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**REPORT OF STRATEGY ADVISORY GROUP ON ANTI-MALARIA SUPPORT STRATEGY FOR  
TROPICAL AFRICA**

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FOR TROPICAL AFRICA

Conclusions and recommendations of Strategy Advisory Group  
together with findings of Abidjan Workshop, March 27, 1980

Authorized under

Contract AID/SOD/PDC-C-0164

Bureau for Africa

Agency for International Development

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## SUMMARY CONCLUSIONS AND RECOMMENDATIONS

The Strategy Advisory Group was asked by the Bureau for Africa, Agency for International Development, to respond to a series of questions:

Recognizing the nature and the magnitude of the problem which malaria poses to the countries of tropical Africa, is it possible to blunt the impact of malaria? Is it probable that the countries of Africa can (and will) make progress against malaria without external assistance and encouragement? Is control of malaria in tropical Africa an appropriate target for externally assisted efforts? What should be the goals of such assistance? What techniques and approaches are available and appropriate to reach these goals? What steps must be taken by the countries of Africa to develop effective anti-malaria programs? What criteria should govern the extension of external assistance toward the support of anti-malaria programs? From the answers to these questions, the Bureau for Africa hopes to formulate its anti-malaria assistance strategy.

The Strategy Advisory Group concludes:

A. Is Malaria Control an Appropriate Focus for External Support?

1. Of the health problems facing the nations of tropical Africa, malaria poses the greatest threat to life, to the quality of life and to socio-economic development. Annual incidence of the disease in Africa exceeds that in the rest of the world combined.

2. The constraints against successful anti-malaria efforts, found in many parts of the world, are particularly severe in Africa. These constraints have not in the past been fully recognized, or have been taken too lightly or ignored, thereby creating a pattern of failure in anti-malaria programs.

3. In consequence, many of the nations of tropical Africa have come to regard the malaria problem fatalistically.

4. It is improbable that many -- indeed, most -- nations of tropical Africa can make appreciable progress against malaria without major external assistance and encouragement.

B. Are Anti-Malaria Efforts in Africa Feasible?

1. The state of the art is such that it is possible to mount successful anti-malaria efforts in tropical Africa -- depending on the goals of that effort.

C. Choice of Strategy

1. The strategy of malaria eradication is not at this time applicable to any of the countries of continental tropical

Africa, although such a strategy may quite possibly prove feasible on a limited number of Africa's smaller coastal islands.

2. The strategy of malaria control is currently applicable throughout tropical Africa; the extent to which the impact of malaria can be reduced is a function of technical feasibility, administrative capacity and resource availability. Within these parameters, there exists a considerable range of goals and techniques to achieve such goals.

#### D. Goals and Tactics

1. WHO has advanced a series of "tactical variants" which relate control tactics to the nature and extent of malaria problem(s) in a given country and to the level of control which the country selects and can achieve. The Strategy Advisory Group considers this series of tactical variants to comprehend the range of goals, approaches and techniques which are at this time suitable for anti-malaria activities in tropical Africa.

2. No single variant or specific combination of variants is uniformly applicable to the enormous diversity of conditions in the countries of tropical Africa, since in some countries (or parts of countries) the parameters of technical feasibility, administrative capacity and resource availability permit a greater degree of control than is elsewhere possible.

3. Individual countries will and must establish their goals and priorities with respect to malaria control; these will be embodied in their program proposals and assistance requests. Most are expected to give their primary attention to malaria in their rural areas.

4. The level of control envisioned under Tactical Variant No. 1 -- reduction of malaria caused mortality -- would constitute an enormous advance toward the goal of "Health for All by the Year 2000" if it could be achieved continent-wide.

Recommendation: As an initial and overriding priority, within the limits of the outreach capacity of the health care delivery system, curative administration of an effective drug (chloroquine wherever the drug continues effective) to all suspected severe cases of malaria, regardless of the age of the individual, should constitute the minimum basic service. Innovative techniques of health care delivery are required to extend outreach capacity to geographically remote areas, and particularly to nomadic groups. Monitoring systems also are needed which can detect chloroquine resistant strains of P. falciparum.

Comment: An earlier WHO estimate of the needs of such a program included a requirement for 600 million 100 mg. chloroquine tablets annually (average

number of tablets per attack, 3, all age groups included) -- 60 tons of technical product. The cost (which today would have to be up-dated) was calculated at \$6 million per year -- exclusive of the costs of distribution and maintenance of a distribution system.

5. Reduction of malaria-caused mortality and morbidity is technically feasible throughout Africa -- through the distribution of anti-malaria drugs as a preventive as well as curative measure.

Recommendation: As a second priority, and as made possible within the parameters of administrative capacity and cost, malaria chemoprophylaxis should be extended to the group most vulnerable to malaria: children up to the age of five and pregnant women.

Comment: Such a program involves an entirely different order of both administrative capacity and cost. The WHO study already referred to set the annual drug costs of such a program at about \$45,000 per million of total population. Assuming an increase of 25% in this cost (US \$56,250 per million) to cover rising drug costs, its application throughout tropical, rural Africa (200 million inhabitants) would be on the order of \$11 million annually, exclusive of costs of distribution and administration. Based on estimate made in document AFR/MAL/154, Annex, Case Study, page 19-chloroquine requirements for a population of 20,241 inhabitants (chloroquine cost had been actually US \$10 per thousand tablets of 100 mg).

6. Even in rural Africa, measures beyond drug administration may prove cost-effective under special circumstances.

7. Urban and peri-urban malaria represents a special situation where -- always within the parameters of technical feasibility, administrative capacity and resource availability -- chemotherapy and chemoprophylaxis may appropriately be augmented by a comprehensive malaria control effort to reduce malaria prevalence .

Recommendation: For reasons of cost, technical constraints and staff requirements, residual spraying has a limited application to problems of malaria control in tropical Africa: barrier zones around urban areas, targets of opportunity in forest-surrounded communities, development projects and off-shore islands. Residual spraying should be limited to the few cases where it is cost-effective.

Recommendation: Development projects, where the objective is to reduce malaria to a point where it will not prevent the economic success of the project, require comprehensive malaria control, (utilization of all available methods) actively supported by multisectoral participation from all project participants.

8. As permitted by the parameters of technical feasibility, administrative capacity and resource availability, malaria eradication may prove to be feasible on some of Africa's coastal islands. Eradication is a time-limited program; it is a capital investment, susceptible of reasonably precise benefit-to-cost calculations.

E. Steps to Develop Effective Anti-Malaria Programs

1. Anti-malaria effort should be an integral part of national health planning.

2. Anti-malaria programs should, at a minimum, be planned, directed, supported and evaluated at as high a level as is required to assure cost-effective achievement of program goals.

