture and at other important times as may be determined along the schedule leading to the application at the village level.
3. There is a concerted effort on the part of the GSL to store insecticides properly, not only at the regional level but also at health district and village levels. Field checks made on regional insecticide storage facilities during the course of preparing this PID indicated that stock control and warehousing practices were satisfactory. The regional warehousing reviewed were secure, well drained, with cement floors and walls which provided protection from rain and sun. Careful inspection was made of the residual insecticide containers which were stored in the warehouse. There were damaged boxes of insecticide, but generally speaking, the warehousing situation was satisfactory. The External Review Team (ERT) in May 1982 also reported that with only a few exceptions, warehouses were well-maintained and stores accurately accounted for. A.I.D.-supplied malathion was packed in clearly labelled boxes made of suitable fibre material. This packaging is consistent with A.I.D. specifications which will be followed in the Project. There is a detailed caution label on each box. The date of production, batch number, manufacturer's name and location, product name, and chemical breakdown are all on this label. Theft of organophosphorous (OP) insecticides is not common, and unauthorized use of this product should not be a problem in this program.
4. From the regional and/or health district warehouses, boxes are moved to village or spray unit locations just prior to spraying. Investigations made during the in-depth external evaluation in May 1982 indicated that temporary village stores were satisfactory for the short period of time that the insecticides are stored there. Every effort is made to use storage which is secure and which protects the insecticide from adverse weather conditions. Warehousing needs continual supervision but is considered adequate in the program.
5. Field teams using OP insecticides in the districts are given training in proper handling prior to each operational round. A chain of directives was reviewed starting at the AMC Headquarters and leading organizationally to regional and sub-regional malaria offices and to the spraying units. Circulars on malathion usage have been issued to all GSL district health officers from AMC Headquarters.

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6. A review of the protective equipment issued to each man was made. Each sprayman is given two sets of clothes which includes a set of gloves. Soap is issued for washing the clothes. Spraymen are instructed to wash frequently during the day and prior to smoking or eating. There were instances where protective clothing was not worn and corrective action was suggested.
7. Supervision of the teams is done by the National and Regional Malaria Officers, and Public Health Inspectors. Spraymen may work a six-day week in the operation season, but if signs of depressed cholinesterase appear, spraymen are assigned to other duties.
8. A review of the AMC cholinesterase testing procedures was done during the preparation of this IGE. The Regional Malaria Officers confirmed that cholinesterase testing is done on each sprayman and supervisor prior to the initiation of spraying primarily in order to screen out persons who have abnormally low cholinesterase levels at the outset. Those persons so identified would either not be hired or be assigned to duties not associated with spraying. During the 1982 operation, all spray personnel were reported as having been checked. All personnel engaged in the operation receive training on insecticide management and safety. In 1982, no incidences of insecticide intoxication were reported by the AMC.

jb

Narrative Summary

Objectively Verifiable
Indicators

Means of Verification

Important Assumptions

Program or Sector Goal:
The broader objective
to which this project
contribution: (A-1)

To reduce morbidity and
mortality from endemic
diseases.

1. Reduction of malaria
hospitalization rate from
287.8 per 100,000 population
in 1982 (13th ranking cause)
to fewer than 100 per
100,000 population by EOP.
Reduce malaria mortality
from 32 reported in 1982
from hospital data (None
confirmed by AMC) to near
zero by EOP.

Evaluation of statistics
from the Registrar
General, Dept. of Census
and Statistics, Ministry
of Health and other
health organizations
both-public and private.
Reports from MOH, WHO.

- Sustained economic growth
to support national health
services.
- Continued GSL commitment
to supporting its health
services.
- Continued support by WHO.

LOGISTIC FRAMEWORK

Annex II, p.1

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Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<p><u>Project Purpose (B-1_)</u> (higher level purpose) To control the incidence of malaria.</p>	<p>Reduction of malaria to 35,000 or fewer total cases annually by 1987.</p>	<p>AMC surveillance records, case records of public and private hospitals, health posts and centers, validated by: annual multi-donor assessments, AID mid-term and EOP evaluations, and continuous monitoring by long and short-term advisors.</p>	<ol style="list-style-type: none"> 1. Continuing GSL priority given to anti-malarial activities. 2. Adequate GSL budgetary support.
<p>(lower level) To improve the effectiveness of insecticide spray operations institutionalize effective surveillance and introduce alternative malaria control activities which minimize the need for house spraying with insecticides.</p>	<ol style="list-style-type: none"> 1. AMC fully and properly staffed and effectively operating to maintain continuing malaria surveillance and control. 2. Increased local involvement and cooperation with other GSL institutions. 3. 3500 Volunteer Treatment Centers (VTC) in place. 4. Inter-Ministerial Malaria Council functioning. 5. Four vector control and/or other auxiliary or substitute methods for house spraying tested and, where applicable, implemented. 	<p>Same as above, plus AMC annual report.</p>	<p>Research within Sri Lanka and world-wide will define appropriate alternative methodologies to provide viable operational methods for control of malaria.</p> <p>Major malaria epidemic does not occur.</p>

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions															
<p><u>Project Output (C-1)</u></p> <p>1. House spraying with residual insecticides targetted and stratified to provide coverage where and when needed so that total insecticide spraying is reduced.</p>	<p>Reduction of perennial and seasonal spray areas and increase in non-spray or focal spray areas as follows:</p> <table border="1" data-bbox="877 415 1220 540"> <thead> <tr> <th>Area</th> <th>1982</th> <th>EOP</th> </tr> </thead> <tbody> <tr> <td>Perennial</td> <td>26</td> <td>13</td> </tr> <tr> <td>Seasonal</td> <td>39</td> <td>29</td> </tr> <tr> <td>Non or Focal</td> <td>42</td> <td>65</td> </tr> <tr> <td></td> <td>107</td> <td>107</td> </tr> </tbody> </table>	Area	1982	EOP	Perennial	26	13	Seasonal	39	29	Non or Focal	42	65		107	107	<p>1. AMC annual report. 2. Annual multi-donor assessment of operations. 3. Mid-term and EOP AID evaluations. 4. On-going monitoring by long and short-term advisors.</p>	<p>1. Continued availability of residual insecticides effective against the vector. 2. Implementation capacities exist for alternative control methodologies. 3. Household acceptance of insecticide spraying will improve through health education and community involvement.</p>
Area	1982	EOP																
Perennial	26	13																
Seasonal	39	29																
Non or Focal	42	65																
	107	107																
<p>2. Functioning, effective and continuous epidemiological, parasitological, and entomological surveillance system capable of collection and rapid analysis of valid data and fast reporting of developing foci.</p>	<p>1. All PCD slides are examined and reported by AMC to concerned Health Institutions within 5 - 10 days of collection. 2. All slides from malaria volunteers are examined by AMC and reported to the VTC within 10 days. 3. Increase ACD Agentes to 536 by EOP. 4. Resistance tests on A. Culicifaces adults completed each year in 75% or more health areas. 5. Minimum of 125 resistance tests completed each year against other Anopheles species and other candidate insecticides. 6. Minimum of 3 intensive field investigations for parasite resistance to drugs each year. 7. Minimum of 8 research studies in progress to improve existing and/or evaluate new control methods. (continued)</p>	<p>Same as above.</p>	<p>1. Available trained staff. 2. Malaria education improved in public and private sectors. 3. MOH actively participates. 4. Radio communication network approved by GSI. 5. Suitable computer systems can be identified or developed.</p>															

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
	(continued) 8. Existing regional laboratory capacity increased from 7 to 16 by EOP. 9. Two Entomology Assistants generally available in all regions by EOP. 10. Radio communications net (17 sets) between regions and AMC headquarters in place by end of 1985. 11. Micro-computer and data storage and retrieval systems in place with 2 trained operators by end of 1985.		
3. Effective vector control program in place in pilot areas to replace house spraying.	1. Operational implementation of at least 2 projects to test feasibility of replacement of house-spraying with alternative control methods in representative areas by EOP. 2. Seven research projects to test various methods of vector control under Sri Lankan ecological conditions completed by EOP. 3. Continuing vector census systems installed in each region.	Same as above.	Suitable methodology available which can be adapted to Sri Lankan conditions.
4. Effective presumptive, prophylactic, and radical drug treatment systems in place and responsive to surveillance data.	1. Increase in A.B.E.R. to 10% by EOP. 2. Research projects initiated in side-effects, acceptance rate G 6PD associated problems by EOP. 3. Radical treatment initiated within maximum of 14 days after blood sampling.	Same as above.	Anti-malaria drugs are available which continue to be effective against existing parasites.

