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Terminal Evaluation

REPORT OF THE
EXTERNAL REVIEW/TERMINAL EVALUATION TEAM
JANUARY 9-29, 1981
ISLAMABAD, PAKISTAN

REPORT
OF THE
MALARIA EXTERNAL REVIEW TEAM

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ISLAMABAD, PAKISTAN



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Abbreviations used in this Report:

ABER	Annual Blood Examination Rate
ACD	Active Case Detection
APCD	Activated Passive Case Detection
API	Annual Parasite Incidence
AR/100,000	Attack Rate per 100,000 Population
BHS	Basic Health Services
CDC	Communicable Disease Control
DHO	District Health Officer
DHS	Directorate of Health Services
DOMC	Directorate of Malaria Control
ERT	External Review Team
GOP	Government of Pakistan
GR	Geographical Reconnaissance
HE	Health Education
MCP	Malaria Control Programme
NMTC	National Malaria Training Centre
NWFP	North West Frontier Province
OP	Organo Phosphate
PCD	Passive Case Detection
PC-1 FORM	A GOP project document pertaining to proposed New Malaria Control Extension Plan
SPR	Slide Positivity Rate
ULV	Ultra-Low Volume
UMC	Urban Malaria Control
USAID	United States Agency for International Development
WHO	World Health Organization

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1. INTRODUCTION

At the initiation of the Government of Pakistan, the following External Review Team was constituted to assess the present situation and progress of the Malaria Control Programme:

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Dr. G. Hashim	Federal Government
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Mr. Alan Steffen	USAID

The above personnel formed two teams for field visits:

TEAM A (covering NWFP and Sind)

Dr. A. A. M. Djelantik	(Team Leader)
Mr. Alan Steffen	
Mr. R. Bahar	
Dr. G. Hashim	

TEAM B (covering Punjab and Baluchistan)

Mr. L. Cowper	(Team Leader)
Dr. D. A. Muir	
Dr. J. C. Armstrong	
Mr. Chaudhry A. A. Mujahid	

The External Review Team was given the following Terms of Reference:

The purpose of assessment will be: a) to assess the current status of the Malaria Control Program with particular reference to the process of integration; b) to evaluate the results of spraying operation; c) to discuss the future needs of the program in view of AID project termination and develop guidelines for the future of GOP malaria program; and d) conduct a terminal evaluation.

The scope of work for the assessment is:

- a) to make field visits to gather, verify data and conduct discussions with provincial authorities on progress of program;
- b) to assess the impact of the various insecticide regimes utilized in the program and to determine with areas where discontinuation of spraying is to be recommended;
- c) to review the proposed future provincial plans of action, and the plans and preparations for urban malaria control activities for CY 1981 in the absence of USAID assistance and possible lack of funds by the host country government;
- d) to evaluate adequacy of research and training and of research facilities for the program and suggest possible alternative measures to maintain the gains already achieved, especially in the absence of adequate foreign exchange and local currency;

- e) to review the supply situation and review future requirements for storage, supplies and equipment, including protective equipment and adequacy of automotive maintenance both for rural and urban based programs;
- f) to assess the effects on the Malaria Control Programme of the Communicable Disease Control Programme adopted by the Government of Punjab, which is expected to be followed by the other provincial governments;
- g) to determine the ability of the provinces to field an adequate Malaria Control Programme in the future, particularly in the absence of federal level support and without any foreign exchange provisions for future procurement of insecticides, etc.;
- h) to evaluate the results of the steps taken towards operational integration in the provinces;
- i) to assess the USAID/GOP Malaria Control Project (over its entire life), determining project weaknesses, strengths, success in achieving project goals, and other factors relevant to a project terminal evaluation;
- j) to prepare in final form a Project Evaluation Summary (PES) which will include materials relevant to both the terminal evaluation and the external assessment team review.

Anti-malarial activities have been carried out by local and provincial governments in Pakistan since Partition in 1947. These earlier activities were mainly limited to the control of malaria epidemics by use of DDT and larvicides with a variety of health workers serving as sprayers under the direction of District Health Officers. Thanks to the effectiveness of DDT, good results were generally obtained in the limited epidemic areas treated.

In 1960, Pakistan joined the WHO malaria eradication campaign with a pilot project near Lahore, and two years later the National Malaria Training Center was opened in Lahore. Personnel were trained and equipment was purchased. The 14 year Malaria Eradication Programme started in 1961, and from 1964 financial assistance through USAID was initiated which provided foreign exchange for a program which was conceived as a final confrontation with malaria in Pakistan. By 1966, the entire country was covered by the Malaria Eradication Service and, during the following two years, increasing numbers of districts were completing the consolidation phase of eradication.

Then, as seemingly more pressing problems were turned to, and surveillance workers became too preoccupied with other duties or too thinly dispersed to provide adequate coverage, malaria began its resurgence from 1968, and by 1972 had

reached epidemic proportions. It is estimated that more than 10 million cases of malaria occurred in 1972 and again in 1973, in a population of about 75 million. Emergency funds released by the GOP were used to introduce the use of BHC, from 1972. Over the next two years, the reservoir of human malaria was reduced to about one-half of its 1973 level.

In October 1975, officials of the GOP and the USA signed an agreement, referred to herein as the Five-Year Extension Plan, authorizing the administration by USAID of long-term loans in foreign exchange, together with a grant of US-owned rupees, for the institution of a Pakistani Malaria Control Programmes (MCP). These monies (loans, grants) have been provided on a reimbursable basis to the GOP following submission to and approval by USAID of favorable assessments of progress toward specific goals as stipulated in the country agreement. Annual assessments of the programme have been made by internal and by external review teams (ERT) beginning in 1976. The present report constitutes the final ERT assessment of the Five-Year Extension Plan and the Terminal Evaluation for the Malaria Control Project, Number 391-0424.

2. GENERAL ASPECTS AND PROGRESS OF THE PROGRAMME

A single criterion was selected in 1975 by which the relative success of the Five-Year Plan might be judged. That criterion was the reduction of malaria to a level where it no longer constituted a major public health problem. The level was defined as 500 cases per million population, or about 40,000 cases in a population of 80 million.

The 1981 External Review Team recognizes and appreciates the intensive and costly efforts expended by the GOP during 1976-1980 to contain the epidemic conditions in existence in 1975, and to lower the reported numbers of malaria cases to a level below the 500 per million target. The reported case level of 12,304 for the year 1979 represents a major accomplishment. The ERT urges caution, however, in the interpretation of this 1979 figure, since the reported figure was not intended to imply that each and every malaria infection in Pakistan was detected. Using concepts developed by mathematicians in recent years, it has become possible to calculate from reported data rough estimates of the "true" incidence of disease, taking into consideration such factors as sampling technique and diagnostic accuracy. By means of these calculations it is possible to estimate that the "true" number of malaria infections in 1979 exceeded 45,000 and in 1980 this number exceeded 60,000.

The upper ranges of the estimates were calculated to be nearly 10 times greater than these numbers. Perhaps the most important observation to emerge from this exercise, however, concerns the lack of statistically valid incidence data which is regarded as a major deficiency in the malaria control programme.

An indication of the progress of the programme is shown in the following table of malaria slide positivity rates (SPR) from 1975 through October 1980.

<u>YEAR</u>	<u>NO. SLIDES</u>	<u>NO. POS.</u>	<u>SPR %</u>
1973	4,252,184	599,177	14.09
1974	3,094,098	303,936	9.82
1975	3,205,689	238,315	7.43
1976	2,857,854	122,219	4.28
1977	2,667,315	47,571	1.78
1978	2,588,257	16,160	0.62
1979	2,682,351	12,304	0.46
1980	2,523,426	13,629	0.54

The rate (SPR) for 1980 represents a 93% reduction from the rate in 1975, at the start of the Five-Year Plan. While this result may be viewed with satisfaction, it must not be viewed with complacency. The SPR for 1967 was 0.25 and just five years later it had reached 14.6, an increase of nearly 6000%.