3. Anti-malaria programs may be integrated with other communicable disease control activities but should have organizational identity and designated allocations of funds.

4. Organizational identity means that there must be room for professional recognition of both managers and technical specialists, with provision for their career status and promotion potential.

5. The Primary Health Care system offers the possibility of decentralized execution of certain kinds of anti-malaria activities -- e.g., drug distribution and record maintenance, health education and possibly

minor source reduction -- which may be expected to dominate anti-malaria programs in most situations encountered in tropical Africa; specifically, in rural areas.

6. Community acceptance, support and participation are vital to the success of any anti-malaria effort.

Recommendation: The organizational structure through which an anti-malaria effort is planned and executed constitutes an element in the administrative feasibility of any program. It should be a major concern of external sources from which assistance may be sought.

#### F. Planning

1. In the absence of a technically, administratively and financially feasible plan, no anti-malaria program can anticipate successful attainment of its goals.

2. In the absence of such a plan, the possibilities of attracting major external assistance are remote.

Recommendation: External assistance should be considered appropriate for either plan formulation or the operational research which may demonstrate the feasibility of a proposed intervention technique on which the plan (or an element of the plan) may be based.

### G. In-Country Coordination

1. The problems of malaria control are broader than the scope of the Central Malaria Service, or indeed, of the Ministry of Health. There is need for a malaria coordination body, normally chaired by the Central Malaria Service but including representatives of all ministries of other organizations whose activities impinge upon or can contribute to the effectiveness of the malaria control program.

2. The benefits of such coordination are not one-sided. Without effective control of malaria, activities of the participating entities may be threatened.

### H. Training

1. There are at present no comprehensive training facilities in Africa which provide for the range of skills required for the leadership of a successful anti-malaria program. WHO's demonstration activities, seminars, study tours, support of a post-graduate course in public health including medical entology, and a training center for health personnel have been useful but do not meet the anticipated requirement for trained leadership.

2. National training centers constitute a critical need.

Recommendation: While such centers should have African direction at the earliest possible time, they require, initially and as long as is needed, the stimulus of external technical inputs.

3. The improvement of national training centers would be greatly accelerated by the existence of a regional center.

4. Within each country (or, at a minimum, available to each country) undertaking a national anti-malaria effort, there is need for a strong training program to provide competent technical personnel for the various administrative and operational areas. Such personnel must provide a range of skills, appropriate to the local situation where training is to be put to use and geared to the level of control sought. Where possible, WHO should provide the resident foreign expertise, local colleges and universities, research facilities and vector-borne disease institutes should be drawn upon where they possess the essential skills required. The training should be pragmatic rather than theoretical, stressing the management of resources and the decision process.

5. The success of malaria control efforts depends to a preponderant extent on the availability of trained personnel of all grades. The investment of any external donor in support of a national anti-malaria program is endangered to the extent that technical personnel are improperly or inadequately trained to carry out the program, however well planned.

Recommendation: National training institutions in control of malaria (and other vector-borne diseases) in countries where anti-malaria programs are receiving or will receive external support should receive external technical and financial assistance whenever this is regarded as important to the success of the relevant programs -- to the extent that the countries themselves are unable to provide training appropriate to the demands of the program.

6. Until a country is able to provide (with or without external assistance) a training facility able to satisfy program demands, it is entirely appropriate to seek the assistance of another African country which already possesses such a facility. (See Section VII.B. Technical Cooperation Among African Nations.)

7. The current WHO evaluation of the quality and capacity of existing African training facilities, measured against the estimate of training requirements for present and prospective African anti-malaria programs, may be expected to develop a measure of the need for expansion of existing training facilities or the creation of additional facilities.

Recommendation: Whether the need is for expansion of existing training facilities or the creation of additional facilities, external support is warranted and indeed essential.

Recommendation: To allow long-term planning of regional training programs, an estimate of cost for a period of at least five years should be made so that external sources of assistance may consider their future financial contributions.

Recommendation: A summary of WHO-prepared teaching aids (possibly from the discontinued WHO regional training centers in Lomé and Lagos, but supplemented by more current information) should be made available to all African countries needing such material.

8. Revision of the training curriculum for primary health care workers to incorporate the required level of knowledge of their role in the national anti-malaria effort is essential. Research efforts proposed in Section VII.E.3., Human Constraints, below, should provide a substantial contribution to this revision.

#### I. Research

1. Field (operational) research is a valid and essential part of any anti-malaria program. Its purpose is to solve problems, to make better use of available means, or to improve available means of dealing with a problem.

Recommendation: Operational research should be considered for external support. It may be the course

of action through which a program is formulated or its efficacy demonstrated.

Recommendation: External support should be considered appropriate for applied research by African institutions in areas where:

- a. A direct impact on malaria control is obvious (e.g., vector biology).
- b. Capacity exists to conduct such research.
- c. No parallel research effort is being carried out.

2. Goal- or problem-oriented basic research is equally important to the long-term success of anti-malaria efforts, but is less clearly the responsibility of country-level research.

Recommendation: In view of the fact that chemoprophylaxis and chemotherapy may be the sole methods employed to control malaria in many or most parts of Africa, and that chloroquine-resistant P.falciparum, already a severe problem in Asia, has been reported in East Africa, basic research in drug development is critically important to malaria control in Africa and other parts of the world. The development of new anti-malarial drugs should

be a primary focus of research, under the aegis of WHO's Tropical Disease Research ((TDR) and of AID-supported research as well.

3. With few exceptions, the countries of Africa lack the facilities and the training essential to basic research. The development of such capacity is a long-range matter.

Recommendation: Priority on the part of external donors should be given to immediate needs.

Comment: A vigorous minority of the Strategy Advisory Group insisted that if Africa is to stand on its own feet, it needs basic research capacity, as well as the capacity for operational and applied research. External support of facilities construction, equipment and, especially, long-term training was strongly urged.

#### J. Evaluation

1. A well-conceived malaria control plan should prescribe a process of continuous internal but also recurring external program evaluation.

Recommendation: External donors should consider as a key criterion of a decision to support an anti-malaria program the incorporation into the plan of

a prescribed process of continuous internal and recurring external program evaluation.

2. Apart from consideration of external support, evaluation -- and feedback to replanning -- is critical to program success.

#### K. Prerequisites for Assistance

Recommendation: In the absence of a long-term national commitment to a goal-oriented, well-planned, organizationally sound, technically and administratively feasible and costed plan of anti-malaria activity which takes full account of the country's physical and human resources down to the community level, external support is not warranted.

Recommendation: The preparation of such a plan may be beyond the immediate capacity of a number of African countries. International and bilateral assistance in plan preparation, including "feasibility studies" as embodied in small-scale projects to test the applicability of an intervention technique, or assistance in training, warrant support by international (WHO) and by bilateral sources of external assistance.