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<p>5. Malaria education and information program in place and serving all levels of AMC, MOH informers, educators and potential beneficiaries.</p>	<ol style="list-style-type: none"> 1. Three annual workshops and seminars completed and publicized. 2. Appropriate information materials designed (by end of first year), printed and distributed to all malarious areas by end of 18 months. 3. Appropriate educational presentations initiated in 65 malarious areas. 4. Sociological and market research to design and test motivational programs completed by end of 2nd year. 5. Twelve or more annual media placements for informing and educating the public. 	<p>Same as above.</p>	<p>Technical and creative skills locally exist for design and production of IEC materials.</p>
<p>6. Revised, intensified and continuing training programs for staffs of AMC and other relevant institutions.</p>	<ol style="list-style-type: none"> 1. Three annual seminars and workshops covering all phases of malaria control completed by EOP. 2. Included in annual seminars and all AMC training courses is component on social marketing (i.e. social, cultural and behavioral skills necessary to induce changes in behavior). 3. U.S. short-term training of top-level medical and entomology personnel in vector control as applied to malaria control: 2 per year for 6 by EOP. 4. Out of country, in-region training of mid-level personnel: 30 by EOP. 5. Reduction of the one-year initial training required for microscopists to the three months relevant to malaria diagnosis in order to fill the vacant positions ASAP, with remaining nine months required for general lab techni- <p>(continued)</p>	<p>Same as above.</p>	<ol style="list-style-type: none"> 1. Necessary Cabinet-level support available. 2. Appropriate candidates can be identified and cleared. 3. Suitable courses on malaria control will be available in the Asia region.

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
	<p>(continued) cians to be provided at a later date. 6. Initiation of special courses in vector control, first for entomological staff, later for all AMC personnel, and finally for personnel of other institutions and community development groups: 6 courses by EOP.</p>		
<p>7. Effective program planning, management and evaluation.</p>	<ol style="list-style-type: none"> 1. Yearly Plan of Action prepared and approved. 2. Existing Plan of Operations is revised in 1984 and Plan of Operations for 1987-91 prepared by end of 1986. 3. Evaluations completed in 1984, 85 and 86. 4. AID mid-term (18 month) and final EOP evaluations completed. 5. Indicators for outputs 1 through 6 achieved in timely, effective manner. 	<p>Same as above.</p>	<p>GSL priority for malaria control continues.</p>

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Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<u>Project Inputs (D-1)</u>			
<u>Government of Sri Lanka (GSL)</u>	<u>GSL</u>	<u>GSL</u>	<u>GSL</u>
<ul style="list-style-type: none"> 1. Adequate funds for AMC operations over LOP, including purchase of insecticide not provided by AID, with plans for continuing support after termination of AID assistance. 2. Adequate personnel staffing for AMC. 3. Adequate facilities for AMC through in-kind support of other GSL health institutions. 	<ul style="list-style-type: none"> 1. GSL budgets \$14.33 million (1982 Rs. equivalent) and funds delivered to AMC as required. 2. Approved Plan of Operations exists over LOP. 3. 21% current AMC vacancies reduced to below 5% by EOP and key vacancies (RMOs and central managerial staff) reduced to near zero by 1985. 	<ul style="list-style-type: none"> 1. Annual GSL/MOH budget, and AMC budget/fund availability. 2. Staffing lists. 3. Field visitations. 4. Provision of support for AMC in national planning documents. 	<p>Adequate political and executive support for the malaria control program.</p>
<u>AID</u>	<u>USAID</u>	<u>USAID</u>	<u>USAID</u>
<ul style="list-style-type: none"> Training Operational research Pilot projects Education/information Planning, management and evaluation Technical assistance Regional laboratories Contingencies/inflation Insecticide Multi-donor reviews AID evaluations Total 	<ul style="list-style-type: none"> 1. \$ 340,000 2. 240,000 3. 150,000 4. 115,000 5. 260,000 6. 1,130,000 7. 100,000 8. 1,505,000 9. 10,000,000 10. 80,000 11. 80,000 \$14,000,000 	<ul style="list-style-type: none"> 1. Trained AMC staff 2. OR project documentation 3. Pilot project documents 4. Education programs in field 5. Effective management information system and improved operations. 6. Consultations occur as scheduled. 7. Lab capacities exist. 8. NA 9. TA and backup provided 10. Receiving reports 	<p>Availability of adequate funds</p>
<u>World Health Organization (WHO)</u>	<u>WHO</u>	<u>WHO</u>	<u>WHO</u>
<ul style="list-style-type: none"> 1. Six person years of advisors/consultants. 2. Limited commodity support and training support. 	<ul style="list-style-type: none"> 1. Advisors/consultants \$600,000. 2. Commodities/training \$90,000. 	<p>Presence of WHO advisors and WHO documentation, both in Sri Lanka and WHO/SEARO.</p>	<p>WHO budget projections are realized.</p>
<u>Other Donor</u>			
<ul style="list-style-type: none"> 1. Government of Japan-vehicles 	<ul style="list-style-type: none"> 1. \$300,000 (under negotiation) 	<ul style="list-style-type: none"> 1. vehicles arrive 	<ul style="list-style-type: none"> 1. Negotiations successful

Epidemiological background 1968-1982

Year	Number of slides ... examined	Number of cases (positive slides)	Percent of positive slides	Percent of all cases that were <u>P. falciparum</u>
1968	1,681,052	440,644	26.2	0.2
1969	1,466,467	537,705	37.1	0.7
1970	1,500,414	488,202	31.2	0.3
1971	1,371,465	145,368	10.5	2.7
1972	1,545,700	132,604	8.6	2.6
1973	1,455,572	227,713	15.6	4.2
1974	1,423,000	315,448	22.2	8.3
1975	1,492,008	400,777	26.9	15.9
1976	1,408,644	304,487	21.6	6.2
1977	954,756	262,460	27.2	4.1
1978	968,327	69,685	* 7.2	2.7
1979	1,001,216	48,004	4.8	2.8
1980	803,692	47,949	6.0	3.1
1981	892,143	47,383	5.3	2.6
1982	1,166,171	38,566	3.3	4.2
1983	** (first 4 months)	21,853	-	5.0

* The sharp drop in the slide positivity rate in the last five years is difficult to explain in view of the fact that most blood films are taken from persons who complain of fever.

** Early 1983 figures may indicate the beginning of an upward trend

The national API (number of cases per 1000 of population) was 2.5 in 1982

<u>API</u>	<u>Number of M.O.H. districts</u>	<u>Average A.P.I.</u>
above 10.0	10	15.5
3.1 - 10.0	11	6.2
2.1 - 3.0	4	2.4
1.1 - 2.0	24	1.4
below 1.1	36	0.3
non malarious	<u>23</u>	<u>0.0</u>
Total	108	2.5

The constant shift of disease incidence is demonstrated by the fact that in 1980 there were 14 areas with an API above 10.0. In 1982, 4 of these regions remained above 10.0, and 6 new areas had risen to the greater than 10.0 API category.

The 1982 AMC report showed a 25 percent increase in the number of cases of *P. falciparum*.

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Needed Operational Research Studies

I. Those projects which will enhance present epidemiological, surveillance and control functions.

A. Parasitological

- *1. Development of serologic methods for epidemiologic and surveillance applications.
- *2. Sensitivity of P. falciparum to drug therapy, 4-aminoquinolines and alternative drugs, i.e. Fansidar using in-vitro testing. (25 micro tests conducted in 1981).
- *3 Sensitivity of P. falciparum to Chloroquine by in-vivo testing of hospitalized patients.
- *4 Relapse rate of treated P. vivax cases, testing different treatment regimes by films and by serum antibody monitoring.
- *5 Control by Chemo-prophylaxis without insecticide.
- *6 Control by rigorously applied presumptive treatment only.
- *7 Control by combined prophylaxis/insecticide use.