Urban malaria was largely ignored in the earlier eradication programme, and this oversight contributed significantly to the resurgence of malaria throughout the country. It appears that great strides have been made during the past three years in some of the larger towns and cities of Pakistan towards the prevention of insect-borne epidemics through the application of larvicides and ULV adulticides. The municipal programmes may be characterized as insect pest control programmes, and virtually no effort is being made to evaluate their impact on the incidence of malaria at this time.

The integration of urban and rural malaria control programmes has raised many fiscal and administrative problems, all of which seem solvable in due course. Integration of the MCP with the Basic Health Services (BHS), on the other hand, shows little prospect of overcoming the profound differences that have hindered cooperation between practitioners of preventive and therapeutic medicine almost everywhere. The ERT has observed that the MCP appears to give too little attention to the curative treatment of malaria cases detected by active case detection (ACD) and passive case detection (PCD) and, conversely, that the Basic Health Services (BHS) gives limited attention to the prevention of diseases including malaria. While the process of integration should be viewed as both inevitable and desirable, it should proceed in carefully planned stages and the administrative problems that arise at each stage should receive prompt corrective action. Lingering problems, such as the alleged travel

allowance inequities imposed on Malaria Control Programme and Communicable Disease Control (CDC) workers in the first phase of integration, may lead to disintegration in operational effectiveness.

Success in integration will depend heavily upon the training received by new recruits in the field of health and, of course, even more heavily upon the re-orientation and added training given to present employees. The alarming turnover rate among malaria microscopists in some districts, for example, might be retarded to the benefit of MCP and BHS alike if these workers were trained in the laboratory diagnosis of tuberculosis; the unremitting boredom of malaria microscopy may drive some of these workers to seek other employment. Administrative problems in the area of training must be dealt with as they arise; e.g., the ERT was told that new malaria trainees received no stipend during the period of their training, whereas EPI and other programmes did pay their recruits.

The high quality/low quantity research conducted by the Malaria Training Center (MTC) staff at Lahore, and by entomologists in Punjab, N.W.F.P. and Sind should be expanded. The renewed interest in malaria at PMRC, partly stimulated by a USAID grant, provides opportunities for useful research collaboration especially in monitoring the efficacy of insecticides, but also in epidemiology. Valuable studies on the susceptibility of P. falciparum to chloroquine, performed by the Directorate of Malaria Control and others, have

revealed no evidence of chloroquine resistance to date. The NMTC studies in this area should be enlarged to monitor this potentially serious development.

Malaria epidemiology in Pakistan is characterised by a wide variety of ecological conditions throughout the country. In many areas irrigation for agriculture maintains a high malaria potential, while population movements to and from malarious areas complicate the picture. Development programmes involving irrigation have changed, and are still changing the receptivity and vulnerability of many areas. Lately the influx of Afghan refugees, most of whom are coming from malarious areas, added another dimension to the malaria situation in the country.

Because of these conditions, malaria control can be effective if it is planned according to the ecological variations. A thorough knowledge of local conditions is therefore needed, and experienced personnel at peripheral levels must be involved in the planning process.

The MCP varies among the different provinces, but in general it may be remarked that both ACD and PCD have much room for improvement. This reflects on the significance which can be attached to the Annual Parasite Incidence (API).

The Slide Positivity Rates are dependent on the source of slide collections and have a limited usefulness in assessing particular situations.

In brief, after the steady progress shown over recent years,

the program now appears to be barely keeping the situation in check. Without continuous and long-term support, malaria could return and become again a major national health problem.

Functional integration has been completed in one province, and is being slowly implemented in the others. Protection is being extended to urban areas. The re-structuring process into an integrated malaria control programme is fraught with considerable difficulties, and a clear outline for the adoption of a control strategy is urgently needed.

Some of the main components of this strategy, besides accurate epidemiological stratification and control design, should include:

- a systematic Health Education Programme aimed primarily at the mobilization of the public for anti-malaria activities for the elimination and prevention of breeding places;
- a systematic approach to effectively institute true PCD posts in all health institutions;
- an intersectorial approach to malaria control in cooperation with authorities involved in irrigation, agriculture, public works, local bodies (municipalities) and other development programmes;
- efforts to involve village Community Councils in the malaria control effort.

3. EPIDEMIOLOGY AND SURVEILLANCE

The framework of surveillance activities inherited from the MEP has been maintained with almost no changes throughout the country. GR updating is done during the first two months of each year, and fixed itineraries of Surveillance Agents are maintained. Although the use of house cards has been discontinued in many zones for economical reasons the houses are still being numbered and GR registers are being kept. The main weakness of the surveillance mechanism is in the area of supervision. Many reasons are being given for this defect, such as lack of adequate transport and travel allowances for supervisory staff.

If this lack of supervision is already rendering the validity of surveillance records somewhat questionable, the attitude of the public contributes to another serious drawback for which there seems to be no easy solution. The impossibility of taking slides from the greater part of the female population has left assessment of the true malaria incidence open to a wild guess. The presence of a hidden parasite reservoir in the community should be of the greatest concern to the responsible authorities.

The ABER remains far below the standard MCP goal of 10% of the GR population at risk to malaria, and this is explained, in part, by the virtual exclusion of females from the population sample.

On the other hand, it is encouraging to note that the number of PCD slides has steadily increased in most areas during the past five years. The value of PCD is demonstrated by the fact that in 1978-79 PCD contributed about 7% of total slides and more than 25% of total cases.

Some of the progress made in PCD is due to the activation of health institutions with malaria surveillance agents posted to out-patient departments. While this has had a salutary effect of increasing the output of PCD slides, it has been accomplished at the expense of ACD coverage which should remain the primary activity of the surveillance agent. It appears that the assignment of a malaria worker to a BHS institution has tended to strengthen the comfortable belief among BHS staff that their responsibilities in malaria case detection have been fulfilled, and that they may now ignore that element of their duties. As long as this attitude exists in the BHS, both the spirit and the process of functional integration will be hampered. When a malaria supervisor is assigned to a BHS facility, it should be understood clearly that the assignment is only a temporary one. The BHS staff should immediately undertake to have appropriate members trained by the malaria supervisor in all of the PCD procedures so that, as quickly as possible, the diagnosis, treatment and reporting of malaria cases becomes an integral

and well-functioning routine of the BHS unit.

Lady Health Visitors assigned to rural health centres should be included in the PCD training given by the Malaria Supervisors, and should be encouraged to practice that training in the performance of ACD among the females of their communities in order to complement the ACD activities that are presently almost restricted to males.

The ERT observed at one PCD post that no presumptive treatment was being given at the time blood slides were made. Records at another post indicated that only two tablets of chloroquine (300mg of base) were dispensed to most of the adults, although some apparently favored adults were given the prescribed four tablets. As a result of these practices, carriers of P. falciparum remain infective until such time as they are sought out and given curative treatment 1-8 weeks later.

The speed with which case detection is followed by curative treatment could be greatly increased by the assignment of MCP microscopists to all Rural Health Centres. Since the assignment of MCP microscopists to Health Centres might impede rather than promote functional integration, the ERT advises that additional training in malaria diagnosis be given to the existing microscopists and that more BHS microscopists be brought into service.

No consistent policy can be discerned in the performance

of mass blood surveys, epidemiological investigations and follow-up of positive cases. The indications for these activities in a control programme are quite different from those in an eradication programme. The DDMC should clearly identify the indications for these activities in a directive to the Provincial Officers.

