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VBC PROJECT

Tropical Disease Control for Development

An External Assessment of the Malaria Control Program in Nepal

March 13-29, 1994

By a Joint HMG/WHO/USAID
Assessment Team

VBC Report No. 82201

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Finally, we want to express our thanks to all those we contacted during our external assessment (refer to List of Persons Contacted) for their interest and assistance.

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Executive Summary

His Majesty's Government of Nepal, with the assistance of the World Health Organization (WHO) and the US Agency for International Development (USAID), carried out an external assessment of the Malaria Control Program in Nepal during March 13-29, 1994. In past years such external assessments have been primarily concerned with the program performance of the national malaria control effort. This assessment represents the first assessment of an integrated health services anti-malaria effort in Nepal. The Team's primary responsibility was to offer its comments and suggestions on the changing strategy and operational nature of carrying out vector-borne disease activities through Nepal's reorganized health infrastructure. The specific objectives of this assessment were to assess the overall malaria situation in the country, to assess the National Malaria Control Program performance and its impact on malaria, and to prepare guidelines for the formulation of a Plan of Operation for malaria control in Nepal based on the Global Malaria Control Strategy. In addition, the Team was asked to address the emerging problems of visceral leishmaniasis (Kala-azar) and other vector-borne diseases, to consider epidemiologic and operational indicators for stratification, to provide guidelines for entomological activities, to review the proposed National Health Management Information System as it relates to vector-borne diseases, to review insecticide and logistic requirements, and to consider the start-up activities for the newly constructed Hetauda Research and Training Center. To facilitate data gathering for assessment purposes, the Team divided into two sub-teams for field observations, one sub-team covering the Central and East Regions and the other the Mid-West and West Regions. Detailed travel schedules and a list of contacts made by the sub-teams can be found in the annexes.

Examination of the data provided by the Epidemiology and Disease Control Division, MOH, indicated that the malaria situation in Nepal appears to have generally improved since 1992. In 1993, a total of 16,380 malaria cases were confirmed from the 596,689 blood slides collected from all sources. This represents a considerable reduction in reported cases from 23,234 in 1992 and 29,135 in 1991. In 1993, the Central Region recorded the highest numbers of cases (8,598), representing 52.5% of the total number of reported cases in the country. Approximately 61% of the total cases were reported from six malarious

districts -- Morang, Jhapa, Kavre, Sindhuli, Dhanusha, and Sarlahi. During 1993, there were no reported deaths due to malaria or reported severe cases of malaria. In reviewing the data, we found that data from some districts were incomplete, and we were not assured of the complete validity of some of the presentations. There is little doubt that malaria is being under-reported and may be beginning to intensify in some areas. However, it appears that the program has been able to contain *Plasmodium falciparum* malaria in the past year.

The Team also was asked to review the current status of Kala-azar. This disease is on the rise in Nepal, principally in 11 districts of the Central and East Regions bordering India -- Jhapa, Morang, Sunsari, Saptari, and Siraha in the East Region and Dhanusha, Sarlahi, Mohottari, Bara, Parsa, and Rautahat in tne Central Region. Since 1980, there have been over 4,500 cases of Kala-azar and more than 166 reported deaths. It is believed that the number of cases is under-reported at least several-fold, the incidence is dramatically increasing, and that Nepal has the highest case-fatality rate in Asia.

The Team visited the newly constructed Hetauda Research and Training Center and was very impressed with the new facilities. Accompanied by the building contractor, the Team visited the laboratories, training classrooms, offices and dormitory areas of the Center. One of the Team's primary recommendations is that this facility be fully staffed, equipped, and put into active use for training and operational research as soon as possible. The facility has the potential to become a major center of excellence for training and research on vector-borne diseases in Asia.

A major task for the Team was to provide guidelines and recommendations for the reorientation of the present anti-malaria activities into the new health services structure. In both field and central office discussions with concerned officers, this task was kept firmly in mind. It is of utmost economic and social importance to the Nation to retain and develop an adequate response system to vector-borne disease problems within the health services, so that these diseases do not overwhelm the existing health infrastructure, impacting negatively on Nepal's development programs. To lose the Nation's hard won achievements in controlling malaria would be not only socially disastrous but conomically crippling to many agricultural districts, industrial centers, and development projects. The Team has provided a series of

recommendations and guidelines for the development of a new Plan of Operation for malaria to be prepared by a National Working Group.

Nepal participated in several international meetings to help develop a Global Strategy for Malaria Control. The strategy states that it is imperative that a technically sound malaria unit be established at the Central level of Government. In Nepal, the Team suggests that the Central unit be staffed with a malariologist/epidemiologist, parasitologist, an entomologist, and a vector control specialist to provide professional assistance to Regional health offices and to guide the policy and planning of future vector-borne disease activities for the country. The Team feels that there should be a strong epidemiological capacity to support the Global Strategy's epidemiological approach.

One technical area the Team found to be in immediate need of strengthening is entomology. The present status of this important technical aspect of vector-borne disease control in Nepal can only be described as inadequate. Without an adequate entomological base, program operations will be blind as to which insecticides to use, when and where transmission is occurring, and which vectors are to be controlled.

At every point during the assessment, the Team found pressing demands and needs for training in the field of vector-borne disease control for the present and planned health staff. While the Hetauda Research and Training Center can assume some of this load by training trainers, it is essential that training of large numbers of personnel such as the Community Health Volunteers (Female), Sub-Health Post staff and Health Post staff should be carried out closer to their respective work sites. A detailed work plan for training should be developed and implemented to ensure that these front-line staff are prepared to assume their responsibilities in controlling malaria and other vector-borne diseases.

Public and private sector collaboration in malaria control and prevention is essential. Discussions between personnel in health, agriculture, water supply, roads and highways, and other relevant activities should take place. The success in implementation of the National Plan of Operation will depend to a great extent on the commitment of the Government in mobilizing internal resources; which may then be augmented by external assistance.

The Team expresses its sincere appreciation to the Government of Nepal and the officers and personnel of the Health Services at the Central, Regional, and District levels whc helped the Team in carrying out this watershed program assessment.

I. Introduction

A. Purpose of the Assessment

The purpose of the assessment was to review the present status of malaria control activities in Nepal and provide guidelines for a future Plan of Operation based on the Global Malaria Control Strategy. The specific objectives of this assessment were to:

1. To assess the overall malaria situation in Nepal and to evaluate malaria control activities carried out during 1990-1993.

2. To assess critically the National Malaria Control Program, reviewing all aspects and issues (technical, operational, administrative and financial) of current malaria control activities and their impact on malaria.

3. To discuss and finalize a Plan of Operation for malaria control in Nepal based on the Global Malaria Control Strategy and in accordance with the recommendations of the Regional Working Group Meeting, SEARO.

During the first team meeting with the Director of the Epidemiology and Disease Control Division, it was agreed that this Team could not present a finalized Plan of Operation in the time frame provided for the assessment. It was agreed that the Team could provide guidelines for the preparation of the Plan of Operation with recommendations on the necessary actions to be taken to accomplish this important task.

B. Terms of reference

The Terms of Reference for this assessment are listed below.

1. Evaluate the overall malaria situation and anti-malaria activities conducted during the years 1990-1993 in Nepal, and keeping in view the activities currently being undertaken, recommend appropriate national malaria control strategies with reference to the four technical elements of the Global

Strategy, as well as reflecting the recommendations for implementation of the new Global Malaria Control Strategy. In addition, address the emerging problem of visceral leishmaniasis (Kala-azar) and other vector-borne diseases.

2. Consider the prevailing epidemiological and operational indicators of stratification of malarious areas with special reference to falciparum malaria with a view to planning and developing appropriate control strategies.

3. Provide guidelines for entomological activities to be undertaken in the light of the new control strategy to be adopted and the restructuring of entomological teams at the regional level.

4. Review the newly introduced malaria and other vector-borne disease information system within the National Health Management Information System and recommend appropriate steps to be taken for its effective implementation to facilitate timely actions.

5. Review the insecticide requirements according to the new policy and the logistic support including transport necessary for anti-malaria activities on a long term basis.

6. Provide brief guidelines for the preparation for a National Plan of Operation, including the start-up of the Hetauda Research and Training Center.

C. Team participants

The members of the Assessment Team are as follows:

GON

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Mr. S.R. Shrestha, Entomologist

USAID

Dr. Richard Andre, VBC Medical Entomologist

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WHO

Dr. A.V. Kondrachine, WHO/Geneva
Dr. K.M. Rashid, WHO/SEARO (Consultant)
Dr. M.V.V.L. Narasinham, WHO/SEARO (Consultant)

Originally, the assessment team was to include participants from several other bi-lateral agencies such as UK/ODA, Japan/JICA and Denmark/DANIDA, but due to late notification of the assessment, these agencies were unable to participate.

D. Summary of assessment schedule

The joint HMG/WHO/USAID Team met on March 13, 1994, with Dr. B.L. Shrestha, Director, Epidemiology and Disease Control Division at the Directorate of Health Services in Kathmandu to review the objectives and terms of reference for the assessment and to plan field activities. A detailed briefing on the re-organization of the Health Services and the present status of malaria activities was provided at this time to the Team.

The Team was divided into two sub-teams and assigned areas of responsibility. It was decided that both teams would travel to the Hetauda Research and Training Center on March 15 to review the newly constructed facilities and the Center's plans for the future. From March 16-21, one sub-team covered the West and Mid-West Regions, visiting Regional Offices in Surkhet and Pokhara, as well as District offices in Surkhet, Kapilvastu, Rupandehi, and Kaski. The other team covered the Central and East Regions, visiting the Regional Offices in Kathmandu and Dhankuta, as well as District offices in Mohattari, Morang, and Jhapa. Both teams also reviewed the activities of a number of Health Posts, Sub-Health Posts and Passive Case Detection Volunteers (PCDV) during the field activity. (Full travel schedules are given in Appendix C.)

Upon the Team's return to Kathmandu on March 21, the process of developing an assessment report through a series of meetings and discussions was carried out.

The final report to the Government of Nepal of the Team's conclusions and recommendations was presented on March 29 to the Health Minister, Dr. Ram Baran Yadav, the Secretary of Health, Mr. Jagadish Upadhaya, the Director General of Health, Dr. Ram Nandan Sinha, and a number of other HMG and bi-lateral agency representatives.

The Team members departed Nepal on March 30 and 31.

II. Programmatic Issues

A. Status of Malaria and Other Vector-Borne Diseases

In Nepal, a total of 12.36 million people in 50 districts are considered to be at varying degrees of malaria risk. There have been changes in the transmission patterns of the disease have changed for a variety of reasons including malaria control measures. Malaria is now limited to focal problem areas. In previously malarious areas, the impact of the disease on socio-economic development has been significantly reduced, primarily because of the national anti-malaria program.

In the original mesoendemic to hyperendemic forest and forest fringe areas of the inner terai, the transmission potential has been reduced by apparent disappearance of primary vector *Anopheles minimus*. In the cultivated and settled areas of outer terai and in mountain valleys, malaria is no longer a major public health problem. Most reported cases are *Plasmodium vivax* infections. At the present time, high-risk malarious areas include forest, forest-fringe, and foot-hill areas where the principal vector is *An. fluviatilis* and the transmission period is prolonged.

The increase in population movements inside the country, as well as across the international border, has added a new dimension to the malaria problem. The movement of non-immune people from the hills to receptive areas of the country has caused of a number of focal outbreaks. Similarly, the incidence of *P. falciparum* has increased in some areas due to introduction of this malaria parasite from neighboring countries.

With the exception of mountain valleys, malaria transmission occurs almost every month of the year in the Terai. However, in areas where *P. vivax* is the predominant species, the main transmission season extends from April to September with peak in July. In *P. falciparum* areas, malaria transmission usually starts around May and reaches a peak in August.

Over the years, unexpected increases of the disease (1974, 1985 and 1991) have been observed. These increases are believed to be related to high annual precipitation and consequent build-up of vector densities.

1. Malaria Situation During 1990 - 1993

With the exception of 1991, when an increase in malaria in some districts resulted in 29,135 cases reported in the country, reported cases have declined from 22,856 in 1990 to 16,380 in 1993. However, it is likely that this decline may not be the true reflection of the prevailing epidemiological situation since the Annual Blood Examination Rate (ABER) has steadily showed a downward trend from 7.3 in 1990 to 4.8 in 1993. The Slide Positivity Rate (SPR) in Stratum I has declined from 5.3 in 1990 to 3.5 in 1993, but the SPR has increased in Stratum IV from 4.4 in 1990 to 8.5 in 1993, primarily due to an increase of cases in two districts from an increase in population movement and an absence of spray protection. (See table A-1)

An analysis of available data shows that during 1993 the Central Region, East Region, West Region, Far-West Region and Mid-West Region reported 52.5%, 18.6%, 12.7%, 9.5% and 6.7% of the total country cases, respectively. During the increase of malaria in 1991 where 29,135 cases were reported in the whole country, 18,337 cases came from Central Region. In addition, *P. falciparum* cases increased significantly in the Central Region where 3,728 out of 4,994 cases were reported. The districts most affected were Dhanusha (Godar and Dhalkebar Health Post areas), Mahottari (Bardibas and Loharpatti Health Post areas), Sarlahi (Bakhtipur and Salimpur Health Post areas) and Sindhuli (Bhiman and Balajhor Health Post areas). Since that time, the situation has improved due to the application of vector control measures. On the other hand, a steady increase of malaria cases has been noticed in the districts of Kavre and Sindhupalchok (mostly *P. vivax* cases). In Kavre, alternate vector control measures are being evaluated in an operational research study on the use of insecticide-treated netting (bed nets). In the East Region, the overall malaria situation remained somewhat static with the exception that during 1991-1992, the incidence of *P. falciparum* showed an upward trend (in some Health Post areas nearly 50%). This increase of *P. falciparum* cases in the East Region is believed to have resulted from the arrival of Bhutanese refugees, as many of these refugees were found positive for falciparum malaria. The most affected districts are Illam (one Health Post area), Jhapa (three Health Post areas) and Morang (three Health Post areas). However, the situation in these districts has shown improvement due to residual spraying. In the West Region, the increase of cases primarily were reported from Rupandehi District (mainly *P. vivax* cases). The

epidemiological situation in Mid-West and Far-West Regions did not show any unfavorable trend. The districts of Kailali and Kanchanpur did experience an epidemic of malaria in 1985 due to a combination of factors, including extensive ecological changes, population movements, and weakness in the surveillance system. However, the malaria situation there has remained under control due to application of adequate control measures. In 1992, a small outbreak of vivax malaria was reported from Pandon Health Post area of Kailiahi District which was controlled through Mass Drug Administration (MDA). (See Table A-2).

2. Local Strategies in Malaria Control

In light of the current malaria situation in the country and the systematic integration of malaria control activities into the general health services, it is essential to develop local strategies in line with the Global Strategy for Malaria Control. These local strategies should be sustainable and cost-effective. This calls for development of an epidemiological intelligence system, improvement in local capabilities in the disease monitoring, and planning timely and appropriate intervention measures.

a. Case detection and management: Case detection and management is being carried out at various levels by different institutions and personnel. At the periphery, the PCD(V), Village Health Workers (VHWs) and the Health Post (HP) personnel such as the Health Assistants and Laboratory Technicians/Assistants are involved in this task. There are, at present, 4,870 volunteers involved in taking blood slides from fever cases. VHWs also take blood slides from fever cases during their visits to the Ward (domiciliary visits have been discontinued). Indiscriminate collection of blood slides using fever as a screening criterium, as was done during the eradication era, resulted in the collection of a large number of blood slides from non-malaria cases and over-loading of laboratory services. In addition, long delays (7-14 days) between slide collection and examination, prevents direct benefit to the patient. In a control program, focus should be placed on malaria as a disease rather than as an infection. Blood slides should be collected only from clinically suspected malaria cases. For this purpose malaria case definitions are required and wall-charts/algorithms have to be developed, particularly for the peripheral health workers. At health institutions (Health Posts, Primary Health Care Centers and Hospitals), the clinicians should

request blood slide examination only from clinically diagnosed or from fever of unknown origin cases. However, in certain situations, blood slides will have to be collected and the following criteria are suggested:

- Severe and complicated malaria cases (confirmation of diagnosis)
- Prognosis of above cases (serial blood slides)
- Treatment failure cases (reported)
- In areas or foci having large numbers of *P. falciparum* cases
- Cases referred from Health Posts to Hospitals or PHC Centers
- A percentage of patients (depending on work-load of the laboratory), attending out patient departments and diagnosed clinically with malaria are to be examined for malaria parasites in order to assist in the clinical diagnosis by physicians.

The performance of the volunteers in case detection was quite encouraging. Approximately, 29% of reported malaria cases during 1993 were detected through the efforts of the volunteers. However, it is a difficult task to retain the interests of this unipurpose volunteer on a long-term basis.

Although a large number of falciparum malaria cases were reported from certain areas, the present reporting system does not provide any information regarding severe and complicated malaria since these cases may be managed by the clinicians differently. In the integrated health system, it is necessary to reorient the physicians, both within and outside the health services, in the management of falciparum malaria cases. WHO Regional and Global publications may be helpful in this regard.

b. Laboratory services: The laboratory services are an essential component of disease surveillance. In the past, microscopic diagnosis has been the only reliable means to confirm a malaria case. In order to play an important role in the early diagnosis and prompt treatment (EDPT) of a malaria case, this service should be available for the immediate benefit to the patient by rapid diagnosis.