Recommendation: Within the limits of constraints imposed by the laws, regulations and national interests of donor nations, such nations should provide support in as flexible a form as possible.

Recommendation: A successful anti-malaria effort is not a short-term activity. The Strategy Advisory Group has recommended that external support to an anti-malaria program should be withheld unless the recipient country gives evidence of its national will, as evidenced by its pledge to support the program over a multi-year period. The Group considers that there should be a parallel commitment by the external partner. A pledge of five-year support would be responsive to this need.

L. Cooperation among African Nations

1. The countries of Africa can be of mutual assistance to each other, and to external donors, through exchange of information, multi-country use of national training facilities, and inter-country coordination of operational and field research.

2. The possibility of common-use facilities such as quality control laboratories, drug pelleting equipment and, at a later date, drug production capacity should be explored.

3. Standardization of both the technical product content and the appropriate dosage by body weight of anti-malaria drug preparations can simplify both program administration and training requirements.

4. Joint planning, exchange of expensive equipment, common-use maintenance facilities and combined procurement may make for future efficiency and economies.

#### M. International Cooperation

1. While a broad range of nations and international organizations have shown themselves willing to support anti-malaria programs (and related activities in the health field), no multinational pre-commitment to the support of such efforts, worldwide or in Africa, exists at this time. WHO has a major responsibility for donor resource coordination and is studying alternatives for mobilization of multidonor resources.

2. Nevertheless, donor resource mobilization is the responsibility of national governments, which must negotiate for such resources on the basis of mutually acceptable plans of action.

3. Donor nations will normally supply assistance in a form which utilizes the technological, scientific and material resources which they have a comparative advantage in providing.

4. International funding agencies have the capacity for and are showing an interest in financing the kinds of inputs --- brick-and-mortar, infrastructure, etc. -- which most bilateral donors prefer to avoid.

Recommendation: Complementary association of bilateral donors and international funding agencies should be explored in relation to anti-malaria activities.

Recommendation: Conversely, the health component of development projects financed by international funding agencies should be examined; where attention is inadequate, or where the health component is not included in coverage provided by the international funding agency, it may be an appropriate focus for complementary association with a source of bilateral assistance.

#### N. Areas in Which External Assistance Is Needed

Section IV lists a number of the major constraints against success in past anti-malaria efforts, in Africa and elsewhere. The list is representative rather than exhaustive.

Section IV indicates those elements within each country which are responsible for or must at a minimum take into account each constraint. The following is a listing of the constraints to the resolution or amelioration of which external assistance may be the principal answer:

##### 1. Planning.

For those countries whose anti-malaria efforts are non-existent, poorly conceived and executed or being expanded, assistance in the very formulation of a plan will frequently be the most appropriate form of initial external assistance.

## 2. Operational Research

Both at the outset and subsequently, as program execution progresses, operational research is a valid and essential part of any anti-malaria program. Its purpose is to solve problems, to make better use of available means or to improve available means of dealing with a problem; it may be the device through which a program is formulated or its efficacy demonstrated. As such, to the extent that the required research lies beyond the capacity of the country to implement, it warrants external support, technical or financial.

## 3. Basic Research

While a minority of the countries of tropical Africa possess basic research capacity, and their use (in appropriate cases) may warrant external support, in the main the problems of basic research should continue to be met through the efforts of external sources of assistance. The need for such external sources to support basic research is clear-cut.

## 4. Training

While African nations are unanimous in their view that training should take place as close as possible to the site where the training will be put to use, they also acknowledge that, with few exceptions, they lack the capacity for in-country training of the planners, the evaluators, the managers and administrators, the trainers of

operational level personnel, and the high-level technical and professional personnel essential to a successful anti-malaria effort. Training of maintenance personnel is critical to a successful logistics supply system.

As is noted in Section VI.D., below, the Strategy Advisory Group lacks the knowledge to evaluate the extent of present (and replacement) need for trained personnel at all levels, or the capacity of African institutions to provide such training.

Determination of the extent of the training gap is, clearly, the appropriate task of an expert group assembled for this purpose, and such a group should be created. On the basis of its findings, the dimension of the need and the kind and amount of assistance to fill that need can be established.

Note: The current WHO evaluation of the quality and capacity of existing African training facilities (see Section H.7., above) should assist such an expert group in determining the dimensions of the training gap and may, indeed, provide the basis for its recommendations.

No area of activity commends itself more firmly for external assistance.

##### 5. Resource Availability

The generally noted constraint of limited resources and cost inflation points clearly to a key area of external assistance: the financing of imported commodities, and

the provision of essential technical assistance. Appropriate foci of assistance include:

- a. Provision of expertise (short-term and long-term), particularly highly specialized professionals (engineers, entomologists, clinical pharmacologists, irrigation experts, anthropologists) as well as management.
- b. Essential supplies (depending on the tactical variant chosen and the intervention methods selected, this form of assistance could include drugs, insecticides, spray equipment, larvicides, etc.)
- c. Transport
- d. Support of ancillary but malaria-related activity such as
  - 1) Health education
  - 2) Mass media and public promotion.

## I. Terms of Reference and Methodology

In a recent functional review of its programs in health and nutrition, the Bureau for Africa, Agency for International Development, identified malaria as the leading health problem in tropical Africa. Some 26 countries were identified as having major malaria problems, and malaria incidence was estimated at over 130 million cases annually -- more than the rest of the world combined. The annual death toll among children under the age of 14 was estimated at a million. Yet the document went on to observe that of the 66 health projects in Africa to which bilateral AID assistance was being provided in 1979, only two dealt with the problems of malaria.

Obviously, there was a glaring disparity between the challenge and the response. The Bureau for Africa concluded that "given the past history of failure of anti-malaria efforts in tropical Africa .... it appears highly unlikely that appreciable progress will be made without external assistance and much stronger international encouragement than has been provided heretofore". The implicit conclusion of the functional review document was that such encouragement was imperative.

To explore the validity of this conclusion, the Bureau for Africa requested the American Public Health Association to convene a Strategy Advisory Group which should include

leading experts in a wide disciplinary range; -- malariology, epidemiology, entomology, tropical medicine, parasitology, engineering, health education, economics, anthropology, sociology and health services. The expert group was supported by WHO representatives, from the Geneva headquarters and from the two WHO regional offices in Brazzaville and Alexandria, and by senior officials from a number of African countries.

Prior to the first meeting of the Strategy Advisory Group, an extensive literature review was undertaken. Supported by visits to the WHO regional offices and to Geneva, the result was a background paper which covered the current status of malaria control in Africa, country by country; the past history of control efforts; a summary of pilot projects and approaches attempted; and an extensive tabulation of individual country statistics.