3.1 ENTOMOLOGY

The Provincial Entomological Services need to be further geared up to the requirement of a malaria control program, not to mention the needs of an eventual general vector control section of a fully integrated CDC programme. Staffing patterns appeared adequate in 3 out of 4 provinces.

In considering entomological services in relation to malaria control, their five essential functions should be clearly borne in mind. These, briefly stated, are as follows:

- a) Provision of basic planning information
- b) Operational evaluation
- c) Epidemiological investigation
- d) Field applied research
- e) Training

It must be emphasized that a high degree of professional competence is required.

These five functions are essential elements for well planned, effective and resilient control operations, and at the present time do not appear to be fully exploited by the Malaria Control Programme.

There is thus room for much improvement in most of the above noted functions of the entomological services, for example, in some districts (e.g., Sibi) basic eco/epidemiological information is not available for planning purposes, in others the reasons for continued high level transmission are not clear; in still others evaluation of malaria control measures is not attempted. Field applied research activities are extremely limited, and are not sufficient to pilot the program.

There appear to be two main causes of the above situation, viz:

- a) Need for wider refresher training opportunities with emphasis on epidemiology for existing entomological staff, especially in view of integration of entomological activities in General Health Services.
- b) Lack of career development for such staff within the Health Sector.

The possible solutions would appear to lie in:

- a) The provision of appropriate basic, special and refresher training opportunities, and

- b) The formation of a polyvalent Vector-Borne Disease Control Cadre within the integrated CDC which would be reflected in the provinces level of Assistant Director.

In this context may be mentioned, besides the overriding requirements of malaria control, the increasing incidence reported for leishmaniasis in some districts, fly-borne disease, episodes involving Aedes aegypti and the possibility of introduction of bancroftian filariasis in growing urban populations.

Current entomological activities in malaria control appear to concentrate almost entirely on partial operational monitoring and susceptibility testing. The former consists of resting density sampling by hand catch and pyrethrum catch in the context of spot checks and trend observations in fixed stations. Observations are made in unsprayed and sprayed areas (in the latter before and after spray). However, in the case of the latter, the reported results appear to be lumped together over a long period post-spray, hence the period of maximum impact of the insecticide tends to be masked.

Estimation of man/vector contact by means of direct biting should be emphasised in entomological activities where appropriate, since these are valuable epidemiological indicators of operational efficiency.

SUSCEPTIBILITY TESTS:

A large number of susceptibility tests on A. culicifacies and A. stephensi using DDT, Dieldrin and Malathion impregnated papers were carried out during 1980, taking the country as a whole. Coverage was not uniform however, especially in Baluchistan due to lack of personnel.

In general, the DDT tests continue to reveal a high proportion of resistance to this insecticide which would be expected to severely limit its epidemiological impact if used operationally. Slightly lower levels of resistance of BHC are indicated by the tests on Dieldrin, but these are in general also of such a level as to cast grave doubts on the feasibility of BHC use for operational purposes.

The effect of focal use of BHC on malaria transmission and on the susceptibility level of the vector population would be an important field applied research subject.

The vast majority of tests carried out against malathion in 1980 indicate complete susceptibility to this

insecticide, however, a small number of survivors to the diagnostic exposure (malathion 5% for 1 hr) were obtained for A. culicifacies and A. stephensi in two tests carried out in Lahore District during July 1980. The presence of malathion resistant individuals in this area has also recently been confirmed independently by Dr. Rothar of the PMRC, Lahore.

Further close monitoring in this area, and in other districts such as Gujranwala where some survival on 3.2% malathion has been noted, should be given appropriate attention so as to have an accurate picture of the degree and extent of the phenomenon, as well as to determine the possible cross resistance pattern to other insecticides.

It must be emphasized, however, that at this juncture there is no reason to believe that malathion may be epidemiologically ineffective in any area due to appearance of resistant individuals.

3.2 PARASITOLOGY

As the frequency and area of insecticide coverage is decreased, in accordance with current DOMC plans, increasing dependence will be placed upon the ACD/PCD activities and upon the laboratory diagnostic services of microscopists. It is pertinent, therefore, to comment on the roles and limitations of these epidemiological components before reporting the ERT-81 observations regarding them.

From the point of view of the malaria patient, the purpose of case detection is prompt and curative treatment for the relief of suffering. From the point of view of malaria control, the purpose of case detection is, in addition to its epidemiological value, the treatment of the patient and the prevention of transmission. When curative treatment is made conditional upon laboratory confirmation of a malaria parasitemia, the role of the malaria microscopist can be seen as crucial -- too crucial. The volume of blood examined in malaria microscopy represents such a minute sample of the total blood volume of a human that it is usually impossible for an expert microscopist to detect infections with fewer than about 100 million parasites in a small child or about 1,000 million parasites in an adult. It should be recalled that each cubic millimetre of blood normally contains between 4 and 5 million erythrocytes, the host cells of malaria parasites, and that humans contain about 90 ml. of blood or 400,000 million erythrocytes,

per kg. of body weight. The aim of this paragraph is to place into perspective the severe limitations of malaria case-finding based upon the examination of single blood slides from individuals who may have real, but undetectable, infections.

In general, the ERT formed good impressions of the procedures, equipment and technical competence demonstrated in provincial and district laboratories, and by the quality of the blood smears prepared by Malaria Supervisors in the field. The monocular microscopes in some labs should be replaced with binoculars when possible, and the slides should not be used after they become badly marked, but these are minor problems.

Malaria microscopists posted at Health Centres tended to be underutilized although there has been a steady growth in the numbers of APCD posts. The N.W.F.P. continues to show the best record in this regard. Positions for malaria microscopists remain open in some districts due to insufficient recruitment and a loss of experienced workers to other jobs. Lady microscopists appeared to remain on the job longer than men.

A major problem encountered by the ERT was the long delay between slide collection and the administration of curative treatment. Since this delay can rarely be shortened appreciably, alternate methods of rendering the malaria carrier non-infective for mosquitoes should be sought. Chloroquine

given as presumptive treatment should relieve symptoms, but it has no immediate effect on the transmission of falciparum malaria, which has shown an alarming rise in Punjab since 1978. The drug, Darachlor, contains pyrimethamine and will sterilize the gametocytes of P. falciparum. The ERT considers the delay in administration of gametocytocidal treatment to carriers of falciparum malaria to be a problem that should not exist, since pyrimethamine is quite inexpensive and can be given as presumptive treatment with chloroquine.

The laboratory register of positive malaria diagnoses was examined on a few occasions. Not surprisingly, the vast majority (94% in one sample) of diagnoses occurred in males. The explanation for this is the reluctance of females to give blood, and their reticence to submit to examination by a male worker. The epidemiological implications can only be speculated upon. Unless females share the drugs given to males by the MCP, or receive drugs from other sources, it is possible that females in Pakistan endure a much higher malaria rate than males and, coincidentally, form a larger and unmeasured reservoir for transmission. This situation should be investigated wherever possible by Lady Health Visitors properly trained in the preparation of blood slides.

The ERT is of the opinion that very much more information can and should be extracted from the epidemiologic data

at the district level in order to gain the flexibility needed for an efficient, yet frugal, malaria control programme. Some light may be shed on the potential problem cited in the previous paragraph by a simple analysis of slide positivity rates by sex; if females show higher rates than males, the situation should be investigated. Slide positivity rates analysed by age group may assist in the stratification of areas of high, medium and low endemicity. For example, where transmission is high, adults tend to acquire a degree of immunity that suppresses parasitemias below the level of detectability by malaria microscopists, as described above. Young children living in the same area who have not yet acquired a level of immunity sufficient to suppress parasitemias will show a much higher rate of positivity than the adults. In areas of low endemicity, the rates of slide positivity for adults and children are similar due to the absence of acquired immunity in either age group. These and other simple data analyses may be performed by MCP/CDC officers at the district level for investigative and planning purposes at that level, and forwarded with recommendations to the provincial and federal offices.