In the past, laboratory services were decentralized to Ilaka Health Post levels. In the reorganized health system, laboratory facilities at Health Post level will not be provided but will be provided from the Primary Health Care Centers and District Public Health Offices. In each of the PHC Centers there is provision for a Laboratory Assistant. At the district level, there will be one Laboratory Technician and three Laboratory Assistants. The Laboratory Technicians and Laboratory Assistants attached to each of the five Regional level Disease Control Sections will primarily function for cross-checking microscope slides. Laboratory personnel are multipurpose workers examining blood slides for malaria and sputum smears for TB. For EDPT, three Laboratory Assistants from the district level laboratories will be deputed to three Heath Posts which are strategically important from a malaria point of view. The examination of blood slides will have to be planned in such a way that the results of examination are available rapidly, so patients will not wait for treatment. The five Regional reference/cross-checking laboratories will carry out quality control measures, training (on the job), and *in vivo* testing of treatment failure/drug resistant cases. To perform their role effectively, the selection of examined blood slides must be done by the Medical Officer or DPHO on a random basis without involvement of the persons who have examined those slides. The 3-day *in vivo* test as recommended by Dr. K. H. Rieckmann should be done for all treatment failure cases.

c. Treatment: Existing treatment and drug policies need to be reviewed according to the Global Malaria Control Strategy. At the periphery, suspected malaria cases from whom no blood slides will be collected will be given full treatment with a first-line drug. However, in special situations, such as areas with a high proportion of falciparum malaria or international border checkposts, second line drugs may be used in treatment. The use of primaquine may be discontinued except in those areas where the prevalence of falciparum malaria is high. For radical treatment, the existing policy should be

continued, and treatment should be administered by the peripheral health workers. Falciparum malaria cases treated with sulfadoxine-pyrimethamine need to be followed up by VHWs to exclude treatment failure, particularly because of the observations made by the Health Coordinator at the Bhutanese Refugee Camps in Jhapa District. If treatment failure with the second-line drug is confirmed, or the malaria case is severe and complicated, Quinine (Tablets and Injectable) should be made available. In the health institutions, army camps, refugee camps, and development projects, if the results of examination can be made available on the same day, there will be no need for presumptive treatment. Peripheral health workers and volunteers are not expected to collect blood smears in the future, except under special circumstances, and they will not be required to give presumptive treatment.

d. Mass drug administration (MDA): The present policy of MDA in localized/ focal outbreaks where no spraying is done may be continued — provided the MDA is adequately planned and thoroughly implemented. High population coverage (>80%) in each of the two rounds is needed.

e. Chemoprophylaxis: Because of poor compliance on a long-term basis and acceleration of development of resistance, chemoprophylaxis is not generally recommended. However, it has been found useful as a short-term measure for travellers, soldiers, police or workers in development projects who are coming from non-endemic areas.

f. Monitoring Drug resistance: Past *in vivo* and *in vitro* tests carried out in areas with high prevalence of falciparum malaria reveled resistance of the malaria parasite to chloroquine at the RI and RII levels. No resistance was, however, detected against sulfadoxine-pyrimethamine (Fansidar) or mefloquine. Until such time that provision is made to resume *in vitro* tests, *in vivo* tests should be organized with the help of the five Regional Disease Control Sections on the basis of information regarding treatment failure cases received from various health institutions. If the WHO 7-day/28-day standard tests cannot be organized at this stage, the 3-day *in vivo* test recommended by Dr. K. H. Rieckmann should be tried (Figure A-1). At the present time, there is complete lack of information regarding malaria drug resistance in the country.

g. Entomological surveillance: Four vector species — *An. fluviatilis*, *An. minimus*, *An. maculatus* complex and *An. annularis* - have been found responsible for malaria transmission in Nepal. *Anopheles fluviatilis* and *An. minimus* were responsible for maintaining mesoendemic to hyperendemic malaria in the forested outer terai and inner terai. With the exception of two isolated specimens, no specimens of *An. minimus* have been collected in recent years. *Anopheles maculatus* complex is the vector of malaria in mountain valleys up to 6-7,000 feet. *Anopheles annularis* breeds primarily in stagnant water and ponds in outer terai. Susceptibility tests and other observations carried out to date have shown some exophilic behavior in *An. fluviatilis* and some degree of tolerance/resistance to DDT in *An. maculatus* complex and *An. annularis*.

At the present time, it appears that all entomological activities have come to a halt. Since entomological activities are an important component in understanding the epidemiology of malaria, the five Regional Disease Control Sections should be made operational by removing constraints that impede entomological investigations.

h. Vector control measures: Spraying: In 1993, vector control measures were primarily limited to indoor residual insecticide spraying in selected areas. The selection of these areas were made on the basis of:

- Occurrence of malaria epidemics/outbreaks,
- Epidemic prone areas,
- High prevalence of falciparum malaria and drug resistant foci, or
- Villages in Stratum I with persistent high levels of transmission.

Due to acute shortage of insecticide in recent years, a number of different types of insecticides (malathion, Icon, bendiocarb and Actellic) were used for malaria control at two rounds a year. The smallest operational unit for insecticide spraying is a Village Development Committee (VDC) area with a population of about

5,000. The areas protected by spraying in 1993 were in Dhanusha, Mahottari and Sindhuli Districts of Central Region, Dang and Surkhet Districts of Mid-West Region and Kailali and Kanchanpur Districts of Far-West Region. The affected areas in the Districts of Saptari, Siraha and Sunsari in East Region, and Dhanusha, Mahottari, Sindhuli, Sarlahai and Rautahat in Central Region also were subjected to spraying for the control of Kala-azar. The impact of this spraying was not properly evaluated. However, the spray operations did result in the reduction of cases and the prevention of outbreaks. The unsatisfactory impact of spraying was attributed to poor supervision, loss of community interest, and exophilic behavior or resistance of the vectors *An. fluviatilis* and *An. maculatus* complex. The impact of spraying in Far-West Region was considerable. Interruption of spraying operations in Sindhuli District in 1991 resulted in serious rise of malaria there. Similar problems occurred in Kavre and Sindhupalchok Districts which have not been sprayed for several years. It is evident from these experiences that insecticide spraying cannot be discontinued in receptive and vulnerable areas. However, in order to obtain maximum impact of insecticide application, the following conditions should be fulfilled.

- The area/focus to be precisely delineated through epidemiological and entomological studies.

- Adequate evidence is obtained that the vector(s) is (are) susceptible to the insecticide to be used.

- A high degree of coverage is achieved through community mobilization and adequate supervision.

- Spraying is done at the appropriate time.

<u>i. Use of insecticide-treated nets:</u> A TDR sponsored field-trial to ascertain the effectiveness of insecticide-treated nets in malaria control is presently in progress in Sindhuli District. Some 2,000 bed-nets treated with Icon are to be distributed (1 bed-net for 2.5 persons). For evaluation purposes,both epidemiological and entomological techniques are to be used.

A similar small scale project supported (nets and insecticide, only) by Bayer (Germany) has been in progress in Kavre for more than one year. The insecticide used for impregnating the bed-nets is Solfac. No results were available to the Team.

In seven Bhutanese Refugee Camps, 25,000 insecticide-treated bed-nets have been distributed by the Save the Children (U.K.). One bed-net for three persons was provided. Initially, the response of the users was not encouraging, but the situation has improved through the efforts of Community Health Volunteers.

Use of larvivorous fish This project supported by the WHO/SEARO Research Fund, has been tried in the past. Results of this project were inconclusive because the fish were washed away by flood water.

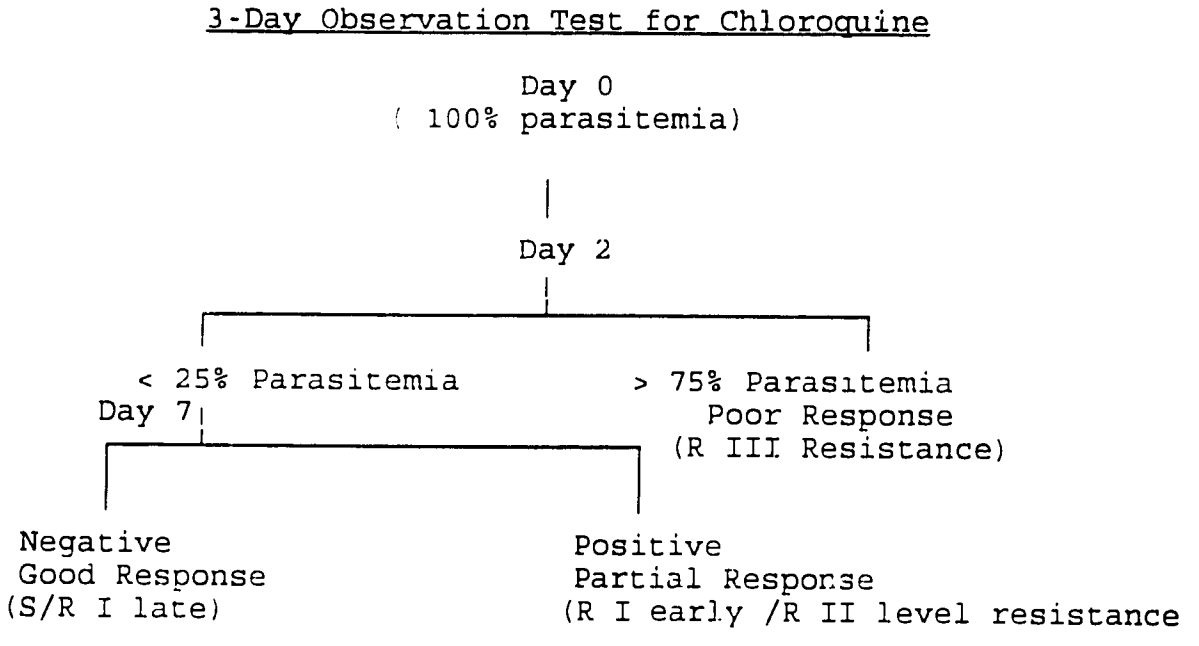
Table A-1 Overall Malaria Situation, Nepal (1990 - 1993)

Year	Population	B. Slides Examined	ABER (%)	Positive	SPR (%)	% P. fal.
1990	11643741	847491	7.3	22856	2.7	8.1
1991	11871917	781543	6.6	29135	3.7	17.4
1992	12030945	725068	6.0	23234	3.2	12.7
1993	12355314	596689	4.8	16380	2.8	9.5

Table A-2 Malaria Situation by Region, Nepal (1990 - 1993)

Region	Year	Population	B.S.Exam	ABER	Positive	P. fal. Cases
Central	1990	3763053	365477	9.5	10382	956
	1991	3856741	369799	9.4	18337	3728
	1992	3923232	317427	7.9	13078	1354
	1993	3942500	254731	6.4	8598	665
Eastern	1990	2710800	176338	5.6	3625	572
	1991	2798574	158333	4.8	4538	988
	1992	3131562	173261	5.4	4543	1196
	1993	3214375	126889	3.8	3056	687
Western	1990	2182337	167139	7.6	2181	103
	1991	2187294	138008	6.3	2808	108
	1992	2187662	123260	5.6	1923	98
	1993	2248904	110998	4.9	2079	80
Mid-West	1990	1049223	89338	8.3	3839	110
	1991	1054789	73179	6.9	1571	75
	1992	1064164	66675	6.3	1593	193
	1993	1111554	61543	5.5	1091	51
Far-West	1990	856433	49199	5.7	2829	85
	1991	901684	42224	4.6	1877	95
	1992	912324	44445	4.8	2097	84
	1993	998706	42528	4.2	1556	57

Figure A-1


3-Day Observation Test for Chloroquine
Day 0
(100% parasitemia)
Day 2
< 25% Parasitemia
Day 7
> 75% Parasitemia
Poor Response
(R III Resistance)
Negative
Good Response
(S/R I late)
Positive
Partial Response
(R I early /R II level resistance

3. Other Vector-Borne Disease Problems

The Team was requested by the MOH in Nepal to broaden the scope of its terms of reference to address the emerging problems of other vector-borne diseases, particularly with regard to visceral leishmaniasis (Kala-azar). Another endemic vector-borne disease with high case fatality rates that requires further delineation is Japanese encephalitis. In the future, the emergence of dengue hemorrhagic fever and lymphatic filariasis may need to be addressed as well.

a. Visceral leishmaniasis (VL)

(1) Background of the disease in the region

Visceral leishmaniasis (Kala-azar) is a vector-borne parasitic disease that has been known to be endemic in the sub-continent of South Asia for several centuries. Currently, VL is found in India, Bangladesh, and Nepal. The malaria eradication program (MEP) had a dramatic impact on the reduction of transmission of VL during the 1960s and 1970s. Residual spraying of DDT in houses had the synergistic benefit of reducing not only populations of anopheline mosquitoes, but also phlebotomine sandflies, vectors of VL. Despite the significant reduction in disease directly attributed to the early success of the MEP, vertical vector control efforts were progressively diminished in the early 1980s as donor support for insecticides lessened. Also, there was the advent of the primary health care program initiated in Alma Ata which called upon maximizing the use of indigenous resources and integration of health services. Meanwhile, there has been a serious resurgence of Kala-azar in the region. This disease is characterized by extremely high case fatality rates (>75%) in Nepal and is cured only by expensive and lengthy chemotherapeutic regimens.

During the period 1980-1992, India has suffered the most from the resurgence of VL with 400,000+ cases and 3,000+ deaths. Bangladesh had 20,000 cases and 35 deaths during this period, while Nepal had 4,511 cases and 166 deaths (by far the highest case fatality rate in Asia). Considering the rural focus of the disease and the inadequacy of case reporting, it has been suggested that these figures should be increased by a factor of 3 to 5. VL was declared a notifiable disease in Bihar, India in 1991. As a result of the

successful implementation of control strategy in India, a decline of 36% in the incidence of VL was reported during the first half of 1993. However, in Nepal where a control strategy is not yet in place, cases reported increased by 61% from 1991 to 1992.

(2) Current status of Kala-azar and its control in Nepal

Kala-azar is considered to be endemic in 11 districts of the Central and the East Region bordering India: Parsa, Bara, Rautahat, Sarlahi, Mahottari, Dhanusha, Siraha, Saptari, Sunsari, Morang, and Jhapa. (See map 1 in Appendix D). Traditionally, VL had been considered to predominate in the East Region. However, based on interviews with hospital directors and public health officials in both regions, it appears that the focus in 1994 has shifted toward the districts surrounding Janakpur in the Central Region. As a result of the lack of an effective surveillance system for Kala-azar (including laboratory diagnostic capability) and the reported large numbers of patients seeking treatment from private practitioners, there are currently no complete figures available for 1993. However, it is widely held that both the number of cases and deaths due to Kala-azar increased significantly. At the zonal hospital in Dhanusha, more than 570 new cases were recorded in 1993 alone. Public concern regarding recent deaths attributed to Kala-azar in Dhanusha and Saptari Districts was expressed in a series of newspaper articles. There remains the need for the development of rapid and effective laboratory confirmation of clinically diagnosed cases to definitively elucidate the actual epidemiologic situation.

(a) Case detection

Case detection of VL in Nepal to date has been hampered by inadequate training of field health personnel to recognize symptoms of the disease, the lack of effective field diagnostic technology, the rural focus of the disease, and the reported widespread use by the local populations of private practitioners (licensed or not) in Nepal and neighboring India. As a result, there is no routine recording of suspected cases at the Health Post level within the existing health information system. Although suspected cases at Health Posts may be sporadically referred to the District level, there is no specific recording of these events in routine morbidity reports.

(b) Diagnosis

Currently, diagnosis of VL in district/zonal hospitals has been based on clinical symptoms and the use of the aldehyde test. The latter is considered to be insensitive. Bone marrow and splenic aspirate samples for parasitic confirmation are tedious, unpopular among the patients, and apparently not performed on a routine basis at tertiary care facilities in Nepal. The lack of appropriate laboratory diagnostic technologies, e.g direct agglutination test (DAT) or Dot-ELISA makes the task of overburdened clinicians difficult at best. The personal initiative of the zonal hospital directors observed in Janakpur and Biratnagar in case management are highly admirable considering the limited resources with which they have to work. Providing these facilities with new confirmatory diagnostic tools will surely have a significant impact on gaining a better epidemiologic profile of the disease. Private practitioners should be encouraged to use these new tools as well.

(c) Treatment

The first line of treatment in Nepal continues to be sodium antimony gluconate (SAG) (20mg/kg/20 days). Unresponsive cases are treated with a second course of SAG before resorting to the second line of treatment, pentamidine, which must be administered under medical supervision. However, there is some anecdotal evidence of the increasing ineffectiveness of SAG, either as a result of treatment failure or lack of compliance with the lengthy chemotherapeutic regimen, as has been experienced in India. In Janakpur, a number of persons expressed their dissatisfaction with available treatment (in spite of it being provided for free) preferring instead to seek treatment in India or from local private practitioners (whether licensed or not). The evaluation sub-team (accompanied by the Director General of Health Services, MOH, HMG) witnessed one young man being administered — in a rural cowshed — an I.V. solution containing amphotericin B, apparently acquired in India at a total cost of 40,000 rupees. The family appeared to be a typical rural farming extended family of modest means. The economic consequences of this trend could be potentially devastating. The family was made aware that the patient could still receive

medical supervision at the local hospital. Numerous other defaulters (those who withdrew from the complete treatment regimen) were observed during the field visit, many with enlarged spleens.

(d) Vector control

Vector control for VL has fallen under the auspices of the Malaria Control Division, which in turn in the reorganization of the MOH, has been relegated to the Epidemiology and Disease Control Division (EDCD). Indoor insecticidal spraying was conducted with malathion in 8 districts of the Eastern and Central Regions in 1993. Currently, there are plans by EDCD to spray the same districts in April 1994 with DDT (the insecticide available in the inventory of the MOH). However, they have stressed that in order to cover all 11 endemic districts to prevent escalation of the current outbreak, it will need external technical assistance of 5.0 million rupees ($100,000). However, before purchase of these insecticides, susceptibility tests should be conducted, and an operational plan formulated.