B. Genetic

- 1. Clarification of degree of existence of G-6 P.D. deficiency by regions, social grouping etc.
- *2. Correlation (if any) between G 6 P.D. deficiency, Primaquine and development of hemolysis, with reference to dosage administered.

C. Entomologic

- *1. Appraisal for a significant difference in transmission between seasonal and perennial spraying in areas presently designated as perennial - with variables of intensive surveillance, treatment and acceptance factors.
- 2. Screening of indigenous species other than Anopheles culicifacies as potential malaria vectors.

3. Determination of infective rate of A. culicifacies by methods other than dissection, i.e., radio-active immuno assay method - concentration sporozite count.
4. Resting place preference of A. culicifacies for different types of surfaces.
- *5. Confirmation of suspected insecticide resistance when there is survival of more than 30 minutes with 5% impregnation by studying.
 - the adult, its progeny, (insectary) repeat testing, expanding to neighbouring areas for specimens;
 - testing of testing materials and testing methods for potency etc.
- *6 Search for a pesticide - (bed bugs, cockroaches) that could be
 - (1) mixed into malathion;
 - (2) independently applied by sprayers during a household spray operation. Study effect of the procedure on acceptance rate.
- *7 Trials with existing and newly developing insecticides, evaluation for resistance by Anopheles; length of effectiveness on sprayed areas, toxicity to spraymen, household occupants; damage to spray equipment and household contents. Computation of cost-benefit ratios.
8. Establishment of "discriminating dosages".
9. Field trials of feasibility of substituting source reduction and larvaciding for house-spraying under various conditions.

D. Immunologic studies

- *1 Evaluation of newly developed and established methods of ascertaining infection in humans by serologic methods i.e. IFA, RIA, ELISA with a view to incorporate methods to,
 - (1) use as an epidemiologic tool;
 - (2) assess relapse phenomena in P. vivax.

.E. Socio-Economic-Cultural

- *1 To study variables that influence -
 - (1) participation in control or treatment programs;
 - (2) consequences of malaria infection - morbidity, associated nutritional and health problems;
 - (3) motivational improvements;
 - (4) economic consequences of malaria.

II. Those projects designed to test alternative methods of malaria control under local conditions.

A. Bio-environmental control of vectors.

- *1. Bacillus Thuringiensis - production and utilization
- *2. Larvivorous fish - most effective, durable and available types.
 - methods of production and utilization
- *3 Selective larvicide techniques - frequency, components i.e. Abate, micro-layer foam. Method of distribution, best areas for application.
- 4 Periodic flushing of irrigation system waterways.
- *5. Cleaning away vegetation, including weed-eating fish.
- *6. Nematode use for larval control.
- *7. Community participation projects - drainage, clearing, larva skimming, larviciding etc.

B. Entomologic

- 4 Implications of agricultural use of insecticides on vector population and vector resistance.

Cytogenetic studies of A. culicifacies with reference to resistance development potential.

C. Mechanical

- *1. River flow and meteorological data as an early warning system for the detection of malaria epidemics.
- *2. Community vector control
 - source reduction practices applicable through community participation - e.g., Sarvodaya program.
- 3. Study of water usage patterns and possibility for use of water level control as a vector control measure.

* Indicates high priority projects.

Preliminary Job Description for Long Term
Epidemiologist/Project Coordinator

I. Technical Responsibilities

Assist the AMC in

- A. Tracking progress of the epidemiological status of malaria
- B. Planning AMC activities related to
 - epidemiology
 - surveillance - entomological and parasitic.
 - drug treatment
 - in-country and out-of-country training
 - commodity needs and use
 - logistics - vehicles, equipment, buildings
 - new operational support research projects
 - operational assessment programs
 - institutional changes
 - safety procedures
 - community participation programs
 - inter-institutional coordination and collaboration
 - institutionalization of relations between AMC and other MOH divisions
- C. Overseeing operational research and pilot projects

II. Coordination Responsibilities

- A. Plan and make necessary arrangements for, in collaboration with AMC and USAID, the project inputs provided under AID-funding.
- B. Handle in-country logistics required for utilization of AID-funded inputs.

- C. Prepare documentation and obtain needed approvals related to AID-funded inputs as required.
- D. Keep USAID and AMC informed of the status of the project through both written and oral reports.
- E. Serve as liaison between USAID and AMC.

PRELIMINARY JOB DESCRIPTION FOR LONG TERM
VECTOR CONTROL SPECIALIST/MALARIOLOGIST.

1. Organization of vector population surveillance system
 - a. Training of AMC personnel in vector census techniques
 - b. Assistance with recruitment and training of volunteer vector census-takers

2. Assisting AMC vector control activities
 - a. Training of AMC personnel in vector control techniques
 - b. Assistance in establishing a system of community involvement in vector control

3. Training
 - a. As above
 - b. Assisting and advising re training of other MOH personnel
 - c. Planning and assisting with out-of-country training plan, including selection, briefing, and de-briefing of candidates.

4. Research
 - a. Advising and assisting AMC personnel in the choice of projects to be carried out in-house, in cooperation with other Sri Lankan institutions, and with the help of short-term consultants.
 - b. Assistance to any of the above in preparing protocols.
 - c. Monitoring progress of research projects.

5. Use of Short-term Consultants
 - a. Assist AMC and AID in establishing priorities and selection of consultants
 - b. Briefing and assisting consultants

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6. Programming

- a. Assistance to both AID and AMC in preparation of plans of action and programming documents.
- b. Preparation of periodic reports on progress

7. Commodities

- a. Assistance to AMC in determining requirements and to AID in preparation of PIO/C's, etc.

8. Management

- a. Assistance to AMC in fields of personnel management, logistics, transport, communications, etc.,
- b. Assistance with the institutional changes required by the shift from house-spraying to vector control as the major means of attack.

9. Coordination

- AMC - Other sectors of MOH or other Ministries, Sarovodaya program, Mahaweli Authority, Universities, etc.,

AMC CIRCULAR No. 267

Office of the Superintendent,
Anti-Malaria Campaign,
Colombo 5, 26th, Oct., 1982.

MALARIA CHEMOTHERAPY

There have been inquiries from the periphery about the different types of treatment recommended under various circumstances in the Malaria Control Programme. These are as follows :-

RADICAL TREATMENT :

This is administered to all clinical and suspected cases of malaria at the time of blood-filming and to all microscopically confirmed cases.

A combination of chloroquine or amodiaquine and primaquine will act on all stages of the parasite in both *P. falciparum* and *P. vivax* malaria resulting in a radical cure. (It is best not to administer primaquine during the active phase of the disease. Please see page (4) for details.)

The recommended regime is as follows :-

TABLE I - CHLOROQUINE & PRIMAQUINE
(is expressed as mgs. of base)

DAY	DRUGS	UNDER 1 YEAR	1 - 5 YEARS	6 -10 YEARS	11-15 YEARS	OVER 15 YEARS
1	CHLOROQUINE	75	150+75	300+150	450+225	600+300
	PRIMAQUINE	-	3.75	7.5	11.25	15
2	CHLOROQUINE	37.5	75	150	225	300
	PRIMAQUINE	-	3.75	7.5	11.25	15
3	CHLOROQUINE	37.5	75	150	225	300
	PRIMAQUINE	-	3.75	7.5	11.25	15
4	CHLOROQUINE	-	-	-	-	-
	PRIMAQUINE	-	3.75	7.5	11.25	15
5	CHLOROQUINE	-	-	-	-	-
	PRIMAQUINE	-	3.75	7.5	11.25	15

Please note on day 1 Chloroquine is given in divided doses for ages above 1 year. The first dose is the loading dose and the other is the second dose following loading dose after 6 hours.