4. URBAN MALARIA CONTROL - 1980

During the last five year period, routine and organized urban malaria control measures were initially limited to treatment of cases by hospitals, Health Centers, dispensaries (APCD) and private practitioners. In 1978, DOMC emphasized the necessity for application of anti-larval measures in urban areas. During 1978 and 1979, 10 towns were surveyed and the breeding places were indicated on maps, measured and classified for appropriate larval control measures. A course on urban malaria control (UMC) for junior staff of malaria and local bodies was organized in NMTC Lahore. UMC cells have been established in all provinces since 1979. UMC activities were activated and gained momentum by a grant of yen 600 million (\$2.78 million) from the Government of Japan during 1979-80. This fund has been utilized for purchase of required supplies, equipment and vehicles for UMC. Table 1 shows the items purchased and their distribution to provinces. With the exception of the second item in Table 1, the remaining material has been distributed to the different municipalities in four provinces of Pakistan. In addition to the external grant materials, the government has purchased larvicides and distributed to the four provinces for urban malaria control (see part II of Table 1). These larvicides were distributed to all of the provinces according to their requirements.

A total of 95 municipalities throughout Pakistan have received insecticides, supplies and equipment for urban malaria control.

URBAN MALARIA -- SIND

During 1980, on DDMC instructions, Sind Province like the other three provinces prepared a plan of action for malaria control in urban areas. Thirty-six major cities and towns in 13 districts of Sind Province were included in this plan. The activities recommended in the plan of action of urban malaria control are as follows:

- training of municipalities personnel on the above subject;
- mapping of the breeding places;
- classification of breeding places for control measures to be applied;
 - environmental management
 - biological control
 - chemical control (larviciding)
- space spraying (ULV) of premises around the breeding place;
- evaluation of the work.

According to the plan, provincial malaria control offices are to provide insecticide, spraying equipment, transportation and technical assistance and evaluate the work. Municipalities are to provide the manpower for implementation for the

recommended measures. The list of supplies provided is given in Table 1.

Of the activities described in the plan of action, only mapping of the breeding places and larviciding have been carried out. The rest of the activities either have been partially implemented or not at all. Guidelines for antilarval measures and ULV operations have been prepared and distributed. Training of larviciders and squad chiefs has been brief and to some extent, superficial. More important, the cities and towns which has been included in the urban Malaria Control Programme have not been surveyed prior to application of control measures to determine malariogenic status and to establish a baseline data for future evaluation of the work.

In Karachi and Hyderabad, Mirpur Khas and Thatta, it was noticed that larvicides were applied to the ponds, pools, pits and ditches indiscriminately without any prior survey to establish the presence or absence of anophleine larvae. Larviciding has been applied on a weekly basis.

During 1980, the Karachi Municipal Corporation (KMC) received the following items provided by DOMC through provincial malaria control departments.

LARVICIDES

Fenthion 5% granules	30 MT
Abate 2% granules	535 Kg.
Abate 500 EC	25,000 lit.
Dursban 5% granules	15 MT
Actellic 50% EC	1,000 gallons
Permethrin (ULV) 10%	900 lit.

EQUIPMENT

Sprayers	150
ULV machines	4
Water Pumps	2
Rubber Gloves	1,000

VEHICLES

Pick-up Trucks	4
Motorcycles	8

At the time of the visit, the staff engaged in urban malaria control activities in Karachi were as follows:

<u>POST TITLE</u>	<u>MALARIA CONTROL STAFF</u>	<u>MUNICIPALITIES STAFF</u>
Entomologist	1	-
Malaria Superintendent	2	-
Malaria Inspector	14	-
Sanitary Inspector	-	1
Malaria Supervisor	57	-
Coolies (Larviciders)	-	790
Lab Assistant	1	-
Insect Collectors	8	-
Clerk	-	1
Peon	-	1
Drivers	-	5

CONCLUSION AND RECOMMENDATIONS

As Karachi Metropolis constitutes the largest urban center in Pakistan (population 7 million) and has a past record of malaria epidemic, this will be taken as an example to focus attention on the urban malaria control activities.

While the KMC plan for malaria control is sound in principle, it lacks the details which are necessary for the field personnel to follow. The plan should include why, where, when, what, who and how to carry control measures.

The contributions of municipalities for malaria control must be spelled out in detail in terms of personnel, supply and equipment and funding in the approved work plan. Prior to application of control measures, epidemiological baseline data must be collected. An efficient monitoring system through case detection (APCD), larval and adult density should be established for continuous evaluation of the work. Clear cut job descriptions must be prepared for all categories of personnel. An efficient reporting system with built-in feedback must be designed for evaluation and improvement of the work.

Although anti-larval measures proposed in the plan include environmental management, biological control and chemical control, it was noticed that in all the urban centres including Karachi emphasis is mainly placed on application of larvicides. Moreover, in Karachi City, it was observed that 5 different insecticides (on a trial basis) have been applied at the same time. This practice is not only uneconomical, but is technically undesirable in view of possibilities of enhancing resistance of vectors to these insecticides which are all O.P. compounds. This indiscriminate use of larvicides with different formulations also will be confusing to field workers while preparing the final spray mixture for application. The number of larvicides should be limited to two only, one for clear water and the other for heavily polluted breeding sites. As

proposed in the plan, attempts should be made to reduce use of larvicide which is repetitive and costly through application of permanent measures such as drainage, filling and extensive use of local larvivorous fish in those breeding places which could support their survival. Tilapia mozambica, Tilapia zilli, Gambusia affinis are known to exist in Pakistan. These species of fish could be utilized in the UMC programs.

For proper application of urban malaria control (UMC), the recruitment of a sanitary engineer with a good knowledge of vector control is long overdue. Although the assignment of a sanitary engineer for UMC has been included in the basic agreement and reconfirmed by different ERTs since 1976, so far, the assignment of a national sanitary engineer has not materialized.

The initial training of UMC personnel has taken place. However, staff training is a continuous process and adequate courses which meet the requirements of different categories of personnel must be organized.

According to data presented in the field, supervision is not adequate. The ratio of malaria supervisor (squad chiefs) to coolies (larviciders) comes to an average of 1 to 14 which makes efficient supervision of the work impossible. This may also be true in other levels as well.

For a successful UMC, community participation must be encouraged. The public must be kept informed of the objectives of the program so that their expectation can be met rather than

develop misconceptions. The program is directed at malaria control, not mosquito abatement.

For application of the larvicides in the plan, nozzle tip fan jets H SS 8002 were recommended and are being used presently in the field. The UMC programs might consider for more efficient and economical application of larvicides, nozzle types, cone jet 1/4 T.L. x 1.5 with output of 95 mil/min under 40 P.S.I. or cone jet 1/4 T.L. x 2.5 with output of 158 mil/min under 40 P.S.I. which are actually made for this purpose.

Application of space spraying for mosquito control with ULV machines are not mainly directed for mosquito control. They are also used for other target insects such as flies. The time, frequency and proposed sites of ULV applications must be indicated in the plan.

Continuous evaluation of the work must be carried out through an established monitoring system. The results obtained by this system must be analyzed. In situations where malaria cases do decline in a given town, the UMC plan must be revised accordingly.

The same procedures for program revision are valid in case of a decline in larval and mosquito densities. Those breeding places with no larval density should be excluded from application of larvicide. Prior to and after each application of larvicide, the breeding places must be checked for establishing larval density in evaluating the effectiveness of larvicide.