(e) Epidemiologic Surveillance (Health Management Information System)

At present, there is no viable epidemiologic surveillance system in place to enable the MOH to monitor current and future outbreaks of VL in endemic areas, or other vector-borne diseases for that matter. The current routine reporting system of morbidity from Health Post to District level does not include reference to suspected cases of VL (albeit this may be done occasionally on an ad hoc basis). Also, there is no mechanism yet in place to obtain case reports from the private sector. Furthermore, there is no mechanism in place to assess the extent of cases imported from neighboring India (which are anecdotally considered to be significant). Also, the lack of adequate laboratory diagnostic technology at government hospitals in Nepal, makes it impossible to definitively confirm clinically diagnosed cases, and to assess potential treatment failure to SAG, a possible serious problem considering the situation in neighboring India.

(3) Recommendations

There is an urgent need for the formation of a task force to develop a national strategy for the prevention, control and monitoring of VL and other vector-borne diseases in Nepal. Ideally, the task force should be comprised of physicians and public health officers from the most seriously affected Districts/Regions (Central/East), as well as key figures from the private sector. The Epidemiology and Disease Control Division would seem the logical source of local leadership in the formation of such a task force. The newly created center for research and training in vector-borne diseases in Hetauda would seem the logical venue to drive such an effort.

The objectives of such a task force should be to develop a long term strategy and action plan for the prevention and control of VL in Nepal. Specific objectives should address a coordinated approach toward enhancing the national capacity in six critical areas: 1) early case detection, 2) improved laboratory diagnostic technologies, 3) improved treatment and case management, 4) vector control 5) operational research to understand the epidemiology of the disease and 6) development of an epidemiologic surveillance system. Training of MOH personnel will be a necessary component in all six areas. The Hetauda Center could readily provide this support once it becomes fully operational later this year. However, the task force will need to conduct a thorough resource assessment to determine what will be the requisite resources needed for such a program in terms of: existing manpower, essential drugs, laboratory equipment and regents, insecticides and other vector control materials, and particularly, what external technical assistance and resources will be required.

The Hetauda Center must have the capability to provide in-service training of MOH personnel in new diagnostic technologies such as the Direct Agglutination Test (DAT), and Dot-Elisa to rapidly detect presence of VL-specific antibodies. Also, the Center has the potential to conduct operational research via new technologies, e.g. PCR (polymerase chain reaction) that would enable rapid and highly sensitive identification of parasite antigen in sera as an adjunct, and/or potential replacement for traditional methods of parasite isolation from bone marrow and splenic aspirates, as well as from phlebotomine vectors to elucidate local transmission patterns. Likewise, PCR technology will have an important role in confirmation of Japanese

encephalitis virus in serum samples, a procedure currently unavailable in Nepal. An epidemiologic surveillance system should be developed based on improved case detection, diagnostic and treatment regimens, and monitoring via epidemiologic field stations to be established at hospitals in Central (Janakpur) and East (Dharan or Biratnagar) Regions. Overall monitoring and coordination of such a surveillance system will be most efficiently managed by the Hetauda Center of the Epidemiology and Disease Control Division, once it becomes fully operational this year.

The task force should consider the potential benefits (in terms of improved case detection) of making VL a notifiable disease in endemic districts. Also, it should explore the possibility of obtaining new drugs for treatment of VL, such as liposomal amphotericin B (AmBisome - Vestar Inc., San Dimas, CA, USA), or Amphocil (Liposome Technology Ltd., Menlo Park, CA, USA). AmBisome has been reportedly extremely effective in trials in Africa, Brazil, and Europe, and is expected to be made available in the near future at costs comparable to current SAG regimens. When available, a clinical field trial in a suitable area (e.g., Dhanusha District), should be considered.

b. Japanese encephalitis (JE)

(1) Current status of JE and its control in Nepal

Japanese encephalitis (JE) is the only other known vector-borne disease in Nepal that is characterized by high case fatality rates. Since 1978, the Division of Epidemiology of the MOH, Nepal has reported an average of 500-700 cases per year, throughout the Terai (albeit based on clinical diagnosis). From recent focus interviews (albeit anecdotal) case fatality rates appear highest in the Central and the East Region. In general, Nepal is considered to have one of the highest CFR in the world for JE at 18.1/1000 (on average) as of 1992. Lack of laboratory confirmation facilities have made it impossible to delineate the precise epidemiologic foci of the disease, or to differentiate JE from bacteriogenic encephalopathies. As with Kala-azar, JE appears to be predominant among males.

(a) Case detection

Currently, the only apparent case detection protocol in practice is that complicated fevers or encephalopathies that do not respond to antimalarial or antibiotics respectively, are referred to tertiary care facilities. However, there is no systematic system in place at the Health Post level to record these events. Effective laboratory technologies for confirming exposure or isolation of the virus (e.g., MAC-ELISA or PCR) are not yet available in Nepal. Meanwhile, the case definition for JE in Nepal is reported to be the following: any encephalitic case that has succumbed after radical therapy with antibiotics is considered a JE case. This approach is based on the lack of suitable confirmatory tools, and local physicians realize that it is lacking in sensitivity.

(b) Treatment

After clinical diagnosis at tertiary care facilities, the treatment regimen is basically supportive in nature. The following supportive therapy is reportedly administered: antibiotics (penicillin for secondary infection), corticosteroids (beta methazol to reduce cerebral edema), and an antipyretic.

(c) Vector control/prevention

Currently, vector control is considered infeasible considering the extremely large areas where the mosquito vectors (*culex spp.*) breed. Although JEV vaccines are available (and have been used on a limited basis by NGOs) external support would most likely be required in order to mount a sustainable immunization program for JE in Nepal.

(2) Recommendations

Epidemiologic sentinel sites recommended to monitor falciparum malaria and Kala-azar should monitor suspected cases of JE as well. If MAC-ELISA and PCR capability can be developed at the Hetuada Center to include IgM and antigenic confirmation of JE, it would be a major contribution to the development of control strategies for JE in Nepal. Once a better understanding of the actual epidemiologic foci

of the disease is established in Nepal, focal immunization strategies could be developed by the Epidemiology and Disease Control Division. Meanwhile, a training module should be developed for peripheral field personnel to refer suspected cases, and JE should be included in the proposed epidemiologic sentinel site surveillance system.

B. Stratification of Malarious Areas

Background

Nepal has been engaged in anti-malarial activities for the past four decades. Until 1988, the malarious areas of each region were differentiated into hyperendemic and hypoendemic areas. In that year a reclassification of malaria areas according to topography and malariogenic potential was begun. This was revised during the period 1990-1993.

During 1988-89, the malaria profiles of the Regions were used to identify problem Districts. Cases reported were categorized by the parameters of malaria parasite species (*P. falciparum* or *P. vivax*) and locus of presumed transmission (indigenous or imported). Four operational parameters were then determined by which to analyze particular areas:

- Annual Blood Examination Rate (ABER),
- Slide Positivity Rate (SPR),
- Slide Falciparum Rate (SFR), and
- Percentage *P. falciparum* Cases (PFC).

Additional epidemiologic information such as age, sex, village, location, population movement, and elements of human behavior were not available or used for stratification.

Indicators for Malarious Area Stratification, 1990-93

Malaria risk and the approximate populations affected were grouped by receptivity and malaria potential into three broad categories: areas of moderate risk, areas of low risk, and areas with no regular malaria risk.

Level of Risk:	Moderate	Low		Usually none
Previous classification by endemicity	Hyperendemic	Hyperendemic	Hypoendemic (Low seasonal transmission)	No malaria (Short seasonal transmission)
Geographic description:	Forest fringe, foothills, inner terai	Terai forest, cleared settlements, rice cultivation.	Hills with river valleys, elevation 3500-4000 feet	Upper river valleys. (17 Western Districts)
Population:	3.98 million	4.89 million	2.34 million	0.82 million
Vectors	*An. fluviatilis* *An. maculatus* *An. minimus*	*An. annularis* (low transmission potential)	*An. fluviatilis* *An. maculatus*	

Using the revised 1990-93 parameters for classification by malariogenic potential, five eco-epidemiologic strata were identified. (See map 2, Appendix D) Maps of the stratified areas were prepared, and the goals, objectives, and approaches for malaria control in each strata were defined. The five strata are the following:

Stratum I (originally Hyperendemic)
Geography: Foothills, forest fringe, Inner Terai, population 1.48M
Vectors: *An. fluviatilis* (prolonged transmission); *An. maculatus* (secondary)
Potential: High
Receptivity: Moderate
Malaria: High incidence of *P. falciparum.*

Stratum II (originally Hyperendemic)
Geography: Foothills, forest fringe, Inner Terai, population 2.49 M
Vectors: *An. fluviatilis* (prolonged transmission); *An. maculatus* (secondary)
Potential: Moderate
Receptivity: Low

Stratum III (originally Hypoendemic)
Geography: Cultivated plain, Terai
Vectors: *An. annularis*
Potential: Low
Receptivity: Low

Stratum IV (originally Hypoendemic)
Geography: Hill river valleys, population 2.34M
Vectors: *An. fluviatilis*, *An. maculatus* (occasional transmission)
Potential:
Receptivity:
Malaria: Exacerbations due to imported cases

Stratum V
Geography: Hills, population 0.82M
Vectors: *An. fluviatilis*, *An. maculatus* (occasional transmission)
Potential:
Receptivity:

The following epidemiologic and operational indices were selected:
Epidemiologic indices: API, AFI, SPR, SFR, PF%
Operational indices: To measure surveillance efficiency: ABER
To monitor vector control: Percentage of population protected by spraying; vector density before and after spraying; sporozoite rate.

Specific objectives and approaches were defined for each of the five strata:

Stratum	Malaria control approaches
I	Develop early warning system for projects and adjacent areas. Expand the network of Passive Case Detection Volunteers (PCDVs). Establish peripheral laboratories for diagnosis and treatment. Carry out selective intradomiciliary spraying based on epidemiologic indices. Plan to carry out longitudinal entomologic studies in problem areas. Monitor vector resistance.

II Develop early warning system for projects and adjacent areas. Develop network of PCDVs. Carry out selective focal spraying in endemic foci of *P. falciparum*.

III Early warning system. Develop network of PCDVs. Carry out selective focal spraying of *P. falciparum* outbreaks.

IV Develop network of PCDVs. Institute a strategy of early detection and prompt treatment (EDPT). Carry out focal spraying in areas of persisting transmission.

V Treat "suspected cases of malaria" at Health Post level.

Observations on the Present Stratification of Malarious Areas in Nepal

This stratification adds "vulnerability" to the earlier measures of endemicity and receptivity to characterize areas with differing patterns of malaria. The advantage over the previous system is that "vulnerability" takes into account the potential for malaria transmission, as well as the actual level of transmission risk in different eco-epidemiologic zones. API is available up to the Ilaka level.

In the present stratification scheme, additional factors have been used for sub-stratification:

(i) Persistence of transmission. API, SPR, and SFR over the past five to six years have been used to analyze trends in the indigenous transmission of malaria at the Health Post level within each stratum.

(ii) Areas of potential for exacerbation. Within each stratum, epidemiologic indicators have been used to delineate areas with potential for malaria exacerbation. On the entomologic side, however, although vectors have been identified, longitudinal monitoring of changes in vector density and infectivity are not carried out routinely.

(iii) High prevalence of *P. falciparum*. Within each stratum and by Health Post, falciparum malaria cases have been categorized by whether they represent indigenous or imported cases and by drug resistance status.

(iv) Population migration. Patterns of migration have been mapped by identifying cases imported from neighboring countries. Migration to the areas of new development projects within the country and transmigration to endemic areas of neighboring countries are not carried out since these require special studies.

(v) Vector species and bionomics. Prevalence of vector species within each stratum has been determined and associated with ecologic changes. The disappearance of *An. minimus* from the Terai, for example, and the presence of *An. maculatus* complex in some high hilly valleys have been noted. Vectorial capacity indices in problematic areas are inadequate, however, and are based on longitudinal studies in representative zones. Entomologic indicators such as entomologic inoculation rates and vectorial capacity are insensitive predictors of malaria outbreaks. Epidemiologic indicators are adequate to alert health officials to take appropriate preventive and containment actions. Higher numbers of blood slides reflecting sudden increases in fever cases and a sudden increase in vivax or falciparum cases are indicators. These are reflected by the SPR and SFR rates.

Special Consideration of *P. falciparum* Malaria

Among the parameters used in the revised stratification scheme to characterize the falciparum malaria situation at the Health Post level within each stratum are the following:

Total falciparum cases,
Slide falciparum rate (SFR) from ACD, PCD, or other surveillance mechanisms, and
Imported versus indigenous cases.

Some areas with chloroquine resistance have been identified. In areas with a high potential for malaria, high risk populations need special attention.

Additional operational parameters include:

Proportion of suspected *P. falciparum* cases that are confirmed by laboratory, by health facility, and by month or year;

Numbers and proportion of *P. falciparum* cases treated with recommended antimalarial drugs on a monthly and yearly basis;
Number of health facilities supplied with antimalarials, as well as inventory details on quantities provided and consumed.

Suggested Variables for Future Stratification for Malaria Control

In accordance with the National Health Policy adopted in 1991 to provide integrated preventive, promotive, and curative services to the people of Nepal (with emphasis on rural areas and villages) and with the 1993 decentralization policy, the overall health care package has been expanded to include the control of malaria, Kala-azar, and Japanese encephalitis.

Within this context, it is essential that specific, precise, and concise information be generated at the grassroots level for use in planning and managing malaria control activities at local, district, regional, and national levels.

Given the diversity of geography, climate, and ethnic groups in Nepal, changing eco-epidemiologic patterns, and the phase-out of ACD with replacement by PCD, a simplified, meaningful, and operationally feasible set of parameters is needed. These parameters will be used to stratify and identify priority groups for malaria protection. The following section lists parameters to be considered for stratification. They are divided first into categories of disease management or prevention, then, within each of those two categories, into epidemiologic or operational parameters.

1. Parameters for Malaria Case Management

a. Epidemiologic parameters

(1) Morbidity indicators:

- Numbers of cases of clinically suspected malaria (patients with acute fever that is not otherwise explained) — the "Fever Index."

- Bloodsmear case detection results expressed as positives, SPR, SFR, and falciparum cases as a percentage of total cases.

- Cases recorded in medical facilities as severe, complicated, cerebral, and referred.

- Numbers of children, pregnant women, and other high risk groups diagnosed clinically by peripheral workers, Sub-Health Posts, and Health Posts.

- Numbers of treated *P. falciparum* cases documented as treatment failures at Health Posts, PHC Centers, and District, Regional, and Central Hospitals.

(2) Mortality indicators:

- Deaths in hospitals and PHC Centers due to confirmed malaria.

- Case fatality rates by age and sex in such institutions.

b. Operational parameters

(1) Input indicators:

- Health and medical facilities having antimalarial drugs availabie throughout the year.

- Health and medical facilities having trained staff, microscopes, and laboratory technicians capable of handling malaria diagnosis and management.

- Annual drug supplv and consumption.

(2) Process indicators:

- Percentage of sanctioned posts at health facilities that are filled.

(3) Outcome indicators:

- Reductions in the numbers or rates of malaria deaths. (Note that no deaths are reported at present.)

- Reductions in the numbers of clinical and laboratory confirmed cases, especially those due to *P. falciparum*.

- Increases in trained staff and access to facilities prepared to handle malaria cases.

2. Parameters for disease prevention and epidemic control

a. Epidemiologic indicators:

- Proportion of laboratory confirmed cases that are due to *P. falciparum*.

- Proportion of *P. falciparum* treatment failures in PHC centers and hospitals.

- Populations of epidemic-prone areas and numbers of clinical and laboratory confirmed cases of vivax and falciparum malaria in these areas.

- Populations living in areas of insecticide resistance as documented by the special regional entomologic teams.

- Vector density as determined by regional entomologic teams.

- Populations in areas of *P. falciparum* drug resistance as determined by 7-day *in vivo* follow-up tests carried out at regional and district hospitals.

- Numbers of foci of high *P. falciparum* rates in a district.

- SPR and SFR by Health Post, later by Sub-Health Post

b. Operational indicators:

(1) Inputs for preventive services:

- Populations targeted in basic units designated for spraying (preferably by Sub-Health Post, otherwise by Health Post) in epidemic outbreak areas, in areas with high rates of malaria (especially *P. falciparum*), and in areas with drug resistance.

- Numbers of trained staff available for disease prevention activities.

- Available spray equipment, insecticides and their expected coverage, and vehicles both for routine and emergency use.

(2) Output indicators:

- Spray coverage of targeted population.

- Population protected during epidemics.

(3) Impact indicators:

- Reductions in total cases, in PF cases and PF foci, in drug resistance foci, and in morbidity in children and pregnant women.

- Reductions in malaria cases in development projects having facilities to prevent and manage malaria cases.