- 2 -

TABLE 2 - AMODIAQUINE AND PRIMAQUINE
(is expressed as mgs. of base)

DAY	DRUGS	UNDER 1 YR.	1 - 5 YEARS	6 -10 YEARS	11-15 YEARS	OVER 15 YRS
1	AMODIAQUINE	50	150	300	400	600
	PRIMAQUINE	-	3.75	7.5	11.25	15
2	AMODIAQUINE	50	100	200	200	400
	PRIMAQUINE	-	3.75	7.5	7.5	15
3	AMODIAQUINE	50	100	200	200	400
	PRIMAQUINE	-	3.75	7.5	7.5	15
4	AMODIAQUINE	-	-	-	-	-
	PRIMAQUINE	-	3.75	7.5	7.5	15
5	AMODIAQUINE	-	-	-	-	-
	PRIMAQUINE	-	3.75	7.5	7.5	15

CHILDREN UNDER ONE YEAR AND PREGNANT MOTHERS SHOULD NOT BE GIVEN PRIMAQUINE. ANTI-MALARIAL DRUGS SHOULD PREFERABLY NOT BE GIVEN ON AN EMPTY STOMACH.

PRESUMPTIVE TREATMENT :

This is the treatment given to a person who is presumed to have or suspected of having malaria. The objective of presumptive treatment is to relieve symptoms and prevent transmission until the diagnosis is confirmed when radical treatment (Table 1 or 2) can begin.

A blood-film should be taken from all such cases before administration of anti-malarial drugs. If the examination of the blood-film confirms the diagnosis, action should be taken to contact the patient and start Radical Treatment.

TABLE 3 - CHLOROQUINE/AMODIAQUINE AND PRIMAQUINE
(is expressed as mgs. base)

DRUG	Under 1 Year	1 - 5 Years	6 -10 Years	11 - 15 Years	Over 15 Years
CHLOROQUINE OR AMODIAQUINE	75 mg	150	225	450	600
	100 mg	150	200	400	600
PRIMAQUINE	-	7.5	15.0	22.5	45.0

MASS DRUG ADMINISTRATION :

It is indicated in areas where there are focal malaria outbreaks or epidemics, in addition to insecticide spraying and other measures, but it is not a substitute for proper spraying.

TABLE 4 - MASS DRUG ADMINISTRATION
(is expressed as mgs. of base)

DRUG	1 - 5 Years	6 -10 Years	11-15 Years	Over 15 Years
CHLOROQUINE OR AMODIAQUINE	75	150	300	450
PRIMAQUINE	3.75	7.5	15	30

Children under one year and expectant mothers are not treated.

PROPHYLACTIC TREATMENT :

Prophylaxis or suppression aims at early action on erythrocytic forms when they are released by the primary tissue forms. Administration of the suppressive drug should continue as long as the person stays in the malarious area and continue for a month on returning to the non-malarious area.

Prophylactic/suppressive treatment is given as general protection to groups of persons or individuals living in malarious areas for short or long periods and to individuals who go to malarious areas for a short period.

It is necessary that the person should start taking the treatment the day before entering the malarious area and continue it weekly during the stay there and continue taking anti-malarial drugs for a further period of 4 weeks on returning to non-malarious areas.

Chloroquine or amodiaquine is recommended to be taken weekly,

TABLE 5 - CHLOROQUINE OR AMODIAQUINE
(is expressed as mgs. of base)

DRUG	UNDER 1 Yr.	1 - 5 Years	6 -10 Years	11-15 Years	OVER 15 Yrs.
CHLOROQUINE	37.5	75	150	225	300
AMODIAQUINE	50	100	200	300	400

MASS RADICAL TREATMENT :

Is useful where the area is very well localised with small numbers of people involved, if the operation is to be effective. Movement of people adds to the difficulty of supervising this form of drug distribution.

TABLE 6 - MASS RADICAL TREATMENT- CHLOROQUINE & PRIMAQUINE
(is expressed as mgs. of base)

DAY	DRUGS	1 - 5 Years	6 -10 Years	11-15 Years	Over 15 Years
1	CHLOROQUINE	150	200	300	450
	PRIMAQUINE	3.75	7.5	11.25	15
2	CHLOROQUINE	75	150	225	450
	PRIMAQUINE	3.75	7.5	11.25	15
3	CHLOROQUINE	75	150	225	450
	PRIMAQUINE	3.75	7.5	11.25	15
4	PRIMAQUINE	3.75	7.5	11.25	15
5	PRIMAQUINE	3.75	7.5	11.25	15

- 5 -

TABLE 7 MASS RADICAL TREATMENT - AMODIAQUINE & PRIMAQUINE
(is expressed as mgs. of base)

DAY	DRUGS	1-5 Years	6-10 Years	11-15 Years	OVER 15 Years
1	AMODIAQUINE	100	200	300	400
	PRIMAQUINE	3.75	7.5	11.25	15
2	AMODIAQUINE	50	100	200	400
	PRIMAQUINE	3.75	7.5	11.25	15
3	AMODIAQUINE	50	100	200	400
	PRIMAQUINE	3.75	7.5	11.25	15
4	PRIMAQUINE	3.75	7.5	11.25	15
5	PRIMAQUINE	3.75	7.5	11.25	15

DRUGS :

The anti-malarial drugs commonly available at Government Medical Institutions and at Anti-Malaria Campaign centres at present are -

1. CHLOROQUINE - tablets containing 250 mg chloroquine phosphate, corresponding to 150 mg chloroquine base.
2. AMODIAQUINE - tablets containing 250 mg amodiaquine dihydro chloride dihydrate corresponding to 200 mg amodiaquine base.
3. PRIMAQUINE - tablets containing 11.25 mg primaquine phosphate, corresponding to 7.5 mg primaquine base.
4. PYRIMETHAMINE - tablets of 25 mg pyrimethamine.

DOSAGE FOR CHILDREN :

The dosage stated in this circular is a general dosage schedule. Body weight is probably the best and simplest guide to the dosage in children.

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An undersized child of any age group should preferably be given the dosage corresponding to the next lower age group, and an oversized child the dosage corresponding to the next higher age group.

Generally the Table given below is a rough guide -

TABLE 8 DOSAGE SCHEDULE FOR CHILDREN

UNDER 1 Year	1 - 3 Years	4 - 6 Years	7 - 11 Years	12-15 Years
1/10 - 1/8	1/8 - 1/6	1/4	1/3 - 1/2	1/2 - 3/4
of	of	of	of	of
adult dose but No Prima- quine	adult dose	adult dose	adult dose	adult dose

When Primaquine is given together with Chloroquine or Amodiaquins their combined effects may induce vomiting of both the drugs. Therefore, it is desirable when possible, treatment with primaquine not be initiated until the acute manifestations of the disease have been brought under control. (This recommendation is supported by the observation that primaquine may be immuno suppressive and precipitate haemolysis.) A course of primaquine is best commenced, therefore, as soon as the severe symptoms begin to subside. In Pavivax malaria this is usually the day following completion of chloroquine. However, under field conditions where the patient is available for treatment during the acute phase of illness, primaquine should be given immediately and continued for five days together with chloroquine for the first three days.

All Circulars on treatment issued prior to this becomes inoperative.

Pyrethamine (Daraprim) should not be used in any regime without the consent of the S/AMC until further orders. A further circular will be issued in respect of pyrethamine and its use in long-term prophylaxis in due course.

cc:- D.H.S.
DD(PHS).
S.H.SS.
Heads of Institutions.

K Sanyal AMC
S/AMC.

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COMMUNITY-PARTICIPATION IN ANTI-MALARIA CONTROL (CAMC)A Sample Proposal for a Special Plan of Action for CAMC

- A. Main Purposes of the Plan: To make the community realize that
1. Malaria has been and will continue to be a 'problem disease' of the people.
 2. To combat it, the interested effort and direct involvement of the community in the target areas are essential;
 3. A continuous and regular course of action for all households following a self-reliant, sustained and systematic plan is essential.
- B. Strategies of the Action-Programme
1. The AMC in each region will form an Advisory Board consisting of representatives from Government and non-Government Agencies involved in development work in the area.
 2. Sufficient publicity work will be organized through the mass-media, distribution of posters and hand-outs, and by conducting talks at religious places, schools, rural development societies, community centres, etc. (It is necessary that a special unit with health, education and mass-communication personnel be formed to advise on content and format of materials).
 3. Through the Sub-Regions (SRO), Community Vigilance Units (CVU) will be formed in the target areas to help in implementing the program. Volunteers for each CVU (about 5 in number) can be selected at a special discussion organized through a recognized institution in the area - e.g. a school, temple, a NGO working successfully.
 4. The AMC/SRO can set apart a suitable community-oriented Field Assistant or an experienced Sprayer Operator to be the convenor of the CVU and liaise with the SRO.