Periodic susceptibility tests with the larvicide being applied must be carried out. Larvicide proven to be no longer effective should be withdrawn.

CONCLUSION

The UMC activities in Baluchistan, NWFP and Punjab more or less follow those described for Sind Province.

From the data provided, observations made on the spot and discussions held with local government authorities and MCP staff at different levels, there are indications that the first steps have been taken in an attempt to establish systematic and well organized malaria control activities in urban areas. However, as described above, there is room for improvement in planning, implementation and evaluation of the UMC program at every level and for all proposed activities.

It must be recognized that for the effective and permanent solution to urban malaria problems, improvements in waste water disposal and general sanitation are required. These methods should be considered in the long term UMC plan in this respect. Local bodies must be encouraged that, along with routine vector control measures for UMC, they should start planning for a complete waste-water disposal system for their town. This not only will eliminate all the vector breeding places, but will promote sanitary conditions in the area.

Table 1

**Procurement under Japanese Grants and Government of Pakistan and
Distribution Thereof 1979-80 for Urban Malaria Control**

<u>Sr.No.</u>	<u>Items Names</u>	<u>Units</u>	<u>Punjab</u>	<u>Sind</u>	<u>N.W.F.P.</u>	<u>Baluchistan</u>	<u>Azad Kashmir</u>	<u>MTC</u>	<u>DMC</u>	<u>Total</u>
1.	ULV Permethrin 10%	Litres	2500	2000	1500	500	-	-	500	7000
2.	Sumithion 40% wdp	M/Ton.	450	-	-	-	-	-	-	450
3.	ULV Machine (Mini)	Nos.	25	11	10	2	-	-	2	50
4.	HandSprayers	Nos.	470	280	200	30	18	-	2	1000
5.	Water Pumps	Nos.	11	8	4	1	-	-	1	25
6.	Microscopes	Nos.	130	80	70	5	1	14	-	300
7.	Glass Slides		500,000	200,000	200,000	50,000	50,000	-	-	1,000,000
8.	Vehicles									
	a. Cars (Saloon)		1	1	-	-	-	1	1	4
	b. Jeeps		2	1	1	1	-	-	1	6
	c. Pickups		5+(25)	3+(15)	2+(8)	1+(2)	1	-	3	(50)+15
	d. Motorcycles		(32)	(20)	(15)	(6)	-	-		(73)

II. Procurement by Government of Pakistan 1979-80

9.	Abate 2% granules	M/Ton.	160	100	30	10	-	-	-	300
10.	Abate 500 EC	Litres	3375	-	200	225	-	-	-	4500
11.	Dursban 5% granules	M/Ton.	30	20	-	-	-	-	-	50
12.	Baytex 2% granules	M/Ton.	250	150	50	-	-	-	-	450
13.	Actellic 50% EC	Litres	-	11250	-	-	-	-	-	11250
14.	Rubber Gloves	Pairs	2600	1400	700	300	-	-	-	5000

(Figures in brackets provided by Government)

5. SPRAYING OPERATIONS

Since there was no spraying being conducted at the time of the visit of the teams and only a limited opportunity to see the results of spraying activity, most of the comments below are based on the presentation of data as well as discussions with malaria staff at provincial and district levels.

In general there were less houses covered in 1980 than previous years. This ranged from a low of 66.4% in the Sind to a high in the NWFP of 97.9%. See table number 2.

It was noted that many of the problems encountered in the conduct of spray operations were common to all provinces, for example:

1. Increased refusals to spraying on the part of the population due to dislike of the odor of malathion and the fact that in a number of cases there was little or no malaria so people had no feeling of urgency that their house be sprayed. Field observations in September 1980 indicated that where malaria was evident the numbers of refusals dropped dramatically.

2. Spraying was delayed in some areas due to late arrival of the insecticide to the field from Karachi port and another delay was due to the Eid religious holidays which, in 1980, began about August 15. This also caused some areas to be sprayed for one round instead of the planned two rounds.

Based on data provided to the team it is extremely difficult to determine if the areas being sprayed were selected based on actual slide positivity ratio or if, in fact, were simply carry-over areas selected from previous years. Although geographical reconnaissance normally is done in December-January, it apparently has not yet been done in anticipation of the 1981 spray season. There appears as yet to be no real in-depth evaluation of the results obtained as a result of spraying, particularly at subsector and village levels. Since malaria is basically a focal disease, many non-malarious areas of subsectors were found to be sprayed along with other highly malarious localities resulting in higher costs for insecticide and labor.

INSECTICIDE SAFETY MEASURES

As a result of the 1976 malathion fatalities, there was a greatly increased concentration of effort on the use

of improved safety measures in handling malathion. Protective equipment such as shoes, gloves, head gear and uniforms were provided to spraymen, the protective drug, atropine, was provided to squad supervisors and intensive safety training was provided by national, provincial and district supervisors. During 1977, 1978, 1979 and 1980, USAID also provided malaria advisors to assist in training and field monitoring of the malathion areas. Laboratory personnel were trained in the tinto-metric tests for monitoring cholinesterase levels in spraymen and squad chiefs. Since the toxic effect of malathion and other O.P. insecticides results basically in reduction of cholinesterase levels, the use of these tests provides a baseline level prior to spray as well as a means of monitoring blood levels throughout the entire spray round. This intensive effort had a most beneficial effect and no fatalities occurred after 1976.

Table 2
Spraying Operations 1980

Insecticides	Rounds	Insecticide Used MT	Punjab			Sind			N.W.F.P.			Baluchistan			Total	
			Population Protected	Houses Covered	%	Population Protected	Houses Covered	%	Population Protected	Houses Covered	%	Population Protected	Houses Covered	%	Population Protected	Houses Covered
Malathion 50%	I	1158.6	7095562	90%	4560	2611409	66.4	316.3	1509881	97.9%	27.3	161025	73.9%	1958.2	1137787.7	84.33%
wdp	II		182707	92%	-	-	-	-	-	-	-	-	-	-	182707	92.0
BHC 12%	I	42	201925	90.9%	-	-	-	-	-	-	11.0	135296	85.4	53.0	337221	90.15
wdp																
D.D.T. 75%	I	51.4	229313	81.7	-	-	-	52.6	286288	92.9	-	-	-	104.0	515601	89.33%
wdp	II		234605	90.6	-	-	-	-	-	-	-	-	-	-	234605	90.6%
Sumithion 40%	I	404.4	3587811	85.7	-	-	-	-	-	-	-	-	-	404.4	3587811	85.7
wdp																

% of houses covered are expressed as a percentage of houses planned to be sprayed in each province.

6. TRAINING AND RESEARCH

6.1. TRAINING ACTIVITIES

The National Malaria Training Centre, Lahore, has been carrying out pre-service and in-service training of malaria staff since 1961. During the extension plan period, there has been a thorough revision of course contents and the emphasis has been shifted from eradication to control. In addition, some altogether new courses have been offered for the first time to meet the special needs of the Malaria Control Programme. This includes the special course in safe use of pesticides, the course for preventive maintenance of ULV machines and a special junior course in urban malaria for anti-malaria staff of local bodies.

Another massive training effort was mounted to train mid-level supervisory staff of the Basic Health Services who had been assigned to malaria control activities in newly established Communicable Diseases Control Programme in Punjab. A series of compact two week courses were organized for this purpose.

A special course for training the doctors of Basic Health Services in malaria control was held in Punjab and Sind. The execution of the Malaria Control Programme has been entrusted to District Health Officers in the wake of provincialization of the Malaria Control Programme. District Health

Officers are over-burdened with work and lack training in this important discipline of public health. They could hardly be expected to provide technical guidance at this important level. To arouse and sustain their interest, a compact two week course in the epidemiology and control of malaria was offered. Seventeen District Health Officers from Punjab were trained in two batches during March and April of 1979.