Malariogenic Stratification - Nepal 1990 - 1993

Strata	Epid. Features	Indices 88-92 Cases	API	AFI	ABER	SPR	SFR	P.f.%	Objective & Goal	Approaches
I	(EX-Hyper), foot hill, forest fringe, inner Terai - An. fluviatilis prolonged transmission An. maculatus secondary *-High potential-moderate receptivity - Projects: roads, dams, industry resettlements, irrig. proj. Projs - migratory pop. Independent Economic pursuit pop. - High Pf - Pop: 1.46 M	8500 to 8200 except 90: 6,800 91: 11,900	6.3 to 5.5 except 91: 8.2	1.38 to 1.24 except 91: 2.65	16.3 to 8.9	3.9 to 6.5 except 91: 8.7	0.8 to 1.4 except 91: 2.8	22 except 91: 32	- Prevent deroriation - Improve problem areas - Prevent Pf. species spread - Drug 'R' to contain API at 5-10 - Goal: Reduce/contain	- Develop E.W.S. for project & adjacent areas - Expand PCD(V) network - Establish peripheral lab. diag. & treatment - Selective residual indoor spray on epidemiological basis - Plan longitudinal entomological studies in problem areas - Monitor vect 'R' status
II	(EX-Hyper) foot hill, forest fringe, inner terai - An. fluviatilis - prolonged transmission - An. maculatus - secondary - Moderate potential, receptivity Low vulnerability - Pop: 2.49 M	3000 to 3500 except 90: 5300	1.33 to 1.51	0.09 to 0.17 doubling	13 to 6	1 to 2.4	0.07 to 0.28	6.7 to 11.9	- Prevent control of Epidemics - Prevent Pf spread - Contain Drug 'R' - Goal: Reduce/ contain API at 3	- E.W.S. - PCD 'V' - Selective spray - Focal spray in indigenous Pf. Foci - Entomological studies 'S' tests
III	(Ex-Hypo): plain, cultivated outer Terai - An. annularis - Low potential, transmission based on vulnerability, low receptivity (low Terai)	4400 to 6300 (1990) 3600 (1991)	0.96 to 1.28 (1991)	0.18 to 0.08 (1992) 91: 0.13	11.7 to 7 (1992)	0.8 to 1.7 (1991) 92:0.12	0.15 to 0.18 (1991)	18.7 to 11.5	- Prevent resurgence in disease free areas - Control focal O.Bs - Prevent Pf spread - Goal: API at 2	- E.W.S - PCD 'V' - Focal spray Pf. O.B.s
IV	(EX-Hypo): hill river valleys (low hills) - An. fluviatilis/An. maculatus - Short transmission/low potential - Exacerbations - case introduction - Pop: 2.34 M	7000 to 7860 (1992)	3.3 3.3 (1992)	0.3 to 0.12 (1992)	12.3 to 4.4 (1992)	2.7 to 7.7 (1992)	0.24 to 0.27 (1992)	9 to 3.6 (1992)	- Prevent mortality - Reduce mortality - Goal: API at 4	- PCD 'V' - Early detection & prompt treatment - Focal spray in persistent transmission areas
V	Hills - no operations - A. fluviatilis/A. maculatus - Occasional transmission based on vulnerability - Pop: 0.82 M									Treat "SCM" through Health posts

C. Entomological Activities under the New Control Strategy

1. Present situation

Nepal, a country located on the southern slopes of the Himalayan Mountains, is divided into three topographical regions spreading longitudinally from east to west. The climate and topography of these three regions greatly influences the composition of the local flora and fauna, including the insect vectors of malaria, leishmaniasis, filariasis, and encephalitis. There are 144 species and subspecies in 15 genera of mosquitoes known from Nepal. In the genus *Anopheles*, there are 45 species recorded, but only five species have been incriminated as vectors of malaria; *Anopheles annularis*, *An. fluviatilis*, *An. maculatus* complex, *An. willmori*, and *An. minimus*. Although *An. minimus* was the primary vector at one time, indoor residual spraying with DDT during the 1950s and 1960s, as well as deforestation and aquatic pollution, essentially eliminated this species as vector in most areas. *Anopheles fluviatilis* is probably the most important malaria vector at the present time. There are almost 100 species of culicines recorded in Nepal. *Culex tritaeniorhychus, Cx. gelidus, Cx. fuscocephala, Cx. pseudovisnui* and *Cx. vishnui* may play an important role in the zoonotic maintenance of Japanese encephalitis; however, JE virus has been isolated only from *Cx. tritaeniorhychus* in Nepal. *Culex quinquefasciatus* is the major vector of human filariasis (*Wuchereria bancrofti*). Sand flies transmit the leishmanial parasite that causes Kala-azar in Nepal. There are potentially eight species of sand flies recorded from Nepal, but only three are generally found in human habitations; *Phlebotomus argentipes, P. papatasi*, and *Sergentomyia babu*. Recently, *Ph. argentipes* was definitively incriminated as the major vector of Kala-azar in the outer terai region of Nepal.

With this diversity of vectors of human diseases in Nepal, entomological expertise is absolutely essential in a well-running, vector-borne disease, prevention and control program. The Malaria Control Program in Nepal has had a series of excellent entomologists; however, all were or are development staff. Under the current reorganization of the health services, all of the entomologists with advanced training and experience will not be

eligible for a permanent position as all are development staff and over 35 years of age. All four have received Masters of Science degrees from overseas and have received additional training in malariology, vector control, mosquito taxonomy, and sand fly collection and identification. Three have been with the Malaria Control Program for 16 to 17 years, and one recently retired. There are only two assistant entomologists that are regular staff and eligible to continue under the new plan. One of these is at Mahidol University in Bangkok at the present time and will receive a masters degree in a year. At that time, he would be eligible for promotion to entomologist.

Under the new reorganization of the health services, there will be positions for five entomologists and five assistant entomologists at the five Regional Disease Control Sections. The current staffing pattern at the Hetauda Research and Training Center calls for an entomologist, an assistant entomologist, a vector control officer, and a vector control assistant. Unfortunately, there are no entomology positions within the Epidemiology and Disease Control Division, Ministry of Health, Kathmandu. This oversight considerably weakens the Division's ability to form policy and to plan vector-borne disease prevention and control activities. In any case, six entomologists with graduate training in entomology, four assistant entomologists with graduate training in zoology, a vector control officer with graduate training plus experience in vector control, and a vector control assistant must be hired to fill the existing positions under the new staffing pattern. Clearly, a huge gap exists between what is needed and who is available. Advanced training of new entomological staff will be a key issue, and experience will only come with time. Therefore, the next two years will leave the Malaria Control Program very weak in entomology unless something is done to mitigate this problem; for example, contracting experienced development staff for a period of time.

The Team inquired about current entomological activities in four different Regions and interviewed two of the three remaining entomologists. The results of these queries were not promising at all. In fact, in some Regions no routine entomological activities (except for spraying) have been carried out during the past year because of budget problems, lack of administrative support, lack of

transport, and low morale. Operational research that was funded by WHO/TDR has been stopped due to budget considerations except the insecticide-treated net study in the Central Region (Sinduli District) which continues one year behind schedule. Study design problems, inadequate community involvement, and other factors may preclude full statistical interpretation of the data in any case. The study is also inhibited by the fact that the vehicle supplied by the WHO/TDR grant apparently was not available for the study; therefore, the entomological team must travel by public bus and then walk four hours to the study villages. Another insecticide-treated net study in Kavrepalanchok District (operational costs provided by HMG and insecticide nets provided by the German company Bayer) has been more successful and is in its second year of treated net use. Projects on forest malaria transmission (TDR funded), malaria vector population dynamics (TDR funded), and community environmental control have all ceased due to various considerations. No research activities have been carried out during the last year on sand flies (Kala-azar) or *Culex* (Japanese encephalitis and filariasis). No recent data were provided to the Team on insecticide susceptibility tests for either mosquitoes or sand flies. It is not clear why the sand fly testing kits sent by WHO/SEARO were not utilized, particularly with the potential of extensive spraying against the vectors of Kala-azar which may be resistant to DDT. In summary, entomology in the Malaria Control Program needs a real boost in support at the National, Regional, and District level.

2. Future direction

The future for the development staff in entomology is not bright under the new reorganization of the health services. The future for new regular staff in entomology is less clear. The new entomologists will be placed primarily at the District level (Disease Control Section) but with Regional responsibilities. They will have to rely on the District Health Officer for support such as transport but will have to answer to the Regional Director. They will have the only entomological expertise available to the Regional Directors to predict and/or investigate vector-borne disease outbreaks, with the possible exception of the entomologist assigned to the Hetauda Research and Training Center. Therefore, they are an extremely valuable resource, but their ability to move about the Region for

routine surveillance activities may be restricted by lack of support and direction.

As resources for vector-borne disease prevention and control activities are reduced due to lack of government and donor support, the need to delineate risk factors for intense transmission of malaria, Kala-azar, and Japanese encephalitis increases greatly. Effective focal control of outbreaks will be absolutely essential since broad, ill-defined methods cannot be financially supported or sustained. Prediction of outbreak conditions will be critical as decentralization of vector-borne disease control affects the response time of the decision makers. Also critical is the ability to detect resistance development in vector populations prior to expenditure of scarce resources for inappropriate insecticides. The new entomologists in Nepal will have to focus on those things that enhance their ability to predict or stop epidemics. No longer can they afford to routinely collect data month after month which do not provide useful information for this purpose. They will need to select sentinel areas and proper surveillance methods which will provide early warning that environmental conditions and/or human behavior is enhancing human-vector contact and epidemic transmission potential. Extensive training, supervision, and prioritized operational research will be key elements in the development of the above capabilities. The Hetauda Research and Training Center will be the cornerstone for this development. Contracting of experienced development staff may be the only way to cover the sentinel areas during the next two years until the new staff are trained and capable of carrying on surveillance, supervision, and operational research.

Sentinel areas should be considered for high risk malaria outbreak Districts and for Districts at high risk for other vector-borne diseases, particularly Kala-azar and Japanese encephalitis. For example, in the Central Region one are might be in Sindhuli District for malaria and in Dhanusha District for Kala-azar. In the East Region one might be in Morang District for Kala-azar, in Jhapa District for malaria, and in Sunsari District for Japanese encephalitis. In the West Region one might be in Rupandehi District for Japanese encephalitis and one in Nawalparasi District for malaria. With the limited entomological and epidemiological resources available at present, the Team felt that not all regions can

be covered in a like manner. However, the Team feels strongly that the Central and East Regions should be properly covered since both malaria and Kala-azar appear to be on the rise; also, JE outbreaks are possible.

The entomologist at the Hetauda Research and Training Center should be part of an emergency response team (which includes a medical epidemiologist and a parasitologist from the Center) to assist the Regional teams during epidemics. He and other professional staff at Hetauda should also provide assistance and information to the Headquarters staff on epidemiological factors that affect policy and planning. Part of this information will be gained through his timely review and analysis of regional epidemiological data obtained at sentinel sites (see Recommendation No. 7 on the Health Management Information System), part through review of recent literature, and part through analysis of operational research results. An important aspect to his job will be training. He should assist in the development of curricula for various courses, including training-of-trainers courses, and should spend a significant amount of his time teaching in the classroom, laboratory, and field. Another major portion of his job will be to conduct well-designed operational research projects on malaria, Kala-azar, Japanese encephalitis, and filariasis. This will include preparation of collaborative research grants, field and laboratory investigations, data analysis, and publication of results in international journals.

3. Required training

Since the entire regular entomology staff may be completely inexperienced in vector-borne disease prevention and control methodologies, extensive training of these staff will be required. It is assumed that all new entomologists will have a MSc in Zoology from Tribhuban University or its equivalent. It is recommended that a training plan be worked out with WHO so that these individuals can apply for a WHO fellowship for medical entomology graduate training in one of the Asian Universities (e.g., Mahidol University in Bangkok). Through this training and additional short-term training over a two- to five-year period, these individuals (entomologists) should receive a firm foundation in biosystematics, malariology, parasitology, arbovirology,

epidemiology, research methodology, computer application software, and biostatistics. Eventually the entomologist to be involved in teaching and research at the Hetauda Research and Training Center should be sent abroad for Ph.D. training. The assistant entomologists should receive short-term training in biosystematics, malariology, parasitology, and computer application software. After five years of service, they should be eligible to apply for WHO fellowships for MSc training in entomology.

D. Assessment of the Information System for Vector-Borne Diseases and its Integration into the Proposed National Health Management Information System (HMIS)

1. Present situation

The present situation of managing information on vector-borne diseases in Nepal is clearly inadequate and exacerbated by the recent reorganization of the MOH. Previous attempts to develop a health information system within the Malaria Division were not successful. Technical assistance provided in 1993 for the malaria information system apparently failed to take into account the new reorganization of MOH, Nepal, and instead focused on computer maintenance. Case detection of malaria is in the process of rapid devolution, since the malaria control program has been absorbed into the Epidemiology and Disease Control Division (EDCD). While this occurs, it is important to note that there has not been any comparable system developed to track other vector-borne diseases such as Kala-azar and Japanese encephalitis, both characterized by extremely high case fatality rates. However, it is essential to note that the EDCD is extremely shorthanded in terms of technical manpower to maintain epidemiologic surveillance nationwide, and it is most important that MOH, Nepal, consider bolstering manpower requirements within the Division of Epidemiology and Disease Control Division in order to be able to adequately conduct its mandated activities.

The currently envisioned National Health Management Information System will take some time to become established as noted in the draft work plan: "Design and Implementation of an Integrated Health Management Information System for the Ministry of Health." Although it is inherently admirable that huge amount of forms (many redundant) will be reduced significantly by the new system, reporting of potentially fatal vector-borne diseases has been limited to two forms: a monthly malaria form and a monthly morbidity and mortality form (attached). It appears that the malaria form included is an artifact of the previous Malaria Division, since under the current devolution, it appears unlikely that active/passive case detection methods will be able to be sustained. Kala-azar is

the only vector-borne disease noted on the new monthly morbidity and mortality form. Malaria and JE should be included.

Preliminary plans include the establishment of the new system in several pilot Districts. For the foreseeable future, it appears that these data are to be forwarded to the Central level for collection purposes only, and this system will not have the capacity to rapidly identify focal outbreaks of vector-borne diseases, and promptly respond with effective control measures in affected districts. Meanwhile, several vertical information systems for EPI, family planning, ARI, nutrition, tuberculosis etc. are to be continued. However, there remains no cogent interim system for epidemiologic surveillance of potentially fatal vector-borne diseases (e.g falciparum malaria, Kala-azar, and Japanese encephalitis) to enable the MOH, Nepal, to adequately respond to serious new outbreaks and to plan for long-term sustainable programs to protect its population from massive epidemics characterized by deaths in the thousands.

2. Future direction

The Hetauda Center of the Epidemiology and Disease Control Division should have the potential to provide the necessary interim capability to monitor outbreaks of serious vector-borne diseases in Nepal; e.g., falciparum malaria, Kala-azar, and Japanese encephalitis. The MOH, Nepal, plans on staffing the center with a medical director, epidemiologist, parasitologist, entomologists, and trainers that should enable Nepal to develop effective strategies for control and prevention of life-threatening vector-borne diseases. Meanwhile, an epidemiologic surveillance system needs to be established at the Hetauda Center based on development of several epidemiologic sentinel sites in endemic areas, particularly in the Central and East Regions where falciparum malaria, Kala-azar, and Japanese encephalitis are considered to predominate. Such a system needs to be developed in concert with clinicians, epidemiologists, and entomologists to ensure that maximum effectiveness is achieved. To ensure that an effective system is established, optimum utilization of local manpower is essential. Thus, at least one person (preferably development staff already in place in the field) should be assigned responsibility for managing the collection of epidemiologic surveillance data at each sentinel site

in coordination with District Health Officers, District Public Health Officers, hospital directors, etc. Overall supervision of activities at these sentinel sites would be the responsibility of the director/epidemiologist of the Hetauda Center. Within the epidemiologic surveillance system there needs to be a logistics/communication plan to ensure that pertinent data is routinely collected from target Districts, and sentinel sites are regularly supervised. This development will require considerable interdisciplinary coordination, training, and leadership on the part of the MOH, HMG, Nepal, and at least in the short term, outside technical assistance.

3. Required training

Enhancing the diagnostic capacity of MOH, Nepal for serious vector-borne diseases should be a training priority, along with training-of-trainers courses for multipurpose health personnel. External technical assistance is likely to be required for training in new laboratory diagnostic technologies, in the development of an epidemiologic surveillance system, and in the development of training modules for multipurpose health workers. Short-term external training should be sought for some of the key staff at the Hetauda Center. The medical director/epidemiologist could benefit from a short-term course in epidemiologic surveillance methodology at an appropriate source such as the Centers for Disease Control, USA or at an institution that offers short-term courses in international epidemiology such as the Johns Hopkins University. Expertise in arbovirology could be attained at AFRIMS, Bangkok. Preliminary training on epidemiology and laboratory diagnostic methodologies should be accomplished soon via assistance from USAID/Washington under existing agreements. Additional technical support from WHO/SEARO in this process (particularly in the area of training of multipurpose health workers and overall technical guidance) would be particularly appropriate at this juncture.

E. Review of the Present Status and Projected Long Term Needs for Insecticides and Related Logistic Support for Malaria Control

The application of insecticides will be one of a variety of operational methods used in Nepal in the control programs for malaria, Kala-azar and other vector-borne diseases in the foreseeable future. The use of this methodology depends upon a sound epidemiological intelligence system, including timely and accurate reporting, and a viable response mechanism. In the past few years, the epidemiological system has functioned to guide the limited spraying operations that stabilized the reported malaria incidence in the range of 25,000-16,000 cases per year in the 1988-1993 period. The older stratification process proved satisfactory, but now it may be in need of adjustments to reflect the over-all health objectives of the country in integrating this vertical health program and the Global Malaria Control Strategy.

The 1993 spray operation was carried out to control both malaria and Kala-azar. The data provided to the Team indicated a satisfactory level of spraying coverage for both the malaria and Kala-azar target areas. In brief, the malaria Districts covered included portions of Dang, Surkhet, Dandeldura, Kailali, Kanchanpur, Dhanusha, Mahottari and Sinduli. The Kala-azar Districts included portions of Dhanusha, Mahottari, Sarlahi and Rautahat, Saptari, Seraha and Sunsary. The insecticides used during 1993 included malathion (50%), DDT (75%), and ICON (10% lambda-cyhalothrin). A detailed summary of spray operations in 1993 is presented at the end of this section.

The present status of insecticides in Nepal as reported from the Central level is presented in Table E.1. Unfortunately, a large number of Districts have not presented their insecticide position to the Center. There are stocks of insecticides at many of the non-reporting Districts, but the absence of data reflects reporting problems from the field areas. Without adequate knowledge of present insecticide stocks, it is not possible to accurately provide a sound logistical and operational plan. It would appear from these data that most of the malathion stock is in the Central Region store area. The Team suggests that efforts be made to obtain the correct

insecticide position in the country in order to formulate a reliable logistics plan for spray operations.