Action - Program

1. An Advisory Body will be formed in each RMO consisting of personnel in Government and non-Government Agencies working in the areas of health, education, rural development, land settlement departments, rural development society, community centre, parent-teacher associations, Ayurvedic Physicians and other opinion leaders.
2. The Advisory Board will work out a pilot scheme involving about 5 villages or sub-urban areas in each SRO to launch the activity. In each village, special open discussion should be organized with an audio-visual presentation or a special talk by an accepted and credible person, and all householders should be coaxed to attend. A volunteer force of about 5 members can be selected by the householders to form the primary CVU (Community Vigilance Unit) - the selections should be unanimously decided by the people.
3. The SRO will organize 3 to 4 day residential training camps in each village in a school for example - for the CVU members. The field assistants and experienced spray operators selected to support the work of the CVU, full time, need special orientation prior to the training workshop for the CVU.
4. Assisted by the FA/AMC worker, the CVU will assist in organizing the suggested program of work of the AMC on spraying, surveillance, treatment, vector control, household preparation and participation and information/education.

It is essential that the community be motivated to realize that AMC work is for their benefit and they should share the responsibility. For this purpose, the community should always be consulted not merely informed. For example where spraying is essential, the plan indicating the target houses, spray times and schedules, household preparation and the work styles of the spray operators should be made known to the CVU and their consent should be requested.

5. A special individual from each CVU acceptable to the people should be enlisted for a special training course in malaria control work at the RMO. The people selected should be the more qualified and experienced opinion leaders in the CVU - say a Head-Teacher, Ayurvedic Physician, Gramodaya Representative, etc. On their return these persons can help guide the CVU members toward a better course of action.

6. A scheme should be drawn up to recognize the work of the members of outstanding CU's and successful activities should be highlighted in the mass-media. Special letters/certificates of recommendation from health personnel (e.g. District Medical Officer's letter offers special treatment at medical institutions), or Members of Parliament, Cabinet Ministers etc. will maintain the morale of the CVU members and keep the CVU going as a permanent, self-sustaining institution.

Where CVU members show lack of interest, replacement may be necessary at the early stages.

7. Each RMO/SRO will need minimal funds to meet the out-of-pocket expenses of CVU members who attend meetings out of their area. Funds for refreshments should also be provided for local CVU meetings.

Evaluation and Expansion

At the end of about 6 months, each CVU pilot program should be evaluated by the RMO, amended where necessary or developed for further multiplication.

Proposed Training and H/E Courses in Anti-Malaria
Operations for the Period 1983-1987

Inservice Training

<u>Category of Trainees</u>	<u>No. of Courses</u>	<u>No. to be Trained</u>	<u>Training Staff</u>
01. Public Health			National &
Inspector (Annually)	04	100	W.H.O. staff
02. Medical Officers of			National &
Health (Annually)	02	50	W.H.O. staff
03. District Medical			
Officers (Annually)	02	50	-do-
04. Assistant Medical			
Practitioners			
(Annually)	02	50	-do-
05. Public Health			
Midwives (Annually)	04	100	-do-
06. Medical Student			
(Annually)	02	150	-do-
07. Ayurvedic Medical			
Practitioners			
(Annually)	02	50	-do-
08. Public Health			
Nurses (Annually)	02	50	-do-
09. Health Educators			
	02	50	-do-

Field Programme - Decentralized Level

<u>Category of Trainees</u>	<u>No. of Courses</u>	<u>No. to be Trained</u>	<u>Training Staff</u>
01. Field Assistant (Annually)	06	300	Regional staff & central staff
02. Spray Machine Operators (Annually)	06	300	Regional staff & central staff
03. School Children	06	300	-do-
04. Agricultural Officers (Annually)	03	150	-do-
05. Irrigation Officers (Annually)	03	150	-do-
06. Rural Development Officers (Annually)	04	300	-do-
07. Voluntary Organization Officers (Annually)	04	200	-do-
08. Colonization Officers (Annually)	02	400	-do-
09. Coorporative Officers (Annually)	04	200	-do-

Annex III - H

Minimal list of
Operational Assessment Activities

1. Insecticiding

1.1 Spray "coverage" - does this term given as a percentage give sufficient information

- are the acceptors and refusers consistently the same households
- is time taken to educate and explain
- how does population perceive the program
- does the term covered - uncovered houses given enough detail on the area, village or region

1.2 Spray safety

sprayers - clothing

- methods

- cholinesterase checks - schedule maintenance

- appropriate reaction to low levels

recipients - exposure - person, food

1.3 Spray timing

are applications timed correctly with seasonal risks

1.4 Stratification status

- are proper criteria being applied for classification

- is this reviewed at reasonable intervals

1.5 Training

- spot appraisals of quality and method of spray procedure

2. Surveillance - and control - parasitological
 - 2.1 Special follow up for P.falciparum cases
 - time of follow up
 - investigation procedures followed
 - time of report of positive film to region, to F.A.
 - 2.2 Follow up procedures re positive smear results
P.vivax or P.falciparum
 - completion of treatment
 - investigation of transmission factors
 - 2.3 Geographic reconnaissance measures
 - completeness
 - flexibility to handle new areas, new migrants
 - 2.4 Spot checks re efficiency of
ACD
APCD
 - 2.5 Epidemics/Outbreaks
 - emergency reserve operational capacity
 - interregional or regional/central correlated action potential
 - time frame from first advice to positive response
3. Surveillance - entomological
 1. Routine operational procedures - regularity and reliability
 2. Notifiable findings - time from discovery to appropriate response
 3. Compliance with procedure standards when any test suggests possible insecticide resistance.

4. Treatment

4.1 Is treatment plan consistent and uniformly carried out by all "treaters",VHW,FA ACD,FA APCD etc

4.2 Quality of drugs - there is a suggestion variable amounts of chloroquine base per tablet- methods for random testing

4.3 Compliance rate for prescribed treatment when left to the individual

5. Laboratory

1. Average time from receipt to reporting

2. Maintaining adequate cross-checking structure, present goals are satisfactory

6. Training

1. Is established schedule of training at all levels being monitored

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Annex III- I

Projected population at risk of malaria infection
1983 - 1990

(midyear populations in thousands)