The training courses are planned keeping in view the evolution of the Malaria Control Programme. The Training Centre will thus facilitate the provision of the trained manpower required for establishing the Basic Health Units, and has a key role to play in achieving the desired target of providing basic health care to the entire population. Due to limitations of accomodation at the NMTC, the training of certain categories of BHS staff will have to be carried out at the provincial level.

6.2 RESEARCH ACTIVITIES

With the existing manpower and financial resources of the Directorate of Malaria Control and the National Malaria Training Centre, only limited field research projects could be taken up. Nevertheless, limited but important applied research has been carried out by pooling the resources of the Directorate of Malaria Control, National Malaria Training Centre, Lahore and

Provincial Malaria Control Programmes. Field trials of prospective larvicides, adulticides, in vivo and invitro tests for monitoring the response of the local strains of P. falciparum and the malaria survey in Azad Kashmir and Northern Areas, are some of the studies carried out so far.

The 1981 ERT was impressed by the way in which the Training Centre staff are carrying on under difficult circumstances. Both teaching and hostel accommodation is severely restrictive and there appears to be a problem over lack of stipends for trainees.

Such field investigations as are listed above are an essential activity and should be expanded in collaboration with the provincial entomological services and the PMRC, Lahore. Many useful field applied research observations could be undertaken as part of the field training.

Since training is the key activity for success in malaria control, it is essential that the Training Centre staff be given every opportunity to keep abreast of current advances in theory and practice. Participation of specialist guest lecturers should be encouraged where necessary.

With one or two exceptions, research and training do not at present constitute part of the activities of the MCP in the provinces. The team would like to emphasize that diversity of conditions in various parts of the country require applied research aimed at finding the appropriate mix of anti-malaria measures in the control programme.

Some areas where applied research could contribute to the development of the control strategy are:

- Development of biological control agents;
- Effects of water management practices;
- Determination of optimum insecticide application;
- Investigation of cyclic malaria and epidemic forecasting;
- Comparison of vectorial competence of anophelines;
- Relationship between micro-climate and transmission season;
- Comparison of malaria incidence in the male and female components of the population by means of village surveys.

7. HEALTH EDUCATION

The Team did not have the opportunity to observe health education (HE) activities, but saw that in all the Provincial Headquarters there is a Health Education Section. Samples of pamphlets, posters and other HE material were shown, indicating that there have been many activities in these fields. However, the effectiveness of all these activities appears to be limited. There is still no active participation of the public in any anti-malarial activity anywhere. Slide collection from the female half of the community is still virtually impossible despite the mobilization of female doctors and house visitors. The number of refusals to spraying of houses is still high and replastering of walls after spraying is still frequent.

Apart from the frequently stated lack of manpower and funds specifically assigned to this important task, it seems that attention should be given to whether the present health education techniques should be reconsidered and modified to increase its effectiveness. All malaria personnel from the higher to the lowest level are supposed to carry out health education practices as part of their routine job. To be more effective, they should have more training in health education techniques. It is suggested that an extensive range of refresher training programmes in health education and HE techniques should be initiated as soon as possible in all the

provinces. The task of the health education sections of the Provincial Malaria Headquarters is to give guidance to all malaria personnel in the districts down to subsector level and to assist them with HE material, the production of which is the job of HE specialists at the provincial level.

Besides the HE activities of the malaria personnel, intensive cooperation should be sought with the Ministries of Education and Information. Knowledge of malaria and malaria control should be included in the school curriculum and the Malaria Control Programme should be able to make use of the facilities of the Information Ministry for communication and education of the public at large. The importance of intersectorial cooperation is herewith given emphasis once more.

8. ADMINISTRATIVE ASPECTS

In the Malaria Control Organization the following services are available at different levels:

AT FEDERAL LEVEL

a) Directorate of Malaria Control

There is a Directorate of Malaria Control at federal level comprising of an experienced epidemiologist, entomologist and statistical officers headed by the Director. This Directorate is responsible mainly for assessment and evaluation of the epidemiological situation of the country. Moreover, the DOMC arranges the supply of insecticides and equipment to meet the requirements of Provincial Malaria Control Programmes and coordinates all malaria activities in the country.

b) National Malaria Training Centre

National Malaria Training Centre, a subordinate unit of the Directorate, is based at Lahore. It is suitably equipped to meet the training needs of the National Malaria Control Programme. The National Malaria Training Centre is directed by a Malariologist and supported by a Senior Malaria

Superintendent and Assistant Entomologist.

This centre has now also taken the responsibility of field research on a small scale.

AT PROVINCIAL LEVEL

At provincial level there is a Provincial Malaria Headquarters comprising of an epidemiological section, reference laboratories, entomological, operational and health education units and transport units with well established workshops. These units are functioning for the effective execution of the programme.

AT DISTRICT LEVEL

At district level, evaluation sections comprising of parasitological and entomological units and the operational section are functioning under the supervision of medical officer. In each district 100 to 128 surveillance agents (one surveillance agent per 15,000 population) are working in villages under supervisory staff.

The following technical staff is available in the Malaria Control Programme:

<u>Name of Category</u>	<u>No. Persons</u>
1. Doctors	53
2. Entomologists	43
3. Malaria Superintendents	53
4. Assistant Malaria Superintendents	232
5. Malaria Inspectors	135
6. Malaria Supervisors/Surveillance Agents	3511
7. Microscopists	417
8. Entomologist Technicians/ Insect Collectors	134

FINANCIAL RESOURCES

According to MCP sources, there have been no financial problems since the implementation of the extended Malaria Control Programme, i.e. from 1975-76, in the country. The major objectives and targets have been achieved as were envisaged in the plan. In brief, the financing system is organized by having the provincial governments bear all the administrative costs of the projects such as salaries, P.O.L. allowances, etc., and the federal government provides financial assistance to the provinces in the form of supplies of material such as insecticides/larvicides and equipment. Federal government

support constitutes nearly 70% of the cost of the programme. The federal government manages the finances through Government resources and aid-giving agencies like USAID, Japan and WHO. In spite of limited financial resources, the Government of Pakistan has always given priority to meet the financial requirements of the malaria programme.

The three year period of 1980/82 - 1982/83 will require substantial outlay of funding in order to maintain the gains during the last five years and to support required malaria control efforts during the functional integration process. The 1979/80 budget for Malaria Control is stated to be Rs.63 million, of which approximately Rs.38 million is in foreign exchange costs. The Malaria Control budget authorized for 1980/81 is Rs.50 million.

The 1979/80 budget of Rs.63 million represents approximately 20% of the federal health budget of Rs.319.49 million.

8.1 SUPPLIES AND EQUIPMENT

The ERT examined the supply and transport situation in each province and also in selected districts. With some exceptions, warehouses were well maintained and stores accurately accounted for.

During 1980, a number of commodities were purchased utilizing a 600 million yen (\$2.78 million) grant from Japan for use in Urban Malaria Control operations. With this grant, GOP purchased 15 pick-up trucks, 6 jeeps, 4 sedans, 25 pumping machines, 50 ULV machines, 1,000 sprayers, 300 microscopes, 450 MT Fenitrothion, 7,000 liters of Pyrethroid, and microscope slides. All of the above had arrived in the country by late 1980. Purchased for arrival in 1981 were 580 MT Fenitrothion, 5,000 liters of Pyrethroid and two fully equipped health education mobile vans.

Very little insecticide remains from the 1980 spray season. In Sind there is a balance of about 100 MT, in NWFP about 47 MT, in Punjab 92 MT and none in Baluchistan. It is obvious that the amounts available could be used for only very limited focal spraying.