Tables E.2A and E.2B present the projected insecticide requirement for the 2051/52 (1994/95) period to control Kala-azar and malaria, respectively. The insecticide requirements reflect a major and ambitious spraying program which will require a detailed plan of action. While this large scale operation may be necessary in some locations for Kala-azar (in spite of an absence of a clear epidemiological picture and lack of resistance testing of the sand fly vectors), it is strongly suggested that a plan of action be carefully developed prior to such a massive and expensive operation. This will ensure that the program is based on scientific knowledge before applying expensive insecticides in what appears to be an emergency response to the disease.

Tables E.3A and E.3B provide the present status of spray pumps in Nepal. Table E.3A provides a general inventory of spray pumps in the country; whereas, Table E.3B shows only those Districts proposed for spray operations. Again, there are a lack of data on spray pumps in a number of Districts because reports have not reached the Central level on their present position. There are plans to carry out a large-scale activity to repair several hundred pumps. The Team believes that local facilities now exist to repair pumps, and the Government is encouraged to support local repair contracts if standards and schedules can be met.

The anti-malaria drug status in Nepal is presented in Tables E.4. E.5. The Team was informed that there is no shortage of drugs for anti-malaria activities at present. The Royal Drug Company processes and provides anti-malaria drugs in a adequate manner. No shortage of such drugs is expected in the next year.

Tables E.6 and E.7 summarize the financial position of the malaria control activity. The present budget and the estimated budget are based on two cycles of spraying for both Kala-azar and malaria. The continued heavy reliance on foreign assistance for procurement of insecticide is troublesome and should be stabilized by at least some financial input from the Government of Nepal.

The Team held discussion sessions with the Director of Logistics Management Division in order to obtain an overview on how the supply and procurement system operates now that it has been centralized and is not a function of each vertical health program. We were informed that the Logistic Management Division consists of three sections -- Indent and Procurement (11 persons); Stores and Supply Section (9 persons); and Vaccine Supply Section (7 persons). There is a total of 28 staff, including the Director at the Central level, to service the needs of the Department of Health Services over the entire country. It was brought out that few, if any, of the present staff has had supply training. The Team was concerned that without proper staff training, especially in the handling, storage, and transportation of insecticides, that expensive materials may be damaged and/or cause environmental and human health problems. There are plans to provide training opportunities for this staff and some regional staff through a USAID grant to the John Snow Inc. The Team urges that this training include several sessions on the subject of safe handling and storage of insecticides. One sub-team reported seeing the improper storage of insecticides in the Central and East Regions. The Government should take immediate steps to see that this material is properly stored and handled. In particular, insecticides should be kept separate from drugs and other medical supplies stored in warehouses. A World Bank loan, which is providing funds for the construction of additional Health Posts and Primary Health Centers for Nepal, includes funding for expanded warehouse areas. Adequate warehouse facilities and a sound inventory control system must be provided for insecticides, as well as other materials used in vector-borne disease control programs. Construction plans for warehousing should be reviewed by technically qualified personnel to ensure that the proposed construction will meet acceptable storage standards for insecticides.

Transport needs have not been reviewed in depth since GON policy is controlling the numbers and types of vehicles to be supplied to Regions and Districts. It is suggested that the five Disease Control Sections in the Regions be provided transport for their activities.

The Team urges the Government to prepare a long-term Plan of Operation which includes supply and procurement needs. The Plan should be based on malaria and other vector-borne disease control policies accepted by the Government.

TABLE E.1 Present Status of Insecticides in Nepal for Malaria and Kala-azar Control Activities*

District	DDT, 75% (kgs)	Malathion, 50% (kgs)	ICON, 10% (kgs)
Morang	39480	5760	60
Sunsari	NA	NA	NA
Saptari	NA	6420	NA
Siraha	NA	6234	300
Dhanusha	NA	NA	NA
Mohattari	90	450	-
Sarlahi	NA	NA	NA
Rauthat	1200	240	NA
Jhapa	NA	NA	NA
Sindhuli	NA	NA	NA
Dang	NA	NA	NA
Surkhet	NA	NA	NA
Bardia	NA	NA	NA
Kailali	NA	NA	NA
Kanchanpur	NA	NA	NA
Dadeldhura	NA	NA	NA
Chitwan	NA	NA	NA
Mukwanpur	NA	NA	NA
Central Region Godown	74,700	235,500	4,000
TOTAL	115,470 kgs	254,604 kgs	4,360 kgs

NA -- Data not available at the Central level.

* -- Data provided by the Epidemiology and Disease Control Division

TABLE E.2 Projected Insecticide Requirements (in kg) for 2051/52 for (1994/5) Malaria Control and Kala-azar Control in Affected Districts

E.2A for Kala-azar--based on 2 cycles (March-April & June-July)

District	Projected Population	DDT, 75%	Malathion, 50%	ICON, 10%
Morang	150,000	39,000	60,000	2,100
Sunsari	60,000	15,600	24,000	840
Saptari	60,000	15,600	24,000	840
Siraha	300,000	78,000	120,000	4,200
Dhanusha	500,000	130,000	200,000	7,000
Mohottari	200,000	52,000	80,000	2.800
Sarlahi	60,000	15,600	24,000	840
Rauthat	300,000	78,000	120,000	4,200
TOTAL	1,630,000	423,800	652,000	22,820
East and Central Regions	870,000	226,200	348,000	12,180
TOTAL	2,500,000	650,000	1,000,000	35,000

Note: (1) Kala-azar spray operation is targeting total inside walls, but not roofs and ceilings.

(2) All data provided by the Epidemiology and Disease Control Division.

(3) Insecticide quantities for the East and Central Regions for emergency spraying or presently unidentified focal areas.

(4) Calculations based on 130 g/capita for DDT; 250 g/capita for malathion; 7 g/capita for ICON.

(5) Amounts estimated for cycles are based on the use of only one insecticide or combination of insecticides depending on the availability of insecticides.

TABLE E.2B for Malaria — based on 2 cycles (March-April and June July)

District	Projected Population	Malathion, 50% (kg)	ICON, 10% (kg)
Jhapa	25,000	20,000	750
Morang	25,000	20,000	750
Dhanusha	70,000	56,000	2,100
Mohottari	30,000	24,000	900
Sinduli	20,000	16,000	600
Dang	15,000	12,000	450
Surkhet	25,000	20,000	750
Bardiya	10,000	8,000	300
Kailali	30,000	24,000	900
Kanchanpur	30,000	24,000	900
Dadeldhura	15,000	12,000	450
Chitwan	10,000	8,000	300
Mukwanpur	10,000	8,000	300
Sub-total	315,000	252,000	9,450
Five (5) Regions for Emergency or Focal Spraying	185,000	148,000	5,550
TOTAL	500,000	400,000	15,000

Note: (1) All data provided by the Epidemiology and Disease Control Division.

(2) Insecticide amount based on 400 g/capita for malathion and 15 g/capita for ICON (lambda-cyhalothrin).

TABLE E.3A Present Inventory of Spray Pumps for Malaria and Kala-azar Control Activities in Nepal, March 1994

District	Reported Usable	Repairable	Required
Morang	413	NA	286
Saptari	78	NA	90
Siraha	112	NA	450
Dhankuta	2	NA	NA
Panchthar	57	NA	NA
Ilam	90	NA	NA
Parsa	55	152	NA
Rupandehi	16	50	NA
Arghankhanchi	17	NA	NA
Palpa	7	NA	NA
Kaski	27	NA	NA
Tanahun	1	NA	NA
Bankey	277	NA	NA
Dang	50	NA	30
Surkhet	232	NA	50
Kanchanpur	NA	NA	60
Sub-total	1,434	202	966
West Region	1754	NA	NA
Far West Region	9	NA	NA
Central Region	145	450	NA
East Region	8	NA	NA
TOTAL	3,350	652	966

Note: (1) All data from the Epidemiology and Disease Control Division.

(2) NA -- data not available at the Central level.

TABLE E.3B Present Inventory of Spray Pumps for Malaria and Kala-azar in Those Districts Proposed for Spray Operations, March 1994

District	Usable	Repairable	Required
Morang	413	No Data Provided	240 (286)
Sunsari	60	"	75
Saptari	78	"	75
Siraha	112	"	375
Dhanusha	370	"	765
Mohottari	200	"	310
Sarlahi	NA	"	75
Rautahat	250	"	375
Jhapa	60	"	50
Sindhuli	50	"	40
Dang	50	"	30
Surkhet	232	"	50
Bardiya	NA	"	20
Kailali	NA	"	60
Kanchanpur	NA	"	60
Dadeldhura	NA	"	30
Chitwan	NA	"	20
Mukwanpur	NA	"	20
TOTAL	1,875	"	2,670

Note: (1) All data provided by the Epidemiology and Disease Control Division.

(2) Two figures given for Morang District. ( ) is Table E.3A figure.

TABLE E.4 Present Position of Anti-Malarial Drugs in Nepal as of March, 1994 tablets)

	CHLOROQUINE	PRIMAQUINE	FANSIDAR
CENTER	2,759,000	6,400,000	4,000,000
FIELD	2,035,140	4,556,408	67,409

Note: The Epidemiology and Disease Control Division states there is not a problem with the supply of drugs for malaria at present.

TABLE E.5. Anti-Malarial Drugs Required for 2051/52 (1994/5)

	Tablets	mg/Tablet
CHLOROQUINE	8,000,000	150 mg
PRIMAQUINE	800,000	7.5 mg
FANSIDAR	20,000	

SOURCE OF FUNDING: Government of Nepal.

TABLE E.6 Summary of Present GON Budget for Malaria Control Section

Source of Funding		Budget totals
HMG		55,057,000
Donor assistance:		
1. **Japanese Debt Relief Fund** (ICON)	20,000,000	
2. **Danish Assistance (DANIDA)** (malathion)	40,000,000	
Subtotal:		60,000,000
Total Budget (Rs NC)		115,057,000

TABLE E.7 Projected Budget for Malaria Control, 2051/52 (1994/95)

Source of Funding	Budget totals
HMG	68,186,450
Donor assistance:	
1. [Donor assistance not yet identified]	100,000,000
Total Budget (Rs NC)	168,186,450

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DISTRICT	CYCLE	INSECTICIDE NAME	DOSAGE	DATE START	DATE END	TARGETTED VILLAGE	TARGETTED HOUSE	TARGETTED STRUCTURE	TARGETTED ROOM	TARGETTED POPULATION	PROTECTED VILLAGE	PROTECTED HOUSE	PROTECTED STRUCTURE	PROTECTED ROOM	PROTECTED POPULATION	INSECTICIDE CONSUMED IN KG	PER CAPITA IN GM	SPRAY MAN DAY
Eastern																		
SAPTARI	SUMMER	MALATHION	2gm	1/2/050	30/2/050	57	12396	37002	-	80077	67	16465	47612	-	103697	157 50	8 05	2080
SIRAHA	SUMMER	MALATHION	2gm	14/1/050	8/2/050	114	16105	20022	-	89827	114	16806	27314	-	83558	91 08	19 73	2236
	AUTUMN	MALATHION	2gm	6/5/050	31/5/050	108	17937	27556		97300	108	17749	29583	-	96224	298 45	63 00	2288
SUNSARY	SUMMER	DDT	1 5G	6/1/050	31/1/050	74	9146	13132	-	51458	74	10218	15684		59653	N A	98 3	1090
	AUTUMN	DDT	1 5G	15/5/050	9/6/050	65	9547	13285	-	51026	65	9973	15628		55809	N A	91 9	1352
Total	SUMMER	MALATHION	2gm			171	28501	57024	-	169904	181	33271	74326	-	197155	8263 5	27 78	4316
	SUMMER	DDT	1.5G			74	9146	13132	-	51458	74	10218	15684	-	59653		98.3	1090
	AUTUMN	MALATHION	2gm			108	17937	27556	-	97300	108	17749	29583		96224	298 45	63	2288
	AUTUMN	DDT	1.5G			65	9547	13285	-	51026	65	9973	15628		55809		91 9	1352
Central																		
DHANUSHA	SUMMER	MALATHION	2gm	8/2/050	32/2/050	51	8621	7380		49572	51	8753	7714		47092	17527 20	372 19	NA
	AUTUMN	ICON	025gm	28/5/050	4/6/050	36	5675	4962		30236	36	5756	4951		31334	801 50	19 10	NA
MAHOTTARI	SUMMER	MALATHION	2gm	8/2/050	1/3/050	22	4586	3509	12482	24480	22	4411	4409	12246	26902	10040 00	373 21	988
	AUTUMN	ICON	025gm	24/5/050	6/6/050	10	2552	2653	8240	15037	10	2650	2653	8145	14837	300 00	20 22	948
SINDHULI	SUMMER	MALATHION	2gm	8/2/050	1/3/050	43	3567	298		21180	43	3707	3619		21977	8628 40	392 52	768
	AUTUMN	ICON	025gm	22/5/050	2/6/050	31	2670	2298		15922	31	2711	2427	-	16509	300 90	18 10	578
SARLAHI	SUMMER	MALATHION	2gm	6/1/050	08/2/050	13	7407	1677		29965	13	4738	1741	-	30286	6031 20	199 2	NA
	AUTUMN	ICON	025gm	25/6/050	4/7/050	7	3501	1836	-	20307	7	3516	2008	-	20557	195.1	9 4	NA
	AUTUMN	ACTELIC	1gm	25/6/050	4/7/050	2	480	179	-	3600	2	475	248	-	3686	270	73 07	NA
RAUTAHAT	SUMMER	MALATHION	2gm	26/1/050	20/2/50	163	33228	25815	-	234171	163	35932	20829	-	239699	53624 4	223 8	NA
	AUTUMN	MALATHION	2gm	8/6/050	5/7/050	153	26869	18968	-	171774	156	27169	17897	-	179050	524		NA
	AUTUMN	DDT	1.5G													17006	97	NA

DISTRICT	CYCLE	INSECTICIDE NAME	DOSAGE	DATE START	DATE END	TARGETTED VILLAGE	TARGETTED HOUSE	TARGETTED STRUCTURE	TARGETTED ROOM	TARGETTED POPULATION	PROTECTED VILLAGE	PROTECTED HOUSE	PROTECTED STRUCTURE	PROTECTED ROOM	PROTECTED POPULATION	INSECTICIDE CONSUMED IN KG	PER CAPITA IN GM	SPRAY MAN DAY
Total	SUMMER	MALATHION	2gm			292	57418	41361	12492	358388	292	57541	38312	12246	365836	95849.2	262.00	1756
	AUTUMN	MALATHION	2gm			153	26889	18958	-	171774	155	27189	17697	-	179050	524	N.A.	N.A.
	AUTUMN	ICON	.025gm			84	14398	11751	8240	81502	84	14535	12039	8145	83237	1387.5	16.79	1524
	AUTUMN	ACTELIC	1gm			2	460	179	-	3800	2	475	248	-	3896	270	73.07	N.A.
	AUTUMN	DDT	1.5G													17006		
Mid-western																		
DANG	SUMMER	MALATHION	2gm	8/2/050	16/2/050	47	2263	1191		15905	47	2836	2052		21184	3568.00	168	472
SURKHET	AUTUMN	MALATHION	2gm	8/2/050	1/2/050	34	4995	-		15389	34	4778			17299	4221.6	244	512
Far-western																		
DADELDHURA	SUMMER	MALATHION	2gm	6/2/050	10/3/050	53	2519	1897	12319	14755	53	2515	2380	12220	16162	4440	270	566
KAILALI	SUMMER	MALATHION	2gm	8/2/050	32/2/050	19	4573	2827		30085	19	4824	2580		29814	7376.8	210	760
	AUTUMN	MALATHION	2gm	22/4/050	1/5/050	6	2305	900		3449	6	2220	1068		13959	406.32	29	52
	AUTUMN	FICAM	0.4gm	1/5/050	15/5/050	7	299	171		1837	7	314	304		1862	76.30	40	20
KANCHANPUR	SUMMER	MALATHION	2gm	8/2/050	1/3/050	26	3267	3245	12826	19829	26	3582	3550	12922	22484	8460.00	376.00	784
	AUTUMN	ICON	0.025gm	5/5/050	17/5/050	17	2407	2121	7117	15000	17	2523	2157	8266	15440	298.97	19.30	592
Total	SUMMER	MALATHION	2gm			96	10359	7969	25145	64769	98	10921	8470	25142	68460	20276.8	296.18	2110
	AUTUMN	MALATHION	2gm			6	2305	900		3449	6	2220	1068		13959	406.32	29.11	52
	AUTUMN	FICAM	0.4gm			7	299	171		1837	7	314	304		1862	76.3	40.98	20
	AUTUMN	ICON	0.025gm			17	2407	2121	7117	15000	17	2523	2157	8266	15440	298.97	19.36	592
National	SUMMER	MALATHION	2gm			606	98541	107545	37637	609966	618	104571	123760	37388	652635	128957.5	197.60	8654
	SUMMER	DDT	1.5G			74	9146	13132	0	51458	74	10218	15684	0	59653	0	0.00	1090
	AUTUMN	MALATHION	2gm			301	52126	47414	0	267912	303	51936	48568	0	306532	5450.37	17.67	2852
	AUTUMN	FICAM	0.4gm			7	299	171	0	1837	7	314	304	0	1862	76.3	40.98	20
	AUTUMN	ICON	0.025gm			101	16805	13872	15357	96502	101	17058	14196	16411	98677	1696.47	17.19	2116
	AUTUMN	DDT	1.5G			65	9547	13285	0	51026	65	9973	15628	0	55809	17006	304.72	1352
GRAND TOTAL	SUMMER					682	107687	120677	37637	661424	692	114789	139444	37388	712288	128957.5	181.05	9744
	AUTUMN					474	78777	74742	15357	437277	476	79281	78696	16411	464880	24229.14	52.12	6340

F. Guidelines for the Preparation of a National Plan of Operations

1. Introduction

This External Assessment of the Nepal Malaria Control Program took place at a very crucial time for the Health Services (HS). A major reorganization plan has been proposed and is in the initial implementation phase. With this recent development, a new strategy for the control of vector-borne diseases in Nepal is extremely important. Preparation of a detailed plan-of-action for control of malaria and other vector-borne diseases is the direct responsibility of the national experts; therefore, the Team will provide only the general principles and guidelines for the development of such a plan. The task of the national experts to develop National Plan of Operation will be easier if they would follow the recommendations of the Regional Working Group Meeting on "Implementation of the Revised Malaria Control Strategy" (WHO SEARO, 1993). This meeting specifically dealt with many aspects of the development of a National Plan of Operation..