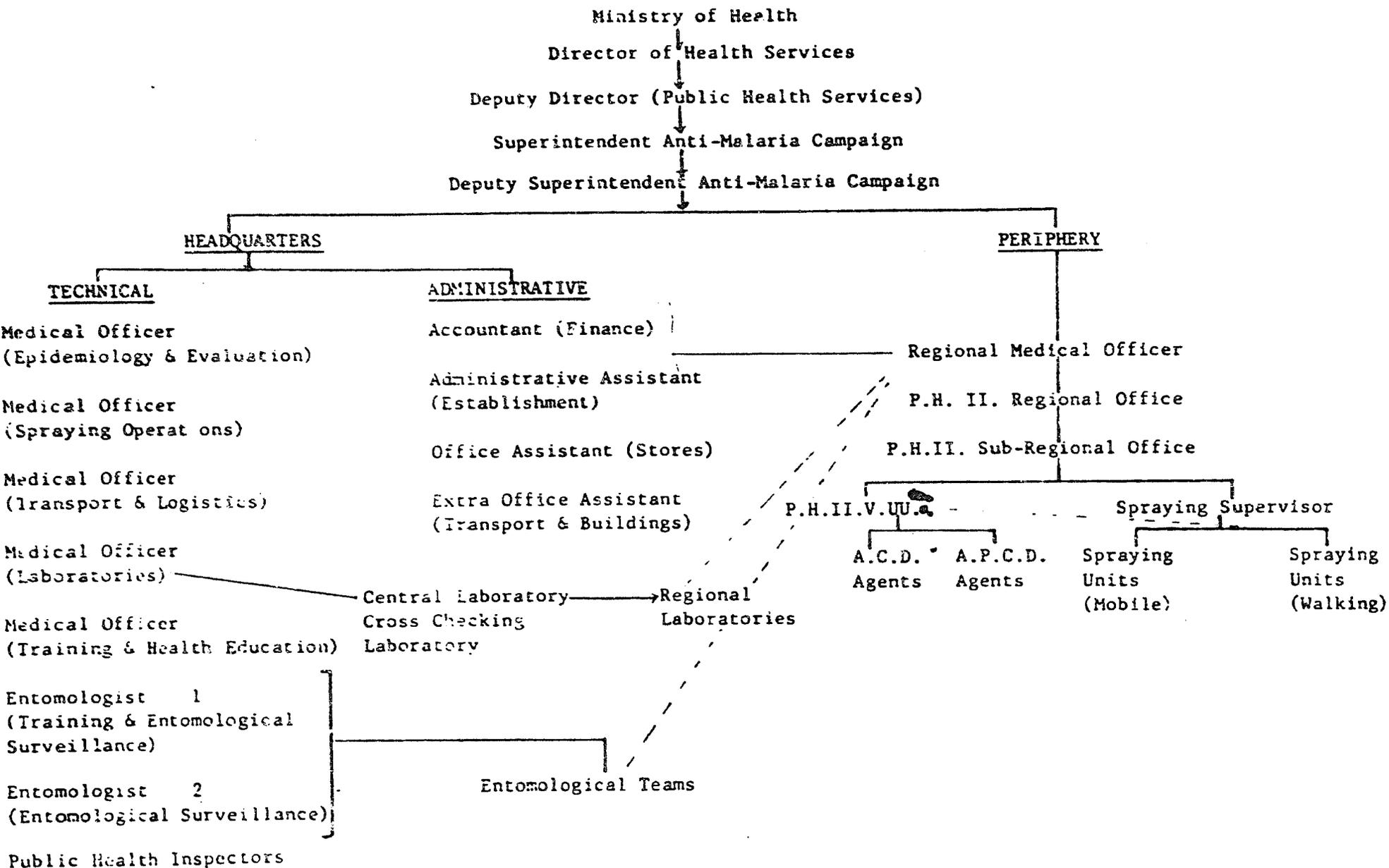
<u>Year</u>	<u>Total Population</u>	<u>Population at Risk</u>	
		** <u>Low Estimate</u>	*** <u>High Estimate</u>
1983	15,495	11,063	11,063
1984	15,756	11,250	11,339
1985	16,022	11,440	11,622
1986	16,293	11,633	11,912
1987	16,532	11,804	12,210
1988	16,773	11,976	12,515
1989	17,017	12,150	12,828
1990	17,267	12,327	13,149

* Based on annual increase rate of 1.6 percent per annum for all of Sri Lanka

**Based on 1981 AMC calculation that 71.4 percent of the population lives in malarious regions

***Predicting a population annual increase rate of 2.5 percent per annum in the malarious regions as these are highly correlated with the dry zones which anticipate a higher growth rate than the nation in general.

Organization Chart - Anti-Malaria Campaign



ABBREVIATIONS - P.H. II. - Public Health Inspectors
 P.H. I. V. U. - Public Health Inspector Vigilance Unit
 A.C.D. - Active Case Detection
 A.P.C.D. - Activated Passive Case Detection

Staffing positions in the AMC sanctioned, actual and projected

Category of Staff	1982		1983		1984 Projected	1985 Projected	1986 Projected
	Sanctioned	Actual	Sanctioned	Actual			
Superintendent	1	1	1	1	1	1	1
Deputy Superintendent	1	1	1	1	1	1	1
Medical Officers-Headquarters	5	4	5	4	5	5	5
Regional Malaria Officers	16	9	16	5	16	16	16
Entomologists	3	2	3	2	3	3	3
Parasitologists	1	-	1	-	1	1	1
Accountants	2	2	2	2	2	2	2
Staff Officers-Headquarters	3	-	3	-	3	3	3
Clerks	150	62	150	77	150	150	150
Public Health Inspectors-Headquarters	5	4	5	4	5	5	5
Public Health Inspectors-Regional Offices	20	20	20	21	20	20	20
Public Health Inspectors-Sub-Regional Offices	22	16	22	16	22	22	22
Public Health Inspectors-Vigilance Units	42	42	42	43	42	42	42
Entomological Assistants	20	9	20	11	20	20	20
Medical Laboratory Technologists	15	8	15	10	15	15	15
Microscopists	233	147	233	158	233	233	233
Supervisors (Spraying Units)	53	49	53	49	53	53	53
Labourers Spraying Units	2274	1853	2274	1728	2274	1968	1810
Driver Overseers	12	18	12	20	12	12	12

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Staffing positions in the AMC sanctioned, actual and projected

Category of Staff	1982		1983		1984 Projected	1985 Projected	1986 Projected
	Sanctioned	Actual	Sanctioned	Actual			
Field Assistants Spraying Units	591	1590	591	1509	591	515	478
Field Assistants Active Case Detection	230		285		358	440	536
Field Assistants Active Passive Case Detection	473		484		487	487	487
Field Assistants Entomological	34		34		34	34	34
Field Assistant Relief	79		79		79	79	79
Field Assistant Clerical	125		125		125	125	125
Drivers	176		148		176	161	176
Drivers (Relief)	34		34		34	34	
Labourers—Office Labourers	46	-	46	-	46	46	46
Karyala Karya Sahayaka	5	4	5	4	5	5	5
Sanitary Labourers	16	1	16	1	16	16	16
Entomological Labourers	80	-	80	-	80	80	80
Stenographers	2	1	2	-	2	2	2
Typists	4	4	4	4	4	4	4
Storekeepers	4	3	4	3	4	4	4
Telephone Operators	1	1	1	1	1	1	1
Cinema Operator	1	1	1	1	1	1	1
Watchers	24	9	24	12	24	24	24
Binders	1	-	1	-	1	1	1
Transport Foreman	1	1	1	1	1	1	1
Motor Mechanics Grade I	7	5	7	12	7	7	7
Assistant Mechanics Grade II	12	9	12	1	12	12	12
Assistant Mechanics Grade III	11	2	11	4	11	11	11

3
Staffing positions in the AMC sanctioned, actual and projected

Category of Staff	1982		1983		1984	1985	1986
	Sanctioned	Actual	Sanctioned	Actual	Projected	Projected	Projected
Blacksmith	1	-	1	1	1	1	1
Carpenters	3	4	3	4	3	3	3
Electricians	2	3	2	4	2	2	2
Hood Makers	2	1	2	1	2	2	2
Machinist	1	-	1	-	1	1	1
Welder Electric	1	1	1	1	1	1	1
Tinkers	2	3	2	1	2	2	2
Painters	2	2	2	2	2	2	2
Total	4849	3959	4915	3880	4991	4691	4592

Malaria Control Issues/ConstraintsA. Staffing

1. Since 1982 AMC vacancies have increased from 18% to 21%
2. 11 of 16 RMO positions vacant
3. 75 of 233 microscopist positions vacant
4. Redefining position descriptions and additional central staff required to pursue vector control, improve MIS and surveillance.

B. AMC Institutional

1. The headquarters staff is small in relation to its responsibilities.
2. There is need for a senior administrative officer position to free more time of the AMC Superintendent for coordination of operational research, assessment and collaboration with other institutions.
3. The two layers of administration between the MOH and AMC superintendent make it difficult for the AMC to coordinate well with entities such as the Mahaweli Authority, and to take decisions required to meet changing program needs.
4. A closer linkage between the headquarters entomology group and regional staff is needed for effective coordination and implementation, particularly with introduction of vector control into the program for which some restructuring of the headquarters entomology unit may also be required.
5. An additional section for information management is needed.
6. The structure lacks a mechanism for inter-institutional coordination at both headquarters and periphery levels.
7. The present organizational structure shows no linkages with communities, community organizations or ultimate beneficiaries.
8. The ability to receive, analyze, store and transmit information promptly and accurately needs to be improved.