The background documentation provided a springboard for the initial deliberations of the Strategy Advisory Group, conducted in Washington in a workshop format. One of the principal functions of the Washington Workshop was to develop the scope of work for two teams, which then visited carefully selected representative groups of French-speaking and English-speaking countries. Each team was made up of a malariologist, an entomologist, an engineer and a public health officer, supported by a WHO senior malaria advisor. In general, the teams confirmed the background information for the countries visited, identified training and research

needs, determined the degree of national interest, visited malaria problem areas, interviewed malaria and public health officials, observed anti-malaria programs in action, and made recommendations to the Strategy Advisory Group as to the nature of external requirements for better control of malaria. They did not attempt to design anti-malaria programs for the countries visited, nor to quantify requirements for country programs yet to be formulated.

The final phase of the work took the form of a second workshop, this time in Abidjan, Ivory Coast, which included all of the initial participants who were able to attend, but supplemented by a representative of the WHO Eastern Mediterranean Regional Office, a number of additional African experts, and representatives of the African Development Bank and ORSTOM. (Because of delayed communications, representatives of other international groups found it impossible to accept invitations to participate.)

The function of the Strategy Advisory Group in its Abidjan Workshop -- building on the results of the preliminary documentation, the first Workshop and the Field Team visits -- was initially to establish the validity of the premise that malaria constitutes the major health problem in Africa; that the impact of malaria can be blunted (if not averted) by suitably selected anti-malaria efforts; and that there is little likelihood that appreciable progress against malaria-caused death, illness and debility will be made without external assistance and augmented international encouragement.

In the event of a favorable response to the initial charge, the Strategy Advisory Group was called upon to identify achievable malaria control goals, together with the techniques and approaches to reach those goals which would be suitable for anti-malarial activities in specific regions of tropical Africa; preparations and actions which the countries of Africa would have to take; and the nature of the response required from potential sources of external assistance. The Strategy Advisory Group, in addition to its consideration of external assistance, also identified techniques of mutual cooperation among African nations which could increase the probability of success in malaria control, regardless of the goals sought by individual countries.

To cover the extremely broad scope of work, the Strategy Advisory Group designated several committees and working groups to organize and present the several aspects of the assigned task for discussion in plenary session and consequent establishment of consensus within the Strategy Advisory Group.

The Strategy Advisory Group recognizes that it is neither desirable nor possible for an advisory body to establish an AID strategy, nor can such a group be fully aware of the constraints under which AID decisions will be made.

Accordingly, the conclusions and recommendations of the Strategy Advisory Group are couched in terms of the role of external assistance in supporting the efforts of African nations to deal with the problems of malaria. Within this broad role, however, it is anticipated that AID can and must play a leading part.

Moreover, the Strategy Advisory Group is fully cognizant of the fact that no single approach to the problem of malaria will have continent-wide validity. East Africa poses a different problem from that in West Africa; forest areas differ in major degree from savannah areas; urban areas; and malaria often ranges from hypoendemic to holoendemic within the same country. Accordingly, the conclusions and recommendations of the Strategy Advisory Group are keyed to a stratification problems: by type of settlement pattern (and within this, by terrain) and by special situations which pose special malaria control efforts. Workshop, Field Team, Committee and Working Group memberships are detailed in Annex 1.

## II. Malaria in Tropical Africa

Malaria is incriminated as the most serious health problem facing most of the countries of tropical Africa, and one of the most common infections in virtually all. In these countries malaria is responsible for about ten percent of annual deaths of infants and children below the age of 14 years.

The most striking feature of the disease in tropical Africa is its high endemicity, with only minor seasonal or annual changes in most areas. The individual is infected at an early age. Should he survive, he is subject to repeated infections throughout his life and gradually develops an increasing immunity. The toll of African malaria falls mainly on the very young and on pregnant women, who give evidence of losing their developed immunity after the fifth month of pregnancy. This means that spectacular outbreaks are uncommon. but the disease is the principal cause of death among infants and young children. The toll paid to malaria by the African population is 3.5 - 4.0 per thousand --- a figure that could be reduced to 1.5 per thousand through the simple and relatively inexpensive measure of chemotherapy and selected chemoprophylaxis.

Moreover, the death toll from malaria understates the impact of the disease on mortality. The debility resulting from the metabolic energy drain of malaria lowers efficiency and vitality, makes the victim more readily susceptible to other diseases, and contributes to the widespread problems of malnutrition.

Various malaria control activities, especially the distribution of drugs for prevention and treatment of malaria infection, are being carried out in many urban and some rural areas, but the overall situation in tropical Africa is not markedly different from that which existed a generation ago. The world-wide malaria eradication campaign, assisted by the World Health Organization (WHO) and vigorously supported by the Agency for International Development (AID), has never been implemented on any large scale in tropical Africa, and the prospect for initiation of such campaigns, based in large measure on intradomiciliary application of residual insecticides, has been sharply reduced by two considerations:

- (1) The operational complexity of a large-scale eradication program, requiring virtual perfection in implementation of a major, nation-wide endeavor involving meticulous planning, technical expertise of a high order, efficient administration, detailed evaluation and, of course, adequate financing.
- (2) The inexorable rise in the cost of pesticides in the face of skyrocketing costs for crude petroleum, from which such compounds are largely derived.

Moreover, WHO (and, as evidenced by its enunciated policy for Asia, AID as well) in recent years has urged a return to a strategy of malaria control, rather than eradication, in areas where short-term eradication is technically infeasible. As has been noted by other observers, the differences are more than semantic.

### III. Anti-Malaria Strategies

The two strategies of anti-malaria campaigns -- malaria eradication and malaria control -- must be clearly distinguished.

#### A. Malaria Eradication

Malaria eradication is designed to interrupt permanently the transmission of malaria, to eliminate any reservoir of infection within the population, to exercise vigilance to prevent the reintroduction of the disease, and to take prompt remedial action if reintroduction takes place, within a specific time frame.

This simplified description of the principle of malaria eradication gives no idea of the operational complexity of a large-scale program. Few other public health endeavors need such careful planning, efficient administration, detailed evaluation and adequate, assured financing.

#### B. Malaria Control

Malaria control has more limited objectives: the reduction of the impact of the disease (although the disease may and indeed is expected to continue) through an organized effort to institute, to carry out and evaluate such measures as are appropriate to the prevailing epidemiological and socio-economic conditions, and to achieve the greatest possible improvement in the health condition of a population subjected to the burden of malaria or threatened by its possible resurgence. The goals of malaria control may include the ultimate eradication of the disease, but where, for technical, operational, administrative or financial reasons, eradication is currently

not feasible, its intermediate goals are the reduction of endemicity to levels not hampering socio-economic development and the reduction to negligible levels of malaria-caused mortality and morbidity. In the short run, goals of malaria control are the prevention of the spread of malaria to areas freed of the disease, a reduction of the levels of transmission in epidemic areas, and, at the base, reduction of malaria morbidity and mortality.