Implementation of the Global Malaria Control Strategy may be accomplished in a variety of forms, depending upon the different political structures and economic situation; however, a national malaria control program (including control of other vector-borne diseases) should be governed by the following criteria:

- The program is supported by long-term national commitment.

- Support is given to the local health services to ensure adequate management of disease.

- Realistic and clear objectives to reduce mortality and morbidity are pursued.

- Reasonable resources are allocated according to national PHC and development planning.

- The program is cost effective.

2. Reorientation of the existing malaria control program

a. Factors to be considered:

- Political support for change;
- Planning control of vector-borne diseases a part of primary health care;
- Proper disease management by the General Health Services (GHS);
- Generation by the GHS of epidemiological information on morbidity and mortality and other relevant data suitable for judicious targeting of vector control;
- Selective use of appropriate methods of disease prevention;
- Training of staff in program management, health system research and epidemiology; and
- Long-term technical assistance for operational research.

Due to the enormous variability in malaria problems and malaria control methodologies, objectives of control should be formulated both in general and specific terms. These objectives should be realistic and should take into account the ability of country to mobilize adequate resources for planning, training, implementation, and evaluation. External assistance, both financial and technical, should also be taken into consideration.

Since the process of reorientation of program(s) will result in changes of responsibilities, job descriptions, and transfers, it is inevitable, especially in the initial stages, that there will be some confusion at various levels. Therefore, the ability of management at all levels to conceptualize and manage the system will have a significant impact on program success.

b. Establishment of major priorities for program implementation in accordance with national strategy for control of malaria and other vector-borne diseases

There should be a clear definition of the role of various services and cooperating departments, sectors, and agencies.

- Define the role of specialized services (e.g., malaria control program).

- Define the role of health services.

- Ensure that the health services take full responsibility (in a phased manner) for the management of malaria.

- Ensure that the control program is targeted on the population(s) most at risk.

- Ensure intersectoral and community involvement in malaria control.

- Decentralize management and strengthen managerial capacity at intermediate and local levels.

- Ensure that evaluation is a part of the program.

- Ensure that stratification of the malaria situation is based upon realistic epidemiological grounds and ensure that strata are appropriately linked to resources available for control.

c. Development of a national implementation plan for control of malaria and other vector-borne diseases

Effective decentralization of the malaria program, as desired by the HMG, should enable local authorities to respond promptly and appropriately to the needs of individuals, households and communities. Since more tasks, responsibilities and resources will be entrusted to the GHS, Government support for change may be needed.

Effective planning of activities will require the involvement of :

- Professionals with good knowledge of malaria as a disease who are able to select malaria control methods in keeping with local conditions. Such expertise is available in the country at present;

- General Health Services and staff;

- Professionals in sectors other than health whose activities are related to malaria and its control, such as agriculture, development, education, and finance.

The Plan should clearly describe:

- activities and tasks to be carried out in various strata as result of malariological stratification;

- priority areas prone to epidemics, mobile population groups, refugee camps, and areas with high transmission potential for resistant strains of *P. falciparum*;

- different categories of staff who will carry out activities in malaria control;

- details of commodities required and the logistics of their supply;

- supervisory, monitoring, evaluation mechanisms;

- training needs and schedules;

- mechanisms for financial management and accountability;

- quality assurance;

- coordination of activities;

- planning for emergencies (based on the reports by the Community Health Workers and PCD(V)s who have the closest contacts with communities and detect increases in fever numbers or excessive consumption of antimalarials). (These reports should go to specialized services who should monitor the situation);

- a monitoring system based either on selected hospitals or health institutions as a sentinel posts for assessment of changes in the number of malaria deaths (if any) and failures of drug treatment;

- a contingency plan with resources identified; and

- a central reserve of drugs, insecticides, and spraying equipment for control of malaria epidemics.

d. Role of health services in control of malaria and other vector-borne diseases

The role of the General Health Services staff in the control of vector-borne diseases is multifaceted.

- The most important role of the GHS staff is prompt diagnosis and treatment.

- They should be able to manage malaria as a disease.

- Sustainable capacity building to manage the disease should be initiated.

- They should assess malaria therapy practices (if any) outside the health services and develop a partnership with nongovernmental and private health care providers in malaria control.

- They should educate the communities on the use of available treatment services, where and when to seek care, and when to come back for further treatment.

- They should educate people to identify disease symptoms requiring medical attention through dissemination of information of the causes of malaria, its complications, and the appropriate drug and dosage.

- They should provide information to specialized services, community leaders, schoolteachers, and traditional healers.

e. Role of specialized services (malaria control program) in control.

The basis for the success of the program is the establishment of a strong core group of specialists trained in epidemiology of vector-borne diseases, malariology, disease management, entomology and program management — with a considerable experience in the control activities.

At the national level this core group of specialists will:

- formulate national policy for malaria disease management (e.g., use of antimalarials);

- organize the monitoring and evaluation of program activities;

- train the intermediate level staff; and

- organize/participate in research.

Specialized skill personnel are also required at the intermediate and peripheral level, where they will:

- analyze the local situation, according to local epidemiological, social, and economic criteria;

- guide the program in the selection and implementation of preventive measures;

- react to emergency situations and epidemics;

- provide advice on drug and diagnostic needs and assist the local HS in providing appropriate referral, supervisory, and logistic support;

- train/assist multi-purpose medical and laboratory staff in the malariological aspects of their duties;

- develop and operate relevant information systems for program management, monitoring, and evaluation;

- promote and maintain links with Regional and District level staff; and

- maintain a dialogue with community leaders and individuals and educate them to ensure their cooperation and collaboration.

3. Disease Management

Disease management is fundamental to malaria control. Population groups at special risk must be identified and specifically defined so that diagnosis and treatment facilities can be focused and prompt management of disease assured.

National policies for the management of disease are needed. The policy should define criteria for diagnosis and the role of diagnostic tools, treatment algorithms, antimalarial drug policy, care providers, and the structure of referral system.

Determination of the patient's clinical history, signs and symptoms can produce effective and standardized medical care. Laboratory support for the diagnosis of malaria is desirable for treatment failures and severe disease and in many cases for uncomplicated malaria during periods of high transmission.

A malaria drug policy should be developed within the framework of the Essential Drug Program approach, and it should also be part of malaria control policies. The elaboration and application of a malaria drug policy is the primary step in the implementation of malaria

control program. The content should be determined by general malaria control policy.

A malaria drug policy should be a statement issued and agreed upon by a competent national authority (e.g., National Committee), consisting of representatives of specialized services (Epidemiology and Disease Control Division), General Health Services, research institutions/universities, and other relevant agencies/sectors responsible for registration, procurement, pricing, and distribution of drugs in the governmental and private sectors.

Malaria drug policies should be subjected to regular assessments and revisions which reflect the changing malaria situation in the country.

The policy should define the use of antimalarials as first, second, and third line drugs for a given situation. The policy should be based upon stratification of the country's malarious areas in terms of malaria risk for various population groups, the status of drug resistance in given areas, different clinical manifestations of malaria, and the status of health facilities.

A National malaria drug policy should address the drug therapy recommendations for malaria, the criteria for therapy efficacy, the policies governing the supply and distribution of specific malaria drugs to various levels of the health system, and detection of adverse effects in malaria treatment. The basis for the therapy policy should be defined criteria for efficacy. Whereas, malaria may be diagnosed and managed on clinical criteria alone in some areas of the health system, the criteria for efficacious treatment must be based on a more thorough evaluation of laboratory and clinical indices.

Strict implementation of the recommendations of the malaria drug policy should result in: a) prevention of deaths and complications due to malaria and b) reduction/elimination of drug pressure which could lead to the development of resistance. Under certain circumstances, (e.g., in areas of low or seasonal transmission), a radical treatment may have an important role in limiting malaria transmission.

Malaria therapy guidelines should also specify the drugs, dosing regimens, and modes of administration for particular disease

presentations and for a defined level of the health care system. They should include known reactions and adverse effects of drugs are define conditions, such as pregnancy, in which specific drugs are either contraindicated or likely to produce adverse effects that outweigh the benefits of the drug.

The role of specialized malaria control services in disease management is very important. In consultation with other members of the National Committee, they should develop antimalarial drug policies, prepare training programs and materials for all levels of health services on the use of antimalarials, and introduce to the public sector treatment guidelines which can be used for basic in-service training. It is also their responsibility to periodically reassess and direct monitoring of drug resistance throughout the country using developed/adopted criteria (e.g., monitoring of treatment failures).

4. Disease Prevention

Vector control operations continue to be an essential part of disease control programs, as changing environmental conditions, mass population movements, and increased parasite resistance to drugs have aggravated the problem.

The success of vector control depends upon a systematic review and selective use of available vector control options. Provision of practical guidelines for planning, implementing and evaluating vector control operations is needed for managers, scientists (entomologists), and implementors (including communities) of these programs. Such guidelines should take into account the varied and changing epidemiological conditions for vector-borne diseases, as well as differences in the infrastructure and resource bases from which the different vector control programs operate.

Use of insecticides may continue to be an important component of vector control. However, the relevance of insecticide use should be examined and take into account concerns of vector behavior, insecticide safety, cost, effectiveness, and environmental impact. In addition, other available tools such as insecticide-treated nets and environmental management should be considered for selective deployment.

The reorientation of the program towards selective vector control cannot be undertaken in isolation. It will need to be in consonance with the national objectives of malaria control and planned carefully and evaluated. An essential step is the reorientation of the health and program information systems and the stratification of malarious areas. Major emphasis should be placed on the development and establishment of mechanisms for prediction, early detection, instituting alert mechanisms, and rapid response to changing transmission risks and epidemics.

5. Health Information Systems

The main concern here should be to reorient program resources away from malaria eradication criteria (e.g., API or SPR). Information systems should be oriented to deal with malaria as a disease problem in a decentralized manner, so that information is available to those who need it to adapt antimalarial activities to local conditions.

Such decentralization requires training of peripheral and district staff in the collection, recording, analysis and reporting of data. Better results can be achieved if recording and reporting are limited to data needed for proper disease treatment/prevention or program management. The main thrust should be on generation of information by the health services. A change from a specialized information system for malaria towards an integrated health information system will allow malaria to be related to other health problems. A revised HIS can not be put into place immediately. A core group of specialists will need to plan, implement, and evaluate the changes necessary for an integrated system.

Implementation of a National Plan should eliminate such indicators as "positive slides" and be replaced by "clinically diagnosed malaria." Particular attention should be given to the definition of "malaria case," taking into account local conditions and the necessity to introduce additional indicator(s) to make the definition more applicable to local malaria transmission and control targets.

In areas where both *P. falciparum* and *P. vivax* occur, malaria diagnosis through microscopy is desirable to confirm the parasites species in sick patients and to identify treatment failures or relapses.

This information might provide a basis for evaluation of the impact of the disease in certain areas.

6. Training

Technical training for program staff should be undertaken only after a review of existing deficiencies and assessment of personnel requirements.

Training should be cost effective (e.g., trained personnel should not be subjected to frequent transfers unrelated to program implementation) and integrated into the other program activities of the GHS. The content and scope of training will differ for personnel working at different levels of the health system. Standards and guidelines for case management, disease prevention, and other control related activities should be incorporated into the training program. The training of district level personnel is important because they will adapt malaria control activities to the local situation.

Workshop/seminars (e.g., workshops on management of complicated/severe malaria), including the use of case studies, are particularly useful for all categories of staff. Supervisors should contribute substantially to the continuing education and retraining of their staff. It is important to develop training programs gradually and make sure that they are adapted to the needs of the overall malaria control program. Incentives and good career development will be needed to retain trained staff.

7. Strengthening operational research capabilities

Operational research should be an integral part of malaria and other vector-borne disease control programs to ensure that the collection of data is cost-effective and relevant to the planning process.

Operational research is required for developing and field testing indicators for evaluation and monitoring of program activities, developing methodologies for sentinel site monitoring, and for assessing the potential of computerized data bases at various levels.

8. Conclusions

A national plan for control of vector-borne diseases should convincingly demonstrate that control of these diseases in Nepal is an essential part not only of health development but the development of the whole country. In the past, the country benefited enormously from the successful control of malaria. The level of control achieved in the past might not be effectively maintained because the potential of malaria resurgence is high in many parts of Nepal.

The main goals of the plan should concern problems that are not only important, but manageable. It should allow approaches and goals to be modified in response to expected improvement of the epidemiological situation and to unexpected situations arising from epidemiological, economic or political changes.

The implementation of the National Plan is expected to affect many current practices, such as:

In the areas of Disease management -- a) national policy for disease management should result in improvement of diagnosis and treatment and in targeted laboratory diagnosis, b) a partnership of the GHS with private diagnostic and treatment services;

In areas of Disease prevention, it is expected that the health services will be able to -- a) use vector control measures using selective approachs, b) recognize and respond to emergency situations, c) promote self-protection measures when they can serve a useful purpose, and d) ensure malaria safe practices are used in individual and community activities.

The implementation of the National Plan has implications for individuals, families, communities, as well as for general health service staff and for specialized services. The members of the communities should know how and when to protect themselves and be able to recognize illness and how to seek treatment. The staff of GHS at various levels should provide effective diagnosis and treatment and be able to manage complicated cases or refer them to those facilities that can do so.

Specialized service staff at central level should know how to plan, guide, evaluate, and implement the National Plan. They should ensure intersectoral collaboration and be able to reorient the health information system so that it serves the role of providing useful information to those in need.

Specialized service staff at the intermediate level should analyze the local malaria situation, react to emergency situations, and organize preventive measures wherever needed. They should also be able to provide support and training to be general health services on various aspects of malaria control, particularly community-based control of malaria.

III. Conclusions

The Nepal Government's decision to base their on-going malaria control activities on the Global Strategy for Malaria Control represents a major program shift from malaria control activities of past years. The Team spent considerable effort during the assessment period attempting to provide guidelines and suggestions to the Government to assist them in their task of preparing a National Plan of Operation based on the Global Strategy. It is the Team's conclusion that unless such a plan of operation is rapidly formulated, approved and implemented, that vector-borne disease control programs in Nepal will not provide the level of service needed to protect the susceptible populations of Nepal from the ravages of these diseases. There already are signs of increasing numbers of malaria and Kala-azar cases in specific areas of the country and extreme caution is urged to prevent epidemics in these areas. The Team recognizes that the present Health Services reorganization period is one that detracts from a major planning effort, but ways must be found to accomplish this task. One of the ways we suggest is to strengthen the Epidemiology and Disease Control Division with additional professionals who will guide the planning and policy development process in the country.

The Team also concluded that the initial start-up period for the Hetauda Research and Training Center is crucial and that prompt action needs to be taken by the Government to provide the agreed staff, equipment, supplies, funding support, and leadership to begin the process of making this facility a center of excellence in training and operational research. Without this timely support, the Team believes that the Center will not be able to fully participate in the rapidly moving vector-borne disease events arising in the country.

A massive training effort on vector-borne diseases is now required for the present regular staff, as well as the large number of new personnel proposed under the reorganization plan of the Health Services. Obviously, a number of Training-of-Trainers courses aimed at providing training staff to handle the Community Health Volunteer (F), Sub-health Post and Health Post courses are necessary. A training plan should be drawn up to provide realistic schedules for all training, as well as cost estimates for such activities.

The Team concluded after a review of the present Health Management Information System (HMIS) that a great deal of work is required to create and put into use a HMIS which provides program managers with up-to-date and useful information for decision making. Without a working HMIS, diseases can not be focally controlled on a timely basis.

Government public health activities are designed to serve the public by protecting them against a magnitude of diseases. These governmental agencies should coordinate and cooperate in their efforts to provide a cost-effective and productive program. The public expects and should receive information on disease problems and how, through individual action and community participation, they can assist in solving health challenges at the local level. The Team concluded that without such intersectoral and community involvement, preventive health programs will not reach desired objectives or high program potentials.

In view of the magnitude of future vector-borne disease control efforts the Team concluded that the Government of Nepal may wish to consider requests for assistance from the international community. This request should only come after development of the National Plan of Operation and a review of national available resources. This assistance could expedite development of control programs in vector-borne diseases to protect large agricultural and industrial areas.

The Team was very impressed with the majority of recommendations made by the National Internal Assessment Team, as they were highly relevant to the solutions of current problems facing malaria control in Nepal. These recommendations, taken in conjunction with the recommendations made by this External Assessment Team, may serve as a good start for the development of an appropriate program to be discussed at the meeting of the National Working Group on Malaria Control. The output of this meeting could be the basis for the development of the National Plan of Operation for control of malaria and other vector-borne diseases (e.g., Kala-azar and Japanese encephalitis).

IV. Major Recommendations of the Assessment

A. National Plan of Operation for Malaria Control

A national long-term plan of operation for the control of malaria and other vector-borne diseases is essential to provide direction to the national effort in this area of health development. The preparation of such a Plan of Operation was agreed to in the Regional Working Group Meeting on the Implementation of the Malaria Control Strategy held at WHO/SEARO, March 1993. This task is scheduled to be completed during the current year. This Plan of Operation should include sections on (a) Disease Management, (b) Disease Prevention, (c) Prevention and Control of Epidemics, (d) Health Management Information Systems, and (e) Program Management. It needs to be developed by a Country Working Group composed of a core group of national experts in malaria control in collaboration with the representatives of the Ministries of Health, Education, Water Resources, Communication, Housing and Physical Planning, Agriculture, as well as the Planning Commission and other partners in the control of vector-borne diseases (e.g., malaria, Kala-azar, Japanese encephalitis, dengue, and filariasis).