C. Surveillance

1. Laboratories have been established in only 7 of the 16 AMO regions - they are needed in all;
2. Shortages of slides are frequently experienced by the laboratories;
3. Many sanctioned staff positions are vacant;
4. Lack of sufficient microscopists, entomologists and regional malaria officers are the most serious;
5. Operational research and operational assessment are inadequate;
6. Surveillance information is received only after long delays by those who need to act on it;
7. Other MOH agencies contribute very little surveillance-type information to the AMC;
8. There is very little active community participation in surveillance.

D. Vector Control (source reduction, larviciding, adulticiding)

1. AMC staff lacks training and confidence in the use of vector control methods;
2. Many sanctioned AMC staff positions remain unfilled-vacancies in entomological positions are particularly serious in relation to vector control;
3. Present job descriptions of spray machine operators, the most logical group to carry out vector control activities in the communities, make it exceedingly difficult for the AMC to use them for that purpose;
4. Operational research needed to adapt known vector control techniques for use in Sri Lanka program has been limited and inadequate to date;
5. Active community participation in the malaria control program, essential to the success of vector control, is currently minimal at best.
6. Institutional linkages with possible contributing agencies (universities, NGOs, other ministries) are inadequate.
7. Training and implementation methodologies need to be planned.

E. Drug treatment

1. AMC staff attempt at all times to obtain a blood film when presented with fever cases, or requests for drugs for fevers. Unfortunately, films are not taken at most other distribution levels listed. This negates the possibility of achieving better epidemiologic surveillance data. It also leads to medicating when not indicated i.e. false positive. This plus the problem of probable non-compliance with the full dosage requirement may lead to the development of resistance or, at the least, to an increase in the relapse rate of Vivax.
2. There is evidence that samples of chloroquine purchased from the lowest bidder vary in chloroquine base content.
3. Definitive research has not been completed to determine whether the G-6PD deficient population (estimated at up to 10% in some regions) are in danger of experiencing intravascular hemolysis from primaquine intake. Should this be proven, the concept of giving primaquine to prevent relapse to these people makes the cure more dangerous than the disease.

F. Information and Education

1. The health educator earlier assigned to the AMC has been transferred to the Health Education Department, and no one has specific interest or responsibility for this critical component of the malaria control program in either AMC or Health Education;
2. It has proved to be extremely difficult to get the Health Education Department to prepare new educational materials related to malaria;
3. Resistance to the use of radio and other media for disseminating information regarding malaria control has been encountered.
4. As the result of having few educational materials available, no staff training in social and communications skills, and no one responsible at headquarters to provide malaria information and education, there is little motivation for AMC periphery staff to carry out educational activities with the people in their regions;
5. The AMC presently has virtually non in-house capacity to develop, reproduce or evaluate the impact of educational materials concerning malaria.

G. Training

1. Failure to fully utilize funds available for this purpose.
2. Adequacy of staff to implement training for vector control.
3. Need for a long-term training plan.
4. Need to improve in-service training.
5. Need to integrate social and communications skills necessary for marketing malaria control and vector control to communities.

H. Operational Equipment and Support

1. A minimum of 14% of AMC vehicles are unserviceable.
2. 135 of 205 AMC vehicles are more than 15 years old and should be replaced.
3. Vehicle repairs need to be decentralized and completed more rapidly.
4. Fuel budget is inadequate.
5. Per diem is too low to allow supervision.
6. Categories of vehicle used, fuel allowances, usage requirements for operations support/supervision should be reviewed to see if reallocation of resources can be accomplished to better achieve objectives.
7. Parts and unit replacement plans/procurement plans are needed for sprayers and microscopes.

I. Insecticide Spraying

1. Acceptance by householders is low as shown below for 1982

	<u>Full complete house</u>	<u>Partial house</u>	<u>House closed or householder refused</u>
	%	%	%
Perennial areas	57	25	18
Seasonal areas	69	23	13

The level of acceptance has decreased to the minimum considered acceptable. Further erosion of support will render the program virtually useless;

2. Field observations indicate that spray coverage, timing and quantity may not always be closely controlled, and that sprayers are not always taking adequate safety precautions nor applying consistent dosages.
3. It is probable that the vector will develop resistance to malathion over time (the major question is when rather than whether);
4. Operational assessment and research on the use and efficiency of malathion to kill Anopheles is far from adequate.

COMPARISON OF POPULATION GROWTH RATES
AND INCIDENCE OF MALARIA, 1982

District	Population 1982	Population Growth 1971 - 81	API 1982	Malaria Cases 1982
WET ZONE				
Kandy	1,144,776	1.3	.95	1090
Kegalle	693,203	0.6	.70	483
Galle	827,614	1.1	.01	6
Kalutara	841,207	1.3	.04	30
Matara	575,222	1.0	.67	385
Nuwara Eliya	531,606	0.4	.24	127
Colombo	3,141,310	1.5	.10	316
Ratnapura	809,491	1.8	1.06	860
DRY ZONE				
Jaffna	845,737	1.9	1.13	965
Matale	631,203	1.3	4.99	3152
Badulla	937,862	1.5	6.42	6021
Kurunegala	1,233,870	1.8	2.75	3395
Puttalam	501,401	2.8	2.09	1048
Hambantota	512,154	2.3	3.87	1982
Mannar	107,864	3.9	12.22	1319
Trincomalee	261,322	3.3	11.04	2885
Batticaloa	762,469	3.3	4.76	3628
Anuradhapura	598,007	4.6	12.40	7413
Vavuniya	<u>176,063</u>	5.4	19.79	3484
	15,132,371			

ECONOMIC ANALYSIS

This economic analysis uses the standard approach of calculating the difference between the events projected to occur with the project and those which would be assumed to take place without the project. Actual costs are available for 1978 - 83. Inflation is not considered in the 1983 - 86 period on the assumption that both benefits and costs would inflate at the same rate. Tables A-D show the calculations of cases avoided, medical cost saved, income loss avoided and anti-malarial drug costs saved. The following sections detail the assumptions behind the tables.

CASES AVOIDED

In 1982, the annual parasite incidence per 1000 population was 2.5. This rate is based on the number of confirmed positive blood smears examined by the anti-malarial campaign. It is assumed that the true API is at least three times this rate. Without the project, it is estimated that the API would rise to approximately 40 per 1000, a rate similar to that encountered during 1969 when anti-malarial drugs were available to the general population but a time during which the spraying of DDT was stopped. (It would not be appropriate to use the rate of 425 experienced during 1931-1947 because neither drugs nor spraying were available at that time.) It is assumed that the true API during 1969 would have been four times the recorded rate due to the less developed health system in place at that time.

MEDICAL TREATMENT COSTS AVOIDED

An analysis of hospital discharge data shows malaria being the fourth leading cause of hospitalization during the period 1971 - 1982.

The discharge data for 1982 show a malaria hospitalization rate of 2.87 per 1000 population. Sources familiar with the health care system feel that the clinical diagnosis of malaria by hospital staff would be a correct diagnosis in 80% of the cases. Thus the rate of hospitalized malaria per 1000 population in 1982 would be approximately 2.3, almost equal to the reported API of 2.5.

Using 7.5 as a true API for malaria in 1982, the hospital discharge data indicate that about one-third of all malaria cases were hospitalized. For the purposes of the economic analysis, a more conservative rate of 10% hospitalization has been used. In addition, it is assumed that one-third of the cases avoided would have sought out-patient treatment through the anti-malaria campaign and that the balance of the persons contracting malaria would have sought self treatment.

Cost per out-patient visit and per in-patient day are available from the GSL Budget Estimates for 1978 - 1983. Constant 1983 costs are assumed for 1984 - 86. Medical treatment costs avoided are a weighted average of out-patient costs, in-patient costs for 5 days per illness and the cost of self-treatment which is assumed to be zero.

INCOME LOSS AVOIDED

The 1980/81 Socio-Economic Survey for Sri Lanka reports that 31% of the total population is employed. Thus, of the cases avoided, it is assumed that 31% of those cases would have occurred in people who would have been employed.