As noted above, the ultimate goal (where feasible) may continue to be the terminal interruption of transmission of malaria, but without the time limits which characterized the programs of malaria eradication. The essential characteristics of malaria control are that the program is not time-limited, must be specifically tailored to the epidemiological situation in each country (depending on goals selected) is not applied uniformly throughout the country (concentrating on target groups to be protected, areas of highest population density or areas of greatest economic importance and may vary in its techniques of application from one area of the country to another. Depending on its goals and the intervention measures taken to achieve them, it may require a range of skills broader than those employed in eradication programs; in its simpler applications and with the relatively modest goal of reducing malaria mortality the demands of malaria control for managerial and technical skills are less onerous, in particular

there is a major difference in minimum standards of implementation; a control program can be successful if its measures of intervention are well carried out; successful eradication requires perfection in execution.

Table 1.

Differences between a Malaria Control Program and a Malaria Eradication Program

|  | <u>Control Program</u>   | <u>Eradication Program</u>  |
|--|--|---|
| <u>Objective</u>                                       | The reduction of malaria to a prevalence where it is no longer a major public health problem | The ending of the transmission and the elimination of the reservoir of infective cases in a campaign limited in time. |
| <u>Area of Operations</u>                              | Not necessarily covering all the area where malaria transmission takes place                 | Must cover all the area where malaria transmission takes place  |
| <u>Minimum Standards</u>                               | Good   | Perfect   |
| <u>Duration of operations</u>                          | Without limits   | Program ends when certain requirements are met  |
| <u>Cost</u>  | Constantly recurring   | Expenditure represents a capital investment and is not a permanently recurring cost                                   |
| <u>Case-finding:</u>                                   | Superfluous  | Of paramount importance   |
| <u>Epidemiological investigation of positive cases</u> | Superfluous  | Necessary in the late stages  |
| <u>Epidemiological evaluation of results</u>           | By usual malarimetric surveys  | Proof of disappearance of indigenous new malaria cases  |
| <u>Imported Cases</u>                                  | Do not deserve particular attention  | Important and dangerous when spraying has been withheld   |
| <u>Total Coverage</u>                                  | Unnecessary  | Indispensable both for the spraying and the case-finding  |
| <u>Administration of the Program</u>                   | May not be the best and still be sufficient  | Must be fully efficient and speedy; if not, danger of failure   |

The above table is a modification of that appearing in WHO, ECM Sixth Report, p.9 (1957).

IV. Constraints Against Successful Anti-Malaria Programs in Tropical Africa

The Strategy Advisory Group took note of the universal practice of study groups, expert committees and individual analysts to list the various factors which had impeded, and would presumably continue to impede, progress in dealing with the problems of malaria. Discussion within the Strategy Advisory Group had identified no fewer than 18 such factors. The Group felt, however, that mere identification of constraints was of little use unless something could be done about them. Accordingly, the Group suggested that these constraints, to the extent possible, be listed in a sequence which might indicate which could be appropriate foci of attention for external donors, which could be overcome or ameliorated by proper country-level attention, and which represented the intractable "facts of life" which planners would have to recognize and to which they would have to accommodate in program proposals.

### A. Program Planning

Of the constraints against successful malaria control identified, nearly half were attributable to or were the immediate concern of initial planning. Although the planner cannot in every case remove the constraint, he can be expected to recognize it and to formulate a control plan which will minimize its effects. Such constraints include:

1. Poorly conceived initial planning, frequently the result of failure to undertake initial reconnaissance, establish baseline data, anticipate logistic requirements, and provide for regular and recurring evaluation of results.
2. Apparent indifference to cost-effectiveness of control measures (or, quite possibly, inadequate knowledge). Clearly, this points up the need for operational research.
3. Structural inadequacy in the anti-malaria effort (To restate, assignment of anti-malaria responsibility to a health infrastructure inadequately prepared to assume the burden.)
4. Shortages of trained manpower essential to the conduct of the proposed program. (This constraint

is, of course, of concern to all entities which participate in an anti-malaria effort -- as is noted below.)

5. A broad category of behavior patterns which make anti-malaria activity difficult or impossible. The list ranges from rejection of house spray to replastering of houses after spray application to outdoor sleeping to nomadism; to counteract these constraints may be a function of health education -- or, equally frequently, the proper selection of intervention measures.

6. Popular indifference to malaria. Without popular knowledge of the reasons for anti-malaria measures (health education) and active participation in self-help and continuous community anti-malaria activity (motivation) programs which rely heavily on popular participation are doomed to failure.

7. Difficulty of access to malarious areas -- by reason of distance, poor systems of transport and communication, or security -- cannot be charged to the planner; but the constraint must be considered in plan formulation.

#### B. Program Implementation

Even well-conceived anti-malaria programs suffer during implementation. Constraints include:

1. Grossly inadequate maintenance of equipment -- frequently a result of failure to provide maintenance training, but also a function of:
2. Poor supervision -- a constraint which stretches across the entire spectrum of implementation activity. One of its most palpable effects is on the performance of the basic health services, to which are frequently assigned key roles in the anti-malaria effort. Trained to low skill levels, they require regular supervision, encouragement and support.
3. Administrative and general services support, a function of the Central Malaria Service in the Ministry of Health. Without adequate, timely logistic support, no program can succeed.

#### C. Technical Staff

While the technical staff is responsible for the identification of levels of malaria endemicity and their fluctuation, vectors and vector ecology, parasites and attack methods appropriate to specific areas, its concerns include, among others:

1. Vector resistance to insecticides. Already demonstrated and spreading, vector resistance demands the constant attention of the technical staff to assure selection of efficient and cost-effective intervention measures.

2. Parasite resistance to anti-malarial drugs.

Already found in other parts of the world and at least suspected and reported in Africa, the possibility of Plasmodium resistance to the most widely employed drug of choice -- cheap and to date effective chloroquine -- must be a source of concern and attention to the technical staff.

3. Incomplete knowledge of vector behavior, an area of research beyond the capacity of most country-level technical staffs, but one commanding their attention. The need for such knowledge recommends such research to external sources of research capacity as well as to in-country research entities.

4. Inadequate research support -- like the previous item, a concern which commands attention. With respect to basic research, most African nations will rely, at least for the short- and mid-term future, on external expertise. With respect to field or operational research, such research is an appropriate and indeed essential part of an anti-malaria program. As necessary, it warrants external support.