1. Disease Management

In the context of the current epidemiological situation of malaria, the National Health Policy, reorganization of the health system, and integration of the malaria control program within the general health services, it is now essential to develop local strategies which are sustainable, cost-effective, and in conformity with the Global Strategy. This calls for development of epidemiological intelligence systems and improvement in local capabilities of the health services for disease management.

At present, microscopic examination of blood slides is the only practical method available for confirmation of malaria. However, the prolonged time-lag between slide collection, examination, and commencement of radical treatment due to a variety of factors defeats the very purpose for prompt diagnosis. Nevertheless, microscopic diagnosis in the management of malaria will continue to play an important role in certain special situations.

The Team recommends that:

(a) For the purpose of early diagnosis and prompt treatment (EDPT), a national policy for malaria case definition and disease management should be developed by the Working Group.

(b) Criteria for clinical diagnosis of malaria by peripheral health workers, volunteers and the clinicians without laboratory support, are to be developed for different eco-epidemiological situations. For this purpose, malaria may be categorized into uncomplicated malaria, severe and complicated malaria, and treatment failure malaria. Suitable diagnostic/treatment algorithms need to be formulated and appropriate IEC materials designed for use at the different levels within the health services.

(c) The taking of blood slides based on fever criteria alone, a standard procedure continued from the malaria eradication era by the peripheral health workers and volunteers, will be gradually phased out.

(d) Collection and microscopic examination of blood slides is to be continued for confirmation of severe and complicated malaria, treatment failures, suspected drug-resistant malaria cases for species identification, in areas/foci reporting large numbers of falciparum malaria cases, and a percentage (depending on work load) of clinically diagnosed cases at hospitals, PHCs, Health Posts, and Sub-Health Posts to help improve clinical diagnosis. For this purpose microscopic diagnostic facilities should be further strengthened and established nearer high risk areas.

(e) Volunteers -- unipurpose or multipurpose -- are to provide full treatment with chloroquine (using the treatment schedule for vivax malaria) to suspected

malaria cases, to refer cases not responding to treatment given by them as well as all seriously ill patients to the nearest health institution, and to create awareness of malaria within the community setting. Considering the workload of the CHV(F) as the front line defense against malaria, selection criteria should be established to ensure that these volunteers meet minimum standards. Sustainability strategies to retain these qualified volunteers should also be designed and implemented.

(f) Guidelines should be prepared for the management of severe and complicated malaria. These should be based on two WHO publications covering this subject and should be provided by HMG to all clinicians, both within and outside the government health services.

(g) To monitor drug resistance, in vitro and in vivo techniques should be reintroduced as soon as possible. However, until this is accomplished, the regional reference laboratory should carry out the simplified in vivo test (see Figure A-1) on the basis of the information provided to them on treatment failure cases.

(h) Provision should be made in the national drug policy to provide quinine (sulphate and dihydrochloride) at hospitals and Primary Health Centers for the management of severe malaria cases. In the procurement of all anti-malarial drugs, strict quality control should be enforced. A standardized treatment policy should specify the drugs, regimens of treatment, and modes of administration for defined levels within the health system.

2. Disease Prevention

Selective and sustainable preventive measures are important elements in malaria control. Absence or delay in the application of

these measures has led to exacerbation of malaria situations in the country. The methods currently available aim at protecting the population against infective mosquitoes through anti-vector measures and at preventing development of the disease in exposed populations through chemoprophylaxis.

The Team recommends that due to limitations of a single measure in controlling malaria transmission, an integrated control approach should be followed.

(a) Indoor residual insecticide spraying should be limited to epidemic control, to known falciparum malaria foci, and to reduce transmission in areas with high levels of drug-resistant malaria. However, to achieve maximum impact, adequate local knowledge of vector behavior and vector susceptibility to insecticides should be available. In addition, adequate supervision must be available to ensure complete target coverage.

(b) Use of insecticide-treated netting such as bed-nets and curtains by the military, refugee camps, infants and children under five, and pregnant women in high risk areas should be encouraged. In order to obtain necessary cooperation, an adequate educational program should be developed and implemented. Indoor residual spraying with synthetic pyrethroids should not be undertaken in areas targeted for insecticide-treated netting.

(c) The government, public or private sectors, and/or activities directly or indirectly involved in the creation of malariogenic potential, should utilize bio-environmental methods of vector control, if possible.

(d) Chemoprophylaxis has not been found useful for preventing malaria on a long-term basis because of poor compliance. However, it is useful for the protection of travellers/tourists and pregnant women as a short-term measure.

3. Prevention and Control of Epidemics

Factors such as socio-ecological changes, population movement to and from high risk malarious areas both inside and outside the country, weakness of surveillance mechanisms in the control program, refractory behavior of a vector species, drug resistance, and other factors enhance the potential for the occurrence of focal epidemics.

The Team recommends that:

(a) Epidemic-prone areas and population groups be identified through a process of simple stratification and past experience.

(b) The peripheral health workers and volunteers should be encouraged to provide early notifications on any unusual disease occurrences, such as the presence of new or expanded development projects, major population movements, and unusual increases in suspected or confirmed malaria cases.

(c) Such notifications should be carefully and promptly analyzed and investigated by the Regional Team, and, if an epidemic is confirmed, integrated vector control measures combined with early detection and prompt treatment, and/or mass drug administration, should be instituted rapidly.

(d) Some reserve stock of insecticides, spraying equipment, antimalarial drugs, and supplies for malaria microscopy should be maintained at Regional level.

4. Health Management Information System (HMIS)

HMIS, which involves collection, analysis, storage, retrieval, and use of information in planning, policy and decision making, is an essential element in the control of vector-borne diseases. It should assist in the assessment of ongoing control activities and in the selection of appropriate control/response measures.

Please refer to Recommendation number 7 for recommendation details on HMIS.

5. Program Management

As a result of the Government's decision to decentralize responsibilities for planning, implementation, monitoring, and review of malaria and other vector-borne disease programs through the primary health care approach, the District health system requires considerable strengthening.

The Team recommends that:

(a) Necessary competence in public health and disease control should be developed as soon as possible. Until specialized manpower is developed and deployed, some interim arrangement should be made to provide necessary technical and management leadership.

(b) The Plan of Operation should clearly state how program evaluation information will be provided to managers for determining whether an activity should be continued, expanded, or modified.

(c) Evaluation should determine the extent to which malaria control measures have been implemented and should measure their impact on the epidemiological situation.

(d) Evaluation methodology should be built into the HMIS to provide continuous review. In addition, internal and external/independent evaluations of the National Program should be continued at various time intervals.

B. Central Program Management

The presence of an epidemiologically oriented team at the Central level for malaria and other vector-borne disease control is essential. This group should include a medical entomologist, medical

epidemiologist/malariologist, parasitologist, vector control officer, and an operations officer. This team can provide technical input for policy development and program planning, as well as work with Region and District personnel to improve vector-borne disease activities, including field operations, reporting, training, and operational research. This team would also be involved in intersectorial coordination to ensure national activities having malaria implications are included in planning and policy development.

The Team recommends that the present malaria section in the Epidemiology and Disease Control Division be strengthened to include the skill areas suggested. Also, the Team recommends that a development staff parasitologist be contracted for an interim period by the Government of Nepal to train and work with the newly proposed parasitology staff.

C. Training

The newly reorganized health services organization will have a large number of new or transferred staff. These staff will require intensive training in a wide variety of skill areas. Although national vector-borne disease control training requirements can only be accurately assessed after an in-depth study of existing positions matched against the National Plan of Operation. Training against known training needs at all levels of the health system [e.g, Community Health Volunteers (Female), Health Sub-Post and Health Post personnel, and Public Health Officers] should begin.

The Team recommends that (1) all job descriptions be developed and/or modified according to the new health structure reflecting the actual skills needed, (2) a working group be formed to plan and prepare a long-range training plan for Health Services personnel in the control of vector-borne diseases, and (3) an interim plan be prepared and initiated to train against known training needs.

D. Hetauda Research and Training Center

The Hetauda Research and Training Center is now ready to assume its important role as a center of excellence for vector-borne disease research and training in Nepal. In addition, the Center will distribute information on vector-borne diseases such as malaria, Kala-azar, Japanese

encephalitis, filariasis, and dengue to various health facilities in Nepal. It is essential that the beginning phase of the Hetauda Center be strongly supported by the Ministry of Health by assigning the approved staff and by providing an adequate level of financial support in order to ensure this Center gets off to an immediate and good start. Funds for maintenance, local equipment, materials, transport and student support need to be included in the budget for the Center.

The Team recommends that all possible efforts be made to put into operation the Hetauda Research and Training Center as soon as possible and to provide adequate fiscal, personnel, and material support -- as listed in VBC Report 82221, "An Assessment of the Needs of the Expanded Research and Training Center at Hetauda, Nepal, February 13 to March 9, 1994" -- to make the Center an immediate success.

E. Entomology

Nepal is extremely diverse ecologically, and this diversity is reflected in its insect vectors of human diseases such as malaria, Kala-azar, Japanese encephalitis, and filariasis. This ecology is constantly changing under the influence of human activities (e.g., deforestation and other agricultural practices like irrigation), and the vector fauna correspondingly responds to these changes in environment. As humans open up new lands, migrate, or change their living patterns, their contact with potential vectors may significantly increase. However, it is difficult to predict where this is happening without proper entomological surveillance in key endemic areas. Well-trained and experienced entomologists are needed in each of the five regions and at the national level. The need is particularly acute at the Hetauda Research and Training Center -- training and operational research at this center will be the cornerstones of a highly successful vector-borne disease control program.

The Team recommends that four experienced entomologists be contracted for an interim period by the Government of Nepal to train and work with the newly hired entomology staff. To ensure the greatest impact on the vector-borne disease prevention and control program, one entomologist should be assigned to the Epidemiology and Disease Control Division, one to the Hetauda Research and

Training Center, one to the Central Region, and one to the East Region.

F. Operational Research

Operational research will be extremely important in the newly reorganized health system in Nepal because of reduced staffing patterns for technical level personnel and decentralization of decision making on vector-borne disease control. There is an acute need in the country to delineate risk factors for intense transmission of malaria, Kala-azar, and Japanese encephalitis. Effective focal control (including early case diagnosis, proper chemotherapy and vector control, if appropriate) of outbreaks will be absolutely essential since broad, ill-defined methods cannot be financially supported, justified, or sustained. Prediction of outbreak conditions and cost-effective tools to overcome them will be critical. Knowledge about these risk factors, as well as effective case diagnosis and treatment (particularly for Kala-azar), is lacking and only carefully conducted operational research can determine them.

The Team recommends that the Ministry of Health recruit highly qualified technical staff and provide adequate recurrent funding -- as recommended in VBC Report No. 82221, "An Assessment of the Needs of the Expanded Research and Training Center at Hetauda, Nepal, February 13 to March 9, 1994" -- to make the Hetauda Research and Training Center the focus for internationally recognized operational research on vector-borne disease prevention and control. The Team also recommends that during the intensive 3-month start-up period at the Hetauda Center (also recommended in the VBC Report No. 82221), prioritization of the most urgent operational research questions (e.g., new treatment and diagnostic methods for Kala-azar) should be done immediately, so international expertise, collaboration, and funding can be sought.

G. Health Management Information System (HMIS)

The newly proposed National Health Management Information System is in a state of evolution and is likely to take some time to become fully operational. Even then, the newly envisioned HMIS will not have the capability of ensuring that data on rapid outbreaks of vector-borne diseases (e.g., falciparum malaria, Kala-azar, and Japanese encephalitis)

reaches the Central level swiftly enough and in sufficient detail and quality so that prompt and effective control measures are conducted.

The Team recommends that an interim epidemiologic surveillance system be established for monitoring vector-borne diseases such as malaria (particularly *P. falciparum*), Kala-azar, and Japanese encephalitis. Considering manpower constraints, the system should consist of periodic surveys at Regional sentinel sites. Wherever feasible, these sentinel sites should be linked closely to Regional hospitals and Regional Disease Control Sections. New laboratory technologies for confirmation of diagnoses should be used to ensure that treatment failure and drug resistance data are highly sensitive and specific.

The precise protocol of such surveys will need to be developed. Sufficient support should be allocated for regional personnel at sentinel sites to ensure that during these surveys, the data are efficiently collected and are of the highest quality. The Hetauda Center of the Epidemiology and Disease Control Division would be the logical venue for development and management of such a system. Training of sentinel site teams on survey methodology and new laboratory diagnostic technologies should be conducted at the Hetauda Center.

Over the longer term, the Team recommends that: 1) the new National HMIS should develop the capacity to deal with malaria as a disease and in a decentralized manner, so that information becomes promptly available; 2) only essential information for control of malaria should be collected/analyzed at appropriate levels; 3) forms for recording/reporting essential information should reflect the revised indicators; 4) malaria should be introduced in the monthly disease profile reporting system; and 5) data analysis should focus on malaria morbidity (clinically diagnosed and laboratory-confirmed cases, uncomplicated, severe and complicated malaria, and treatment failures) and mortality data.

H. Kala-azar and Other Vector-Borne Diseases

Kala-azar has emerged as a serious public health concern in Nepal in recent years. Based on recent figures, Nepal has the highest case fatality rate for Kala-azar in South Asia. The actual number of cases and deaths

reported to date are likely to be several-fold higher due to the lack of an adequate reporting system at health care facilities. There is a reported trend that often individuals from the locally affected population resort to private practitioners (licensed or otherwise) for treatment, either in Nepal or neighboring India.

The Team recommends immediate formation of a task force to develop a national strategy and action plan for control and prevention of Kala-azar and other vector-borne diseases. Specific objectives should address a coordinated approach toward enhancing the national capacity in 6 critical areas: 1) early case detection, 2) improved laboratory diagnostic technologies, 3) improved treatment and case management, 4) vector control , 5) epidemiology of the diseases, and 6) epidemiologic surveillance.

The Hetauda Center of the Epidemiology and Disease Control Division would be the optimum venue for training, operational research, and management of the epidemiologic surveillance system for Kala-azar and other vector-borne disease programs.

The task force will need to conduct a thorough resource assessment to determine resource needs of such a program in terms of existing manpower, essential drugs, financial requirements, laboratory materials, and insecticides. If necessary, that task force will need to determine what external technical assistance and resources would be required to establish an effective and sustainable program.

I. Information, Communication, and Community Participation

The Team commends the emphasis placed on health education and information communication on health and hygiene from the Central level to the periphery by establishing a National Center for Health Education and Communication in the reorganized Health Services. Such a center is responsive to the National Health Policy. In addition, the efforts made by the Malaria Control Program in enlisting community volunteers in surveillance, case treatment, malaria education activities, environmental manipulation activities, and insecticide-treated net trials for vector control in rural areas, are most noteworthy and are in consonance with the Regional Working Group on the Implementation of the Malaria Control Strategy.

The Team recommends that health managers be given the opportunity through training experiences to understand different ethnic social and cultural patterns, community perceptions about malaria as a disease vis-a-vis the role of the mosquito, and the importance of protecting the environment. Training should create an awareness on mobilizing community cooperation in making local decisions for disease prevention, vector control, and other antimalarial activities. To achieve these objectives and to optimize resources, it is recommended that support of nongovernmental organizations, social, and religious organizations be sought.

The Team recommends that orientation about messages on prevention and control of vector-borne diseases be provided to community health volunteers and health services personnel.

J. Intersectoral Coordination and Cooperation

The Plan of Operation should outline how to collaborate with other public and private sectors which may contribute to the malaria problem or may benefit from malaria control activities. Such sectors as agriculture, irrigation, forestry, fisheries, finance, planning and education, should become partners in vector-borne disease control programs. This collaboration is particularly important in the field of disease prevention, in general, and in environmental management in particular. The latter should be used more often by the local community and should be incorporated into the planning of development projects. National and international bodies involved in development activities should be aware of the need for careful environmental planning and management.

The Team recommends that a vector-borne disease control program should be developed and discussed with concerned intersectoral partners. Policies should be developed to ensure that development activities contribute to the prevention of malaria and other vector-borne diseases rather than adding to the problem.

The Team recommends that the Government develops/strengthens coordination mechanisms among nongovernmental, national, and international organizations in order to optimize resources and ensure that common policies are adopted and implemented.

K. Field Spraying Operations

The operation of a large-scale spraying program for both malaria and Kala-azar requires detailed planning, including geographic delineation of target areas based upon valid epidemiological and entomological data. Reporting, proper field implementation, supervision, and continuous evaluation are part of the plan. Such plans specify the quantity and type of insecticides, spray pumps, transport and other equipment, manpower requirements, training schedules for application and safe handling of insecticides, financial needs, and field activity schedules. The decision for insecticide usage should reflect vector susceptibility status and available vector control techniques such as environmental management, larviciding, personal protection, and other techniques.

The Team recommends that specific and detailed action plans be developed for any proposed widespread insecticidal applications. These plans should take into account all technical, environmental, administrative, and operational elements of a fully justified and feasible operation.

L. Resource Mobilization

The primary responsibility for resource mobilization lies with the National Government. In view of the multiple needs in the field of health and the scarce financial resources available, there may be areas of assistance where coordinated international support could be helpful in meeting Nepal's health objectives.

The Team recommends that if the Government comes to the conclusion — after considering its own resources — that external assistance is required to meet shortfalls in program requirements, that these specific activity needs be presented in a detailed format. This format should provide any potential assisting agency with a clear understanding of the purpose of the request, the specific use to which the requested item(s) will be assigned, and how it/they will affect the program. External assisting agencies may consider support for needs in training, technical assistance, health education, operational research, commodities (insecticides, laboratory supplies/equipment, and transport), planning and policy development, and capacity building.