With the provision of the above supplies, it would appear that with the exception of foreign exchange procured insecticides, such as malathion, there are adequate supplies in place to conduct most non-spray activities for the next two years. There are adequate supplies of drugs on hand and these can

also be purchased on the local market.

While the vehicle situation in the provinces appears to be generally satisfactory, more than half of the 248 four-wheeled vehicles assigned to the Punjab CDC/MCP were purchased in the early days of the malaria eradication program. A large number of unserviceable vehicles are parked next to the Health Offices in Lahore, Peshawar and Karachi awaiting official "condemnation" and sale at auction in accordance with GOP regulations. The ERT was told that, due to the slow pace of the condemnation procedure and the excessively high valuations fixed by the government assessor, some vehicles had been standing unused and unsold for five years or longer. The GOP is urged to amend the regulations that tend to produce vehicular graveyards on government property. Furthermore, these rules return the proceeds of vehicle sales to the GOP treasury when those proceeds might more efficiently be used for the purchase of sorely needed spare parts. With an adequate source of duty-free spare parts, not presently available, most of the provinces could keep their venerable fleet of vehicles on the road for several more years.

The GOP is to be congratulated with respect to its policy on the proprietorship of CDC motorcycles, which permits a tenured employee to buy, use and maintain the vehicle placed in his custody. The fact that very few of the aging CDC motorcycles are currently unserviceable attests to the wisdom of the policy.

A special case is Baluchistan. While none of the 32 four-wheeled vehicles assigned to them is considered unserviceable, 8 of them are temporarily out of use for want of spare parts. The vast distances and rough terrain that must be covered in this province can be expected to reduce the longevity of these vehicles unless an adequate supply of spare parts can be budgeted for, or, preferably, purchased duty-free by the GOP and distributed from a central supply. With the addition of 30 motorcycles assigned to Quetta, better communication with and within sparsely populated areas is anticipated. Commercial buses have been used for the transport of blood slides, records and petty supplies in Baluchistan, and this very inexpensive mode of transport should be encouraged wherever possible.

Vehicle workshops capable of doing major or minor repairs are in place in three provinces, and a smaller but still acceptable workshop is available in the remaining province.

9. INTEGRATION, FUTURE STRATEGY AND FUTURE REQUIREMENTS

9.1 INTEGRATION

A major step forward has been achieved in recent years when the administrative integration of malaria personnel with the BHS was completed. The new extension plan has defined as one of its targets the full functional integration to be completed by the end of 1983.

The period of three years appears to be very tight for the purpose, considering the numbers of BHS and malaria personnel to be given re-orientation courses and the amount of preparatory work to be accomplished before the start of this undertaking. The present pilot projects for integration do not seem to have the clearly defined goals of the integrated health service. They are cautious steps to gradually include Passive Care Detection (PCD) in the daily activities of the Health Centre, but the assignment of a Malaria Supervisor attached to the Health Centre to do this job may become counterproductive as far as integration is concerned. Real PCD should involve the BHS personnel themselves in such activities. The presence of a malaria worker to do the job tends to emphasize the position of malaria control work as being separate from theirs.

No planning of integration can be done without the combined effort--not cooperation only--with the Basic Health Services.

Planning of integration should be done together

with the BHS. This should be also made clear to any other outside agency which provides assistance in whatsoever way to the Basic Health Services. There are too many examples where BHS projects are totally isolated from other projects whose area of work falls within the context of the Integrated Health Service, each of them wholly programme-target-oriented and leading to disintegration rather than promoting integration.

No planning of integration also can be done before both the Malaria Programme and the Basic Health Services have agreed upon the work programme of the integrated Health Centre and the roles which will be assumed by either personnel in malaria control activities within the framework of the Basic Health Service. Therefore, a clear work programme should be worked out based on the combination of work manuals both of the BHS and the malaria control programme. For this purpose, the compilation of a Manual for Malaria Control based on the principles outlined in the New Extension Plan should be completed as soon as possible.

9.2 FUTURE STRATEGY AND REQUIREMENTS

The period of 1975-1980 can be generally described as a period of readjustment of the Pakistan anti-malaria activities from an eradication effort to a broader non-time-limited malaria control program. While malaria eradication remains a long term health goal of Pakistan, it will require many years more of determined effort and adequate support to carry out a national program which provides a good quality of malaria control. While the program in 1975-80 was aimed primarily at control of the massive malaria epidemic which raged in Pakistan and to bring the level of malaria incidence down to manageable limits, future anti-malaria activities will need to actively carry out a focused and more broadly based effort if a resurgence of the disease is to be avoided.

A key technical element in preparing for future anti-malaria activities in Pakistan is sound epidemiological stratification of the malarious areas according to their malarigenous potential. Such classification of areas was done in the 1975-1980 period but now needs to be further developed using the data collected during the past four years. From this wealth of data, a base for planning and carrying out anti-malaria activities can be developed which are technically sound, economically efficient and provide the health services required to not only maintain the hard won gains of the last few years, but improve still further

the malaria situation in Pakistan. The GOP/MCP presentation of the planned activity for the Malaria Control Programme as described in the document PC-1 dated April 1980 outlines in brief form the approach that will be used in the period 1980/81 to 1982/82 (three years). A concentration of effort on proper epidemiological classification is highlighted in the PC-1 and the ERT-81 certainly supports and encourages this program direction.

There is no question that there will be a continued heavy reliance on indoor residual spraying supplemented by the use of anti-malaria drugs as major activities of the program. Through the use of the epidemiological techniques the residual spraying area can be systematically reduced over time. Alternative control measures are encouraged in the PC-1 plan and these measures should be established whenever and wherever it is feasible in order to lessen insecticide impact on the vector mosquito.

To be able to determine where insecticide spraying can be discontinued more intensive study is needed of the available data. In the control programme, one has to go into sector-wise and subsector-wise analysis of epidemiological data of the past three years, taking into consideration operational history and susceptibility test data. Moreover, a clear policy has not yet been outlined for the MCP in this respect.

The Team can only make the following suggestions:

- a. For the whole country a sector and subsector-wise analysis of surveillance data over the past three years should be made and calculation of all API's;
- b. Sector and subsector-wise assessment of the present malarionogenic potential should be made. These can conveniently be done at zone/district level;
- c. Susceptibility test results should also be mapped on the above basis;
- d. According to the findings of the above analysis certain sets of actions can be planned along the lines of the agreed control strategy. This will be determined by the targets set for certain periods of the programme;
- e. In certain subsectors in which different conditions prevail between localities, a locality-wise or village-wise analysis may be necessary.

It is obvious that before deciding on where to withdraw spraying operations, the outlines for the National Malaria Control Strategy should be made up. The Team feels that there is still time to perform the above-mentioned analysis before the spraying season of the year. In the light of the uncertainties about the amount of available insecticides (malathion), the exercise is the more imperative since the results of the analysis will allow the programme to better define the priorities for action.

Over the next few years, the spraying operation is estimated in the GOP/MCP plan to cover roughly 30% of the malarious area by selective spraying. While this figure may vary after an in-depth epidemiological evaluation has taken place, it can be used as an initial starting point for planning future operations. The strategy outlined on the PC-1 document has a three year objective to reach 0.4 cases per 1,000 population (400 cases/million population). In view of the reported gains made in the past five years, this national objective appears reasonable. However, a cautionary note is raised with this figure due to the high proportion of P. falciparum malaria present in some areas and the wide differences in malariogenic potential in the country which results in a misleading average case rate. A valid objective of the future strategy is certainly to reduce malaria mortality among infants to zero.