D. Ministry of Health

While most if not all of the above-listed constraints to a successful anti-malaria effort must be of concern to Ministry of Health officials, there are a number of constraints which can be dealt with only at the MOH level. They include:

1. Structural inadequacy of the anti-malaria effort.

Already noted as a concern of program planners, the need for an adequate anti-malaria structure can be dealt with at Ministry level only. While the independent structure of the classical Malaria Eradication Service is inappropriate to a control effort, there is need for a Central Malaria Service within the Ministry of Health, with a line-item budget and a career service which makes it possible to attract and keep key personnel.

2. Inadequate health infrastructure. Directly related to the previous constraint, the pace of creation of health infrastructure determines the degree to which involvement of rural health services in anti-malaria activities can be planned with confidence of success. In the absence, or severe shortage, of well-trained rural health services, the degree of supervisory (and, indeed, operational) involvement of the Central Malaria Service remains high.

E. Other Governmental and Non-governmental Entities

Many elements other than the Ministry of Health and its Central Malaria Service have roles to play in anti-malaria programs. Some of these elements have the potential to ease the burden on the identified malaria budget in the performance of their assigned duties; others can (and, without proper advance planning, do) augment the problem

by creation of new or larger mosquito breeding habitats. The constraints to anti-malaria activities, to the alleviation of which these elements can contribute, include:

1. Uncontrolled "development" -- including not only irrigation and water development, but also road construction, deforestation and induced migration to peri-urban areas. The techniques of dealing with this constraint are detailed in Section VI, B.2, Role of Other Governmental Ministries and Non-governmental Organizations, below.

2. Inadequate maintenance of sanitary services -- such as blocked drainage ditches. Failure of urban services to maintain their facilities multiplies vector breeding sites and increases the threat of vector-borne disease (including, but not limited to, malaria). See Section VI, B.2 below.

F. All Concerned National Entities

Four constraints to a successful anti-malaria effort are of concern to all of the groups listed in sections IV, A to E, above.

1. Inadequate training facilities at all levels. Without elaboration, it may be stated that the shortage of trained manpower, the capacity to train such manpower, and the difficulty in attracting and keeping key personnel endanger any anti-malaria effort which may be mounted in tropical Africa.

2. Limited resources to cope with the many problems faced, of which malaria is only one. Failure to provide a budget large enough to conduct a meaningful anti-malaria program -- whatever its goal -- is sometimes identified as lack of national will or indifference to malaria on the part of decision makers. It may equally correctly be identified as inability to deal with all problems simultaneously. The real problem may be:

3. Inadequate assignment of priority to the problems of malaria. Such a decision would clearly run counter to the concept of "Health for All by the Year 2000" to which all of the nations of tropical Africa have subscribed.

4. Inflation of all costs -- with particular emphasis on chemicals and petroleum products.

#### G. The Role of External Assistance

Of the above-listed constraints (some applicable to one or more national entities; some to all), a number emerge as of particular interest to sources of external assistance. Recognizing that donor nations and other sources of external assistance will normally concentrate their efforts in areas in which they have a natural competitive advantage, it appears to the Strategy Advisory Group that the following list of "constraints" may be ameliorated in greater or lesser degree by the efforts of one or more of the sources of external

assistance. Each of these "constraints" is treated at greater length in Section VI, Requirements for Implementation of Various Strategies, and Section VII, Mechanics of Cooperation, below.

1. Planning. For those countries where anti malaria efforts are non-existent, poorly conceived and executed, or being expanded, assistance in the very formulation of a plan will frequently be the most appropriate form of initial external assistance.
2. Operational Research. Both at the outset and subsequently, as program execution progresses, operational research is a valid and essential part of any anti-malaria program. Its purpose is to solve problems, to make better use of available means or to improve available means of dealing with a problem; it may be the device through which a program is formulated or its efficacy demonstrated. As such, to the extent that it lies beyond the capacity of the country to implement, it warrants external support, technical or financial.
3. Basic Research. While a minority of the countries of tropical Africa possess basic research capacity, and their use of it (in appropriate cases) may warrant external support, in the main the problems of basic research should continue to be met through the efforts of external sources of assistance. The need for such sources to support basic research is clear-cut.

4. Training. While African nations are unanimous in their view that training should take place as close as possible to the site where the training will be put to use, they also acknowledge that, with few exceptions, they lack the capacity for in-country training of the planners, the evaluators, the managers and the administrators, the trainers of operational level personnel, the high-level technical and professional personnel, and the skilled manpower essential to a successful logistics supply system.

As is noted in Section VI.D. below, the Strategy Advisory Group lacks the knowledge to evaluate the extent of present (and replacement) need for trained personnel at all levels, or the capacity of African institutions to provide such training.

Determination of the extent of the training gap is, clearly, the appropriate task of an expert group assembled for this purpose, and such a group should be created. On the basis of its findings, the dimension of the need and the kind and amount of assistance to fill that need can be established.

No area of activity commends itself more firmly for external assistance.

5. Resource Availability. Section VII.A. Prerequisites for Assistance, below, sets forth the views of the Strategy Advisory Group as to the criteria to be met by countries seeking external assistance, including

a long-term country commitment to support the anti-malaria program. It is not the Group's intent to suggest that external assistance be given only to those countries which demonstrate that they can go it alone. Help is needed to initiate an anti-malaria program, and the generally noted constraint of limited resources and cost inflation points clearly to a key area of external assistance: the financing of imported commodities, and the provision of essential technical assistance. Appropriate fields of assistance include:

- a. Provision of expertise (short-term and long-term), particularly highly specialized professionals (engineers with public health background, malariologists, entomologists, irrigation experts, anthropologists) as well as management.
- b. Essential supplies (Depending on the tactical variant chosen and the intervention methods selected, this form of assistance could include drugs, insecticides, spray equipment, larvicides, etc.)
- c. Transport
- d. Support of ancillary but malaria-related activity such as
  - 1) Health education
  - 2) Mass media and public promotion.

V. Malaria Control Techniques, Approaches and Goals Suitable for Anti-Malaria Activities in Specific Malarious Regions in Tropical Africa

A. Tactical Variants

The purpose of any disease control program is to reduce the impact of the disease on the population to the lowest possible level -- within the parameters established by technical feasibility, administrative capacity and resource availability. Given a fully favorable response to each of these considerations, the target of an anti-malaria effort might well be short-term eradication; but no country in tropical Africa (with the possible exception of some of the smaller islands) can present such a response. Accordingly, the selection of strategy is restricted to the highest level of control within the parameters.

In view of the various methods available for malaria control, it is important to choose the most suitable combination of methods. The control measures should be economical and the methods of operation and evaluation must be chosen in relation to the set objectives.

The Seventeenth Report of the WHO Expert Committee on Malaria<sup>(1)</sup> sets forth a series of "tactical variants" which relate control tactics to the nature and extent of the malaria problem in a given country and to the level of control which the country selects and can achieve. The Strategy Advisory Group considered this series of tactical

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(1) Technical Report Series 640, WHO, Geneva, 1979

variants to comprehend the range of malaria control techniques, approaches and goals which are at this time suitable for anti-malaria activities in tropical Africa.