Appendix A

List of Persons Contacted

Date	Place	Name	Title
11 Mar	USAID	Mr. David Oot	Ch., H&FP
		Mr. Shreedhar Pradhan	Mal. Advisor, H&FP
	JICA	Mr. Yasuyuki Kohori	Resident Representative
13 Mar	MOH	Dr. Badri L. Shrestha	Dir, Epid. & DC Div.
		Dr. Manash K. Bannerjee	Chief, Epid. Section
		Mr. Jitendra P.B. Shrestha	Epid. & DC Div.
		Dr. Ram Nandan Sinha	Director Gen., MOH
14 Mar	USAID	Mr. David Oot	Ch., HPN Office
		Mr. Shreedhar Pradhan	Mal. Advisor, H&FP
	MOH	Dr. Badri L. Shrestha	Dir, Epid. & DC Div.
		Mr. Jitendra P.B. Shestha	Epid. & DC Div.
		Dr. Padam B. Chand	Epid. & DC Div.
15 Mar	Hetauda	Mr. Murari Lal Das	Regional Entomol.
		Mr. Shambhu Nath Jha	Parasitologist, MRTC
16 Mar	Dumkibas	Mr. Narayan Pd. Panthi	Senior AHW
		Mr. Kula Nanda Regmi	AHW
		Mr. Babu Ram Thapa	MI
		Ms. Goma Thapa	ANM
		Ms. Tika Ram Sharma	Mukhiya
	Dhanuska	Mr. Indra Kumar Bhattarai	DPHO
	Dhalkebar	Mr. Mahendra Yadav	Health Asst.
17 Mar	Chhinchu	Mr. Prem Bahadur K.C.	AHW
		Mrs. Parbati Kathayat	MCH
		Mr. Obiram Pun	VHW

		Mr. Narahari Regemi	
	Surket	Dr. Mahendra B. Bista	Dir, Regional Office
		Dr. Yem Bahadvr Bista	DHO from Dailekha
		Dr. Mishri Lal Shah	DHO
		Mr. Madan Kumar Sharma	DPHO
		Mr. Mehesh Pratap Singh	Mal. Asst.
	Janakpur (Zonal Hospital)	Dr. Vijay Singh	DHO
		Dr. Ram Nandan Sinha	Director Gen., MOH
	Binihi (village)	Dr. Vijay Singh	DHO
		Dr. Ram Nandan Sinha	Director Gen., MOH
18 Mar	Nepalgung (Bankey)	Mr. Bajamin B. Shestha	Asst. Ento.
		Mr. Ram B. Thapa	Mal. Inspect.
		Mr. Ghana Shyam Shestha	Mal. Inspect.
		Mr. Gopal Shestha	Mal. Inspect.
		Mr. Dil K. Chhetri	Lab Aide
		Mr. Ambike Pd Gupta	Lab Asst.
		Mr. Rajani Singh	Lab Asst.
	Kapilbastu	Dr. Anand Pd. Sharma	DHO
		Mr. Basant Shah	DPHO
		Mr. Mana B. Shukla	Mal. Asst.
		Mr. Bharat B. Chand	DPHO, Rupandehi
	Lumbini	Mr. Sita Ram Gupta	Mal. Inspect.
		Mr. Abdul Rahim	PCD(V)
	Bhairahawa	Mr. Ram Chandra Chaudhari	Mal. Officer
		Mr. Lal Bahdur Shestha	Mal. Inspect.
		Mr. Ghana Shyam Nepal	Mal. Inspect.
		Mr. Pannal Lall	Mal. Inspect.
		Mr. Radhay Shyam	Insect Collect.
	Dhankutta	Dr. Prakash Arjyal	Regional Director
		Dr. V. Arjyal	DHO
19 Mar	Rupandehi	Dr. Dhurba Raj Pradhan	DHO
		Mr. Ram Chandra Chaudhahi	Acting DPHO

	Jhapa	Dr. M. Faiz	SCF/UK, Bhutanese Refugee Project, Health Coordinator
		Mr. U. R. Poudyal	SCF/UK, Bhutanese Refugee Project Pharmacy Coordinator
20 Mar	Pokara	Dr. Hari Nath Acharya	Reg. Director
		Dr. Shambhu Sharan Tiwari	Public Hlth. Admin.
		Mr. Toyo Nath Giri	DPHO, Kaski Dist.
	Shishuwa	Mr. Srawan Chadra Giri	Sen. AHW
		Mrs. Indoo Bhandari	AHW
		Mr. Badri Acharya	Mukhiya
		Mrs. Bam Kumari Hamel	Peon
	Batulechour	Mr. Mahesh Jaishi	AHW
		Mr. Susila K.C.	AHW
		Mrs. Tara Devi Khanal	Mukhiya
	Morang (Dadar Bairiya)	Mr. S. P. Saha	Health Asst.
		Ms. Kuma Guragai	ANM
		Mr. Ratan Prasad Parbat	District Mal. Inspect.
		Mr. Bipulendra Jha	Health Asst.
		Mr. G. P. Sharma	Lab Tech.
		Mr. M. L. Pandit	Mal. Inspect.
	Kadama	Mr. S. Tiwari	VHW
		Mr. Kalawati Karna	PCD(V)
		Ms. Subhadra Rajabansi	CHV(F)
21 Mar	Biratnagar	Dr. Okil Kumar Shresta	Director, Hospital
22 Mar	MOH	Dr. Badri L. Shrestha	Dir, Epid. & DC Div.
		Mr. Jitendra P.B. Shrestha	Epid. & DC Div.
		Mr. Jagadish Upadhaya	Secretary of Health
		Dr. K.B. Singh	Dir, Logistics Div.
	FHI	Dr. Sh_am Thapa	H/MIS Adv. to MOH

23 Mar	USAID	Mr. B.N. Pradhan	USAID Engineer
		Mr. M.L. Kayastha	Engineering Consult.
	MOH	Dr. Ram Baran Yadav	Health Minister
		Mr. Jagadish Upadhaya	Secretary of Health
		Dr. Ram Nandan Sinha	Director General
		Dr. Badri L. Shrestha	Dir, Epid. & DC Div.
		Dr. O.T. Christiansen	WHO Representative
		Dr. Padam Chand	Med. Officer, Epi. & DC Div.
24 Mar	USAID	Mr. Shreedhar Pradhan	Mal. Advisor, H & FP
25 Mar	MOH	Dr. Badri L. Shrestha	Dir, Epid. & DC Div.
		Mr. Jitendra P. B. Shrestha	Epid. & DC Div.
26	USAID	Mr. Shreedhar Pradhan	Mal. Advisor, H&FP
27 Mar	USAID	Mr. David Oot	Ch., H&FP
		Ms. Theodora WOod Stervinou	Dep. Dir.
	JSI	Mr. Kumar Thapa	Logistics
29 Mar	MOH	Dr. Ram Baran Yadav	Health Minister
		Mr. Jaqadish Upadhaya	Secretary of Health
		Dr. Ram Nandan Sinha	Director General
		Dr. Badri L. Shrestha	Dir, Epid & DC Div.
	USAID	Mr. David Oot	Ch., H&FP
	DANIDA	Mr. Larson	
	JICA	Dr. Mahendra Keshari Chhetri	
		Mr. Sira Acharya	Sen. Dev. Spec.
	UNICEF	Dr. Al-nahi	Sen. Proj. Off.

Appendix B

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Appendix C

Detailed Travel Schedule
External Assessment Field Visit, 1994

Team A

Charles Oliver, Dr. K. M. Rashid, Dr. Padam Chand

Field Schedule:

15 March	Kathmandu to Hetauda
	Visit Hetauda Research & Training Center
16 March	Hetauda to Janakpur
	Visit Dhanusha District Visit Dhalkebar Health Post
17 March	Visit Janakpur Zonal Hospital Visit Binihi Village
18 March	Janakpur to Dhankuta
	Visit Eastern Regional Headquarters
19 March	Visit Jhapa District
20 March	Dhankuta to Biratnagar
	Visit Morang District and Dadar Bairiya Health Post Visit Morang District Health Office Visit Kadama village
21 March	Visit Morang District Health Office
	Fly from Biratnagar to Kathmandu

External Assessment Field Visit, 1994

Team B

Larry Cowper
Richard Andre
Dr. M. V. V. L. Narasingham
Shreedhar Pradhan
Shamblu Raj Shrestha

Field Schedule:

15 March — Kathmandu to Hetauda

Visit Hetauda Research & Training Center

16 March — Hetauda to Nepalgung

Visit Dumkibas Health Post

17 March — Nepalgung to Surket

Visit Chhinchu Sub-Health Post
Visit Mid-Western Regional Office
Visit Surket District Office

Return to Nepalgung

18 March — Nepalgung to Taulihawa

Visit Bankey District Health Office

Taulihawa to Rupendehi

Visit Kapilbastu District Health Office

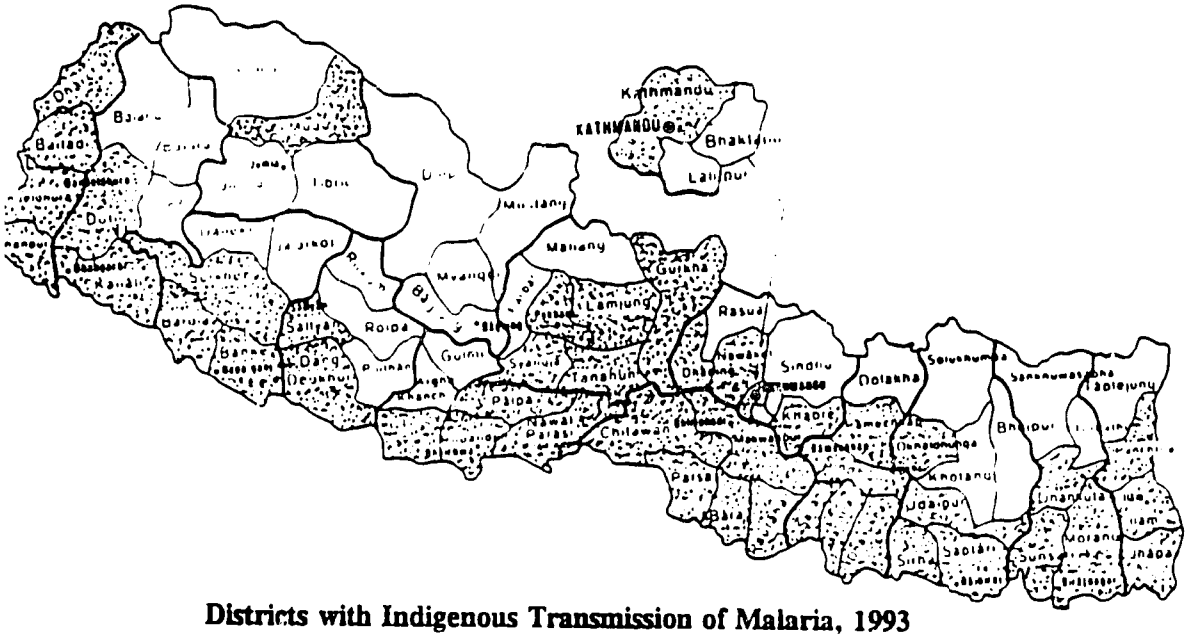
Rupendehi to Bhairahawa

Visit Lumbini Health Post
Visit Bhairahawa Regional Malaria Office

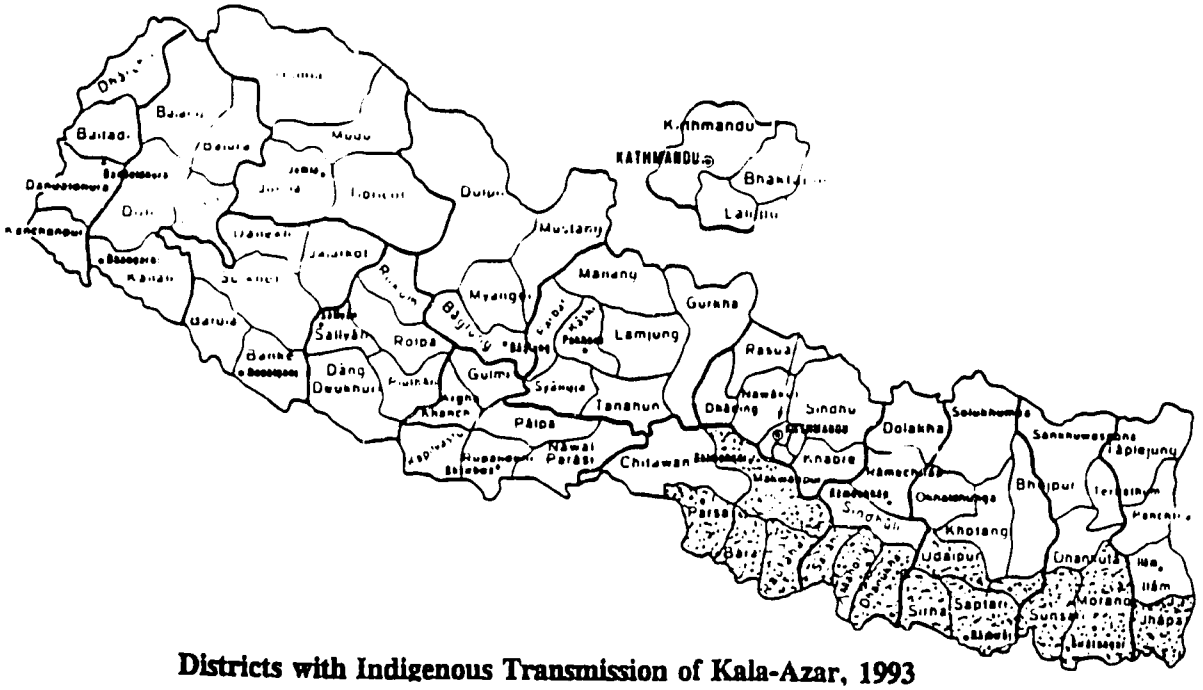
19 March	Bhairahawa to Pokhara
	Visit Rupendehi District Hospital
20 March	Pokhara
	Visit Western Regional Office Visit Shishuwa Health Post Visit Batulechour Health Post
21 March	Fly from Pokhara to Kathmandu

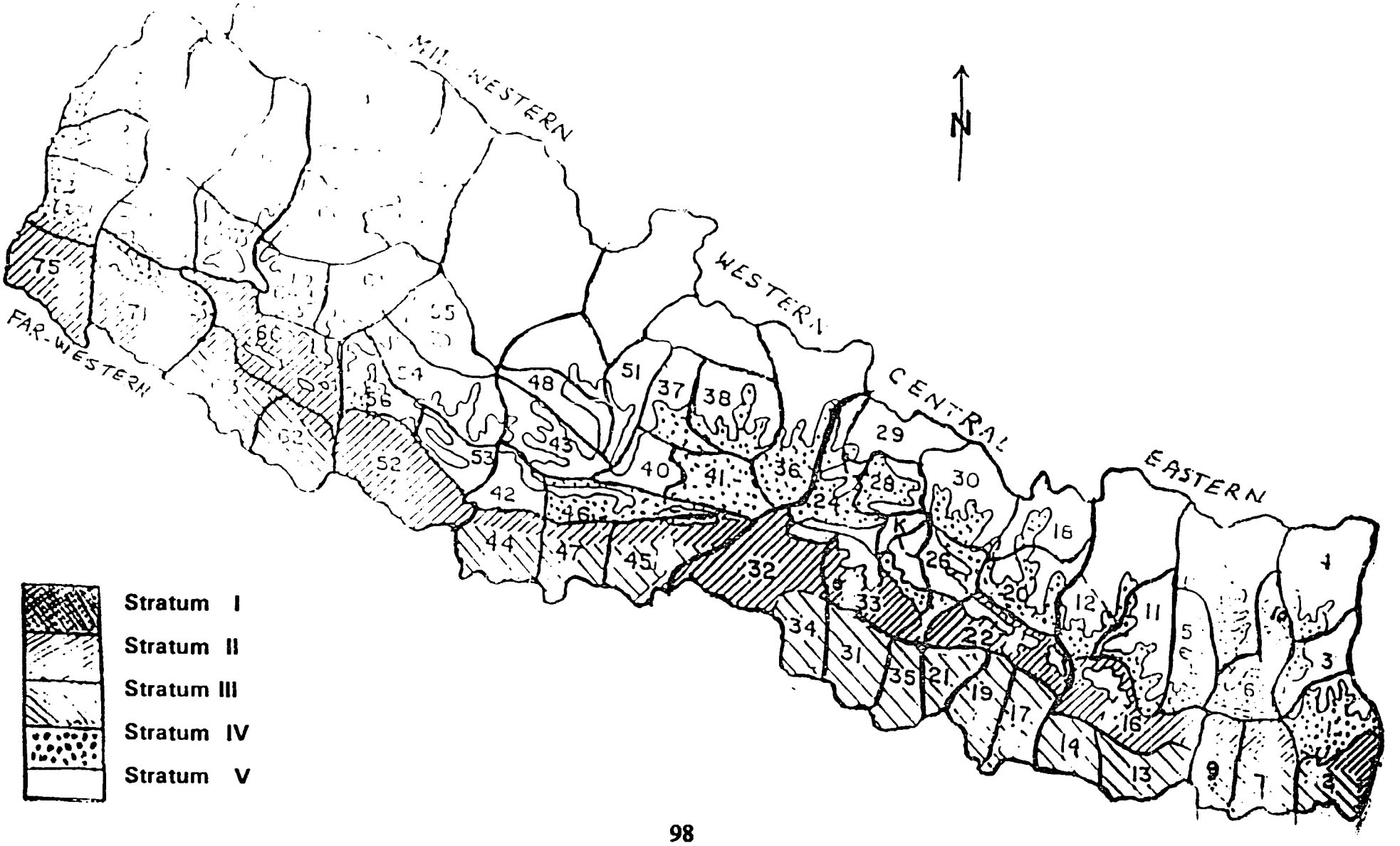
Appendix D

Distribution of Malaria and Kala-azar in Nepal



Districts with Indigenous Transmission of Malaria, 1993



Districts with Indigenous Transmission of Kala-Azar, 1993

Operational Stratification of Malarious Areas — Nepal, 1990 - 1993