During each malaria illness, it is assumed that a worker is out of work for only 5 days. (Other malaria economic analyses have assumed six

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days lost production time and an additional 25 days of 50% reduced effectiveness due to debilitation; a total of 18½ lost workdays.)

Because of the subsistence nature of the economy, it is felt that any person who contracts malaria will be back at work as soon as possible, producing at as high a rate of effectiveness as possible.

Wage data was obtained from the Central Bank and a weighted average wage rate for male (75%) and female (25%) wage rates in the paddy (60%) and unskilled laborer sectors was derived for 1978-83. Wage rates were held constant from 1983.

ANTI-MALARIAL DRUG COSTS AVOIDED

Any person reporting to a hospital or the AMC who is believed to have malaria is given ten 150 mg. tablets of chorloquine and fourteen 15 mg. tablets of primaquine. It is assumed that those who seek self-treatment purchase 10 tablets of chorloquine on the market.

The only price available for the tablets is a 1982 figure. The figure has been deflated by 10% a year to get 1978-81 prices and inflated by 10% to arrive at a 1983 price. Shadow prices for foreign exchange have been used to convert the dollar costs to rupees for each year.

The dosages for chorloquine and primaquine are less for individuals under 15 years of age. A weighted average of dosages by age group indicates that the total drug requirement would be approximately 75% of the requirements for adults only.

PROJECT COSTS

Project costs have been divided into rupee and foreign exchange costs. All foreign exchange costs have been shadow priced by the appropriate yearly rate. Actual expenditures were used for 1978-81,

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budget estimates for 1982 and 1983 and planned project costs for 1984-86. Costs include GSL, other donor and USAID costs. Inflation was netted out for 1984-86.

CONCLUSIONS

The internal rate of return for the project is 33.49%, the net present value at 15% is Rs.25,201,000 and the benefit cost ratio is 1.038. The project is clearly economically viable.

Any sensitivity analysis of the project could only have an effect on the last 3 years, 1984-86, since the costs incurred and the benefits gained in the period 1978-83 are a matter of record. Due to the process of discounting, changes in values in these years would have little effect on the economic analysis.

Table A

CASES AVOIDED

Year	Mid-Year Population (000)	WITH PROGRAM		WITHOUT PROGRAM		Cases Avoided (000)
		Reported API <u>a/</u> (per 1000)	Actual API <u>b/</u> (per 1000)	Estimated API <u>c/</u> (per 1000)	Net API (per 1000)	
1978	14190	4.80	14.40	173.44	159.04	2257
1979	14471	3.30	9.90	173.44	163.54	2367
1980	14738	3.20	9.60	173.44	163.84	2415
1981	14984	3.17	9.51	173.44	163.93	2456
1982	15237	2.50	7.50	173.44	165.94	2528
1983	15495	2.40	7.20	173.44	166.24	2576
1984	15756	2.30	6.90	173.44	166.24	2624
1985	16022	2.10	6.30	173.44	166.84	2673
1986	16293	2.00	6.00	173.44	167.14	2723

a/ Annual Parasitic Incidence as determined by positive blood smears examined by the anti-malaria campaign

b/ Actual rate is assumed to be three times the reported rate

c/ Without the project it is estimated that the API would be similar to that reported in 1969 of 43.66 API. The actual rate for this period is estimated to be four times the reported rate due to the less developed health system in place at that time.

Table B

MEDICAL TREATMENT COSTS SAVED

Year	Cases Avoided (000)	IN-PATIENT			OUT-PATIENT			Total Cost Saved (000)
		Cases ^{a/} Avoided (000)	Cost per Illness ^{b/} (rupees)	Costs Saved (000)	Cases ^{a/} Avoided (000)	Cost per Illness ^{b/} (rupees)	Costs Saved (000)	
1978	2257	226	Rs.62.65	Rs. 14,159	752	Rs.0.83	Rs. 624	Rs.14,783
1979	2367	237	96.75	22,930	789	1.24	978	23,908
1980	2415	242	90.65	21,937	805	4.27	3,437	25,374
1981	2456	246	84.70	20,836	819	7.30	5,979	26,815
1982	2528	253	84.25	21,315	843	7.26	6,120	27,435
1983	2576	258	120.00	30,960	859	10.20	8,762	39,722
1984	2624	262	120.00	31,440	875	10.20	8,925	40,365
1985	2673	267	120.00	32,040	891	10.20	9,088	41,128
1986	2723	272	120.00	32,640	908	10.20	9,262	41,902

a/ Based on AMC records and hospital discharge data for the period 1978-82, it is assumed that one-tenth of the cases avoided would have been treated in a hospital, one-third as out-patients and the balance would not seek formalized treatment. Cost of self-treatment is assumed to be zero.

b/ Costs per illness for in-and out-patient treatment is the weighted average treatment costs in various health institutions as reported in the GSL budget estimates for 1978-83. The average number of days in the hospital per illness is 5.

Table C

INCOME LOSS AVOIDED

Year	Cases Avoided (000)	Cases Avoided ^{a/} which would have been employed	Weighted Average Income Loss per worker ^{b/}	Total Income Loss Avoided (000)
1978	2257	700	Rs. 58.30	Rs. 40,810
1979	2367	710	75.15	53,357
1980	2415	725	100.35	72,754
1981	2456	737	125.05	92,162
1982	2528	758	138.55	105,021
1983	2576	773	150.00	115,950
1984	2624	787	150.00	118,050
1985	2673	802	150.00	120,300
1986	2723	817	150.00	122,550

a/ Per the 1980/81 Socio-Economic Survey, 31% of the total population is employed.

b/ Income lost per day is a weighted average of male and female wage rates in the paddy and unskilled laborer sectors based on Central Bank survey data for 1978-1983. Average days lost due to malaria is 5.

Table D

ANTI-MALARIAL DRUG COSTS AVOIDED

<u>Year</u>	<u>Cases Avoided (000)</u>	<u>Weighted Average Drug Cost per Case Avoided ^{a/}</u>	<u>Shadow Price of Foreign Exchange</u>	<u>Drug Costs Avoided (000)</u>
1978	2257	\$ 0.40	Rs. 20	Rs. 18,060
1979	2367	0.44	20	20,820
1980	2415	0.48	20	23,180
1981	2456	0.53	20	26,040
1982	2528	0.58	23	33,718
1983	2576	0.64	26	42,874
1984	2624	0.64	26	43,654
1985	2673	0.64	26	44,486
1986	2723	0.64	26	45,318

a/ Malaria patients treated at health facilities are given ten 150 mg chorloquine tablets and fourteen 15 mg. primaquine tablets. The one-third of all malaria cases who treat themselves are assumed to buy ten chorloquine tablets. 1982 price for one chorloquine tablet was \$0.028 and \$0.0549 for one primaquine tablet. A 10% deflation factor was used to determine drug prices in previous years. Taking the different age groups into account, the total drug requirement would be approximately 75% of the requirements for adults only.

Table E

SUMMARY ECONOMIC ANALYSIS

(Rs.000)

Year	Treatment Costs Avoided	Income Loss Avoided	Drug Cost Avoided	Total Benefits	Total Costs	Net Benefits	Net Present Value
1978	14,783	40,810	18,060	73,653	111,466	- 37,813	- 32,881
1979	23,908	57,357	20,820	98,085	116,373	- 18,288	- 13,828
1980	25,374	72,754	23,180	121,308	91,281	30,027	19,743
1981	26,815	92,162	26,040	145,018	94,607	50,411	28,823
1982	27,435	105,021	33,718	166,174	134,775	31,399	15,611
1983	39,722	115,950	42,874	198,546	170,272	28,274	12,224
1984	40,365	118,050	43,654	202,069	237,826	- 35,757	- 13,442
1985	41,128	120,300	44,486	205,914	200,058	5,856	1,914
1986	41,902	122,550	45,318	209,770	185,016	24,754	<u>7,037</u>
							25,201

Internal Rate of Return = 33.49

Net Present Value at 15% interest = Rs.25,201,000

Benefit Cost Ratio at 15% interest= 1.038