The WHO report states:

"Antimalaria programme objectives for individual areas depend on national commitment, the prevailing epidemiology of malaria, the effectiveness of technological methods, and the financial capability of each country at any given time.

"For practical planning purposes, the objectives vary within a spectrum of control efforts, ranging from the reduction of mortality in limited areas of risk to the implementation of a countrywide malaria eradication programme. Within this spectrum, the definition of goals and approaches gives a framework within which the national planner may design a programme appropriate for his country.

"The following sequence of goals and associated anti-malaria methodologies, referred to as 'tactical variants', is illustrative of the major possibilities of malaria control. No one approach should exclude elements drawn from other approaches. Depending on the epidemiological situation, and in order to reduce malaria to the lowest level as rapidly as possible, more than one variant could be used within the same county. It must be clearly understood that, while these tactical variants constitute organized lines of approach to malaria control, the adoption of any one or combination of more than one in no way precludes the

"practice of individual measures of protection by members of the community. These measures include the use of mosquito nets, house screening, space sprays against adult mosquitos in houses, and other measures aimed at reducing man-vector contact. Indeed, such methods of personal malaria prophylaxis should be encouraged by the national health services.

"The four principal variants are as follows.

"Tactical variant No. 1

"Goal: Reduction and prevention of mortality due to malaria.

"Typically, this variant may be applied to a country or a part of a country with high malaria prevalence, severe clinical illness, low socioeconomic status, and limited experience in malaria programme administration. While the general health services would principally be responsible for drug distribution, community centres, private clinics, and large industrial and other organizations may also play an important role in the distribution of antimalarial drugs for the prompt treatment of the disease."

"Tactical variant No.2

"Goal: Reduction and prevention of mortality and morbidity, with special attention to reduction of morbidity in high-risk groups.

"This variant could be applied in situations comparable to those using variant No. 1, but a satisfactory organiza-

"tional structure will be required for a systematic distribution of antimalarial drugs to selected groups of the population such as infants and young children, expectant mothers, schoolchildren, and special labour groups. Limited protective and vector control measures might be applied by the individuals, whole communities, or employers with the technical guidance of the general health services.

"Tactical variant No.3

"Goal: Same as variant No. 2, plus reduction of malaria prevalence.

"This variant assumes the existence of an organizational nucleus and a sufficient number of trained personnel to apply the methods and to undertake an epidemiological evaluation of the results achieved. The government's commitment to recurring expenditure for a long-term programme depends partly on the capability of the malaria organization to define the cost-effectiveness of the proposed programme. Essential adjuncts to planning for limited control effort are intersectoral coordination, particularly with agriculture, and the ability to elicit public and local community participation and cooperation over the long term. Countries may opt for this variant when the effectiveness of technological methods, the commitment of the government, and the cooperation of the public do not permit a comprehensive national antimalaria programme.

"Tactical variant No.4

"Goal: Countrywide malaria control with the ultimate objective of eradication; keeping countries or areas free from malaria where eradication has been achieved; and vigilance in countries that are naturally malaria-free but are threatened by the introduction of the disease.

"This variant applies primarily to countries with long experience of antimalaria programmes, firm political support and public participation, a stable and expanding economic base, and a growing professional capability in technical, operational, and organizational management.

"For purposes of planning, basic factors involved in the selection of the appropriate antimalaria measures ..... are related to the epidemiological situation, the local efficacy of the methods employed, the level of national political commitment and public cooperation, the extension of professional training, and also to the administrative, operational, and financial feasibility of programme implementation."

As was noted above, the four tactical variants are not mutually exclusive; it is quite possible to employ two or even more of the four variants at the same time, in different parts of the same country. The keys to variant selection

are in each case the extent of commitment, the prevailing epidemiology of malaria, the effectiveness of technological methods, the available financial capacity, and the capacity to implement.

#### I. Situational Application of Tactical Variants

Clearly, no variant or specific combination of variants is uniformly applicable to all countries in tropical Africa. For purposes of this document -- which attempts to provide potential guidance on both strategy and tactics appropriate to external assistance to a continent characterized by climatic and ecological diversity -- the Strategy Advisory Group chose to deal with three situations -- those typical of rural areas, those to be found in urban and peri-urban areas, and those encountered in special and atypical locations made special by activity not directly related to malaria, or by geographical location which permits consideration of a strategy not elsewhere feasible.

#### B. Strategies for Rural Areas

1. Strategy. Of the two strategic approaches (see Section III. Anti-Malaria Strategies) to the problems of malaria in rural Africa, only the second -- achievement of the maximum degree of control within the limitations imposed by technical feasibility, administrative capacity and resource availability -- is currently practicable.

2. Objectives and Tactics. Noting the limitations implicit in V.A. above, the Strategy Advisory Group identified Variant 1 -- reduction of mortality -- through anti-malarial drugs as having the overwhelmingly highest priority among the four tactical variants for application in rural areas of tropical Africa, by reason of cost, relatively low administrative burden and, consequently, speed of implementation. Variant 2, which in addition to reduced mortality includes disease prevention through drug prophylaxis, takes the second priority. As opportunity permits, and keyed to feasibility, staffing and funding, appropriate vector control (Variant 3) has a potential rural application.

a. Reduction of mortality through chemotherapy.

Within the limits of outreach capacity, curative administration of an effective drug (chloroquine wherever possible) to all presumptive cases of malaria, regardless of the age of the individual, should constitute the minimum basic service.

b. Reduction in mortality and morbidity through chemotherapy and prophylaxis.

As possible, and not necessarily everywhere at once, malaria chemoprophylaxis (through drug administration) should be extended to vulnerable groups: children up to

the age of 5 and pregnant women.

As a special category, and as their identification is possible, chemoprophylactic drug distribution to migrants from areas of low malaria endemicity warrants serious consideration.

C. Reduction in prevalence through vector control

While the predominant strategy of dealing with rural malaria will be a combination of Variants 1 and 2, the Strategy Advisory Group took note of the fact that at least some elements of Variant 3, the reduction of contact between man and vector, may in particular instances provide to be not only the most efficient but also the most cost-effective means of lowering morbidity and mortality, parasite density and, infact, the parasite reservoir within the population.

Among the intervention measures applicable to rural areas are some which require little input from either the central government or external sources of assistance. These include, at a minimum, improved domestic sanitation and waste disposal and minor (self-help) source reduction in and around the rural community. Larviciding (probably limited to dry-season appli-

cation) may be used to eliminate foci of infection or to prevent nearby water supply from becoming such a focus. In extreme cases (e.g., communities surrounded by forest) it may prove possible to reduce man-vector contact within the community to the point where transmission within the community virtually ceases (without, however, affecting the vectors in the surrounding forest) by the application of appropriate (i.e., the cheapest effective) residual spray to the interior walls of houses. Finally, the use of larvivorous fish, or certain bacilli, may prove to be inexpensive and effective in reducing vector density. It must be recognized, however, that such measures require a different order of management in application, of skill in selection, of sophistication in approach, and of training, especially the training below the central core level.

- 1) Source Reduction. As noted, such measures as personally conducted or community organized source reduction come without monetary cost, but they require health education, at least simple engineering guidance, and motivational skill, to bring about the required community participation.
- 2) Larviciding. Larviciding, the limitations on the usefulness of which are marked, has appropriate application under specific conditions. The choice of an appropriate larvicide depends on the use to which the treated water is to be put. The inexpensive chlorinated hydrocarbons

are not advisable for larviciding; the more suitable materials such as temephos (Abate) are too expensive for most rural applications. There is no evidence that local materials (e.g., indigenously produced pyrethrum) are being employed -- possible because of cost considerations -- although they are safe and relatively simple to use. The inexpensive Paris Green of the pre-DDT period is reportedly not being used, and its production is all but suspended.

Beyond the question of the appropriate larvicide, the timing and quantity of application represents the difference between economical success and unnecessary expense or wasted effort, and few members of the Strategy Advisory Group considered self-help larviciding operations to be feasible.

- 3) Residual Insecticides. The use of residual spray, which is indeed technically appropriate to occasional rural situations, brings into consideration such questions as timing, application per square meter, insecticide of choice, skill of application -- and will usually require both financial inputs and a level of technical ability which will come from outside the primary health care system.

In sum, the level of supervision and control required to apply these methods of intervention constitutes an inhibition

to their use which may be more significant than their cost. In many countries, the application of technically feasible methods of attack is not possible until there is developed at the core level, and possibly beyond, the capacity to identify and use the proper tool.

- 4) Reduction of prevalence through biological control. The use of biological control measures to limit mosquito production potential of foci of infection has a long history in the pre-eradication period in the United States. Specifically, the most practical application of biological control has been the distribution and placing in water supply of larvivorous fish, the production of which requires little investment and the distribution of which can be shared by any co-opted individual. Another possibility may be the easily produced Bacillus thuringensis israelensis, already shown to be cost-effective in agricultural use.
- 5) Individual protective measures. Screening and repellants (for reasons of ineffectiveness and high cost) appear to have little application to malaria control in rural Africa; bed nets offer at least some possibility of preventing man-vector contact.

3. Elementary Stratification: While it is possible to stratify rural Africa in many ways, it appears that for initial purposes two ecologic areas should be considered, although both are of a stable malaria nature: dry savannah, where transmission of malaria is seasonal, and forest areas, characterized by perennial transmission. This distinction is drawn for a number of reasons:

- a. A higher proportion of clinically diagnosed cases of malaria are in fact malaria during the savannah transmission season; moreover, the malaria symptoms regions may be seasonal -- but with the caution that drug supplies must reach the distribution system before the onset of the malaria season, and must be geared to the malaria cycle.
- b. In forest areas, perennial transmission of malaria mandates year-round prophylaxis -- with consequent logistic implications.

An attempt by the Strategy Advisory Group to stratify rural areas by population density proved unfruitful in the absence of knowledge of the degree of population dispersion. Clearly, an area characterized by the isolated farm presents distribution problems more pronounced than those where the populations are collected in discrete villages -- a factor for consideration in evaluating both the capacity of basic health services to provide adequate outreach capability, and the per capita cost of either chemotherapy or chemoprophylaxis.

4. Seasonal Impact. Seasonal impact on program implementation is not solely a function of malaria transmission cycles; transportation and communication to remote areas may break down at the time of maximum need -- another reason why even the simplest of intervention measures -- chemotherapy and/or chemoprophylaxis -- requires the capability of planned advance delivery of supplies.

5. Migrants. The special problem of migrants -- referred to in Section V.B.2b, above -- is itself a complicating factor in planning and in program implementation. Individual migrants may be incorporated into an existing program -- although their existence and point of origin must be recognized if they are to receive the prophylactic care advocated; but migrant groups provide a problem of greater magnitude. Not only may the temporary population increase tax or exhaust supplies but, in addition, the qualitative differences in social organization, language and education from the local population may greatly complicate the problem.

6. Summation.

The Strategy Advisory Group again took note of the extreme diversity of conditions in the countries of tropical Africa -- political, social, economic, physical, geographic -- and the inevitable (but not fully predictable) diversity of programs which these countries will mount to deal with what is superficially a set of common problems: the impact of malaria on mortality, morbidity, quality of life and, ultimately,

potential for socio-economic development. A clue to success in dealing with these problems is a combination of adaptability and flexibility -- on the part of potential external donors as well as the afflicted African nations.

The approach to malaria control in rural Africa recommended by the Strategy Advisory Group is a holding operation -- generally feasible and thoroughly worthwhile. Chemotherapy and chemoprophylaxis can save lives and alleviate morbidity (and of course, reduce suffering), but will have no effect on the reservoir of malaria in the rural areas. The program is not time limited. It continues forever -- or until the availability of a still unknown technique of dealing with the total problem of malaria at affordable levels of expenditure. Even the limited vector-control measures identified above as occasionally applicable will be of local and quite probably temporary effectiveness with respect to impact on the malaria reservoir.

### C. Strategies for Urban and Peri-urban Areas

Africa is predominantly rural; malaria is often considered a predominantly rural disease, and the problems of urban malaria have received inadequate attention -- in part because of the successful anti-malaria efforts of a few primate cities. Yet up to 30% of the total population of Africa lives in urbanized areas, and the trend toward urbanization is strong, progressive and accelerating. A current WHO esti-

mate places the urbanized population of Africa just below 100,000,000 -- of whom over two thirds live in areas at malaria risk. The figures are considered conservative.

Urban areas suffer malaria in varying degrees; some large cities already maintain a measure of vector control which makes "indigenous" malaria infrequent (although travel a short distance from the city can produce infection), while others suffer hypo- and meso-endemicity, and in extreme cases, hyper-endemicity. The peri-urban areas tend to the upper extreme of the situation prevailing in the nearby city.

1. Definitions. The Strategy Advisory Group found itself unable to develop a definition of "urban" sufficiently flexible to comprehend all of urbanized Africa. In fact, even U.N. demographers have fallen back on earlier, country-provided definitions which grant urban status to places with as few as 400 inhabitants (Albania) or 5000 inhabitants (Austria); to non-agricultural centers (Israel) or to places "with urban status" regardless of size (Bulgaria). Faced with this