The integration of malaria control activities with Basic Health Services can be gradually completed over the next few years in those areas where malaria has reached a level where it is no longer a major public health problem.

The cost estimates given in the PC-1 for the three year period 1980-1983 of approximately \$20.0 million, of which \$8.3 million is in local costs and \$11.7 million in foreign exchange, are dependent on the outcome of the epidemiological stratification process. Regardless of the results of the epidemiological classification, it is obvious that considerable

amounts of local and foreign exchange will be necessary to adequately support the program. An estimate of \$3.5 million in foreign exchange costs per year seems conservative given the ever-rising cost of insecticides (petro-chemical base) and the inflationary economic pressures of today's world. This level of foreign exchange makes it imperative that all residual spraying be carefully applied and reduced wherever possible and alternative operation procedures applied where possible. Any future strategy for malaria control must contain a large element of training and applied research. Epidemiology of malaria requires trained manpower. Both basic and refresher training must be provided if use is to be made of an improved surveillance system. Research provides opportunities to adapt or create methodologies suitable for malaria control in Pakistan.

The 1975-1980 period saw an awakening to the importance of urban malaria and progress has been made in organizing anti-malaria activities in a number of towns. The future success of malaria control in Pakistan depends heavily on developing and maintaining successful urban malaria control units.

The management aspects of future programs require that both the federal and the provincial levels have adequate manpower and resources which are concentrated on the malaria problem.

10. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

1. ERT-81, recognizing the many difficulties inherent in the double transition from malaria eradication to malaria control and from a vertical malaria control programme towards one integrated with the Basic Health Services, which process is now getting underway functionally, wishes to express its appreciation of the results obtained and the notable progress made by the DOMC and provincial organizations in reducing malaria incidence over the last five year period.
2. After review of the available data, and having had the opportunity to visit some field areas in the various provinces, the ERT wishes to state that, in its opinion, malaria control in Pakistan is now poised in a favourable, but delicate situation. This situation is one which, given continued appropriate effort, can lead to consolidation of gains achieved, and eventually to further progress, but is also one which, without appropriate support can rapidly regress with extremely serious consequences.

3. The instability of the present epidemiological situation is indicated by a combination of the following factors:
- a) An apparent slight rise in overall case incidence during 1980.
 - b) A high P. falciparum ratio which shows an apparent tendency to increase in some districts.
 - c) As yet incomplete implementation of Urban Malaria Control.
 - d) High population mobility in some areas, including movements of refugees.
 - e) Disturbance of operational routine during the necessary period of transitional adjustment to the functional integration of MCP and BHS.
 - f) Traditional and social factors which appear at the present time to exclude segments of the female population from the case detection and treatment processes.

Recommendations

With the above general conclusions in mind, the ERT-81 would like to make the following recommendations:

- A. The GOP is urged to recognize the magnitude of the success achieved by the Malaria Control Programme (MCP) during the Five-Year Extension Plan and, further, to recognize the fragile nature of that success. The 1981 External Review Team (ERT-81) strongly recommends continuation of the surveillance and insecticidal spraying activities that have reduced malaria incidence from epidemic to manageable proportions. Without these activities, the ERT-81 is convinced that the achievements of the past five years would be largely wasted and that epidemic malaria would resume in short order.
- B. Toward this end, the ERT-81 recommends favorable Government consideration and funding of the proposed New Extension Plan (PC I Form) of the MCP for 1980-83, the main objectives of which are to maintain or reduce the incidence of malaria and to complete the integration of the MCP with the Basic Health Services.

Following the recommendations above, and in keeping with them, the ERT-81 wishes to draw the attention of the GOP to an additional listing that is intended to point up

specific areas of importance and concern for the continued success of the Pakistan Malaria Control Programme. The ERT-81 recommends:

1. that the directors and staff of all projects designed to strengthen any element of the Basic Health Services (BHS) be made cognizant of the needs and interests of all other elements of the integrated BHS, including the MCP;
2. that the GOP form an ad hoc committee, comprising the Ministers of Health, Agriculture, Finance, Local Government, and Interior, for the purpose of drawing up and coordinating plans of action that would lead to improved sanitation and the elimination of mosquito breeding sites;
3. that close cooperation be maintained by the Ministers of Health, Education and Public Information in the propagation of health education material on malaria prevention through the inclusion of malaria subjects in the public schools, newspapers, radio and television;
4. that the Director of Malaria Control assemble Federal and Provincial MCP officers at a seminar/

workshop for the purpose of creating a Manual of Malaria Control using as its basis the aims and principles of the New Extension Plan within the context of the integrated BHS, and setting forth procedures, job descriptions and organizational charts;

5. that the Director of Malaria Control invite Urban Malaria Control Chiefs to participate in a seminar for the exchange of ideas and plan improving the process regarding entomological monitoring and malaria case detection as well as the training of municipal squad leaders in geographic reconnaissance, larviciding, ULV adult-iciding, maintenance of equipment, and pesticide safety measures;
6. that the Federal Directorate of Malaria Control be augmented by the addition of senior technical and administrative staff for Programme Evaluation, Programme Coordination (with BHS, Ministries, Urban Malaria Control, etc.), Sanitary Engineering and Training and Research; and that an Epidemiologist and an Entomologist be added to the staff of each Provincial Chief of Malaria; this for the purpose

of promoting integration of health efforts and assuring the flexibility of malaria control operations on a decreasing budget;

7. that the Annual Parasite Incidence statistic be used instead of the Slide Positivity Rate (SPR) for the assessment of malaria endemicity; that improved methods of data analysis be designed for implementation at the district level which will provide SPR data on males and females separately and by age group;
8. that the proposed Sanitary Engineer at the DOMC be charged with the development and execution of plans designed to replace the repetitive application of insecticides with more permanent and less costly vector control measures (e.g., engineering methods and larvivorous fish); that these plans and operations be coordinated with those of the Provincial MCP and Urban Malaria Control directors;
9. that malaria supervisors assigned to BHS units for the purpose of training personnel in PCD procedures be given reasonable schedules for

completion of those assignments and a prompt return to their ACD activities;

10. that Rural Health Centres be equipped and staffed with microscopists well-trained in the laboratory diagnosis of malaria and PCD procedures;
11. that measures be taken to assure the adequate administration of presumptive treatment for malaria at the time that blood slides are taken; that sporontocidal or gametocytocidal drugs (pyrimethamine or primaquine) be included in presumptive treatment to halt transmission of falciparum malaria from treated persons;
12. that efforts to recruit voluntary collaborators for PCD be continued and intensified;
13. that a network of responsible lookouts in urban and rural communities be established for the purpose of identifying unusual increases in mosquito density; that malaria inspectors and assistant entomologists make frequent rounds to collect and investigate the reports of these lookouts;

14. that the insecticides malathion and fenitrothion be applied in two spray cycles in those areas where two peak transmission seasons occur with a 2 - 4 month interval between peaks;
15. that refugees who have served with the Afghanistan Malaria Control Programme be sought out and recruited to aid the Pakistan Malaria Control Programme in the control of malaria in refugee camps;
16. In order to facilitate the integration process in respect of entomological services and provide a highly professional cadre with appropriate career structure, appropriate polyvalent training, with emphasis on epidemiology, should be provided for entomological staff. Consideration should be given to the formation of a fully integrated Vector-Borne Disease Control component at federal and provincial levels of the health services;
17. Due to the high resistance levels shown by the vector species to DDT and BHC at the present time, they should not be used for general operational purposes.

Susceptibility levels should continue to be closely monitored however, and should resistant proportions show sufficient reversion in certain areas field trials should be instituted to investigate epidemiological impact if used on a focal basis, and the effect of focal treatment on anopheline resistance levels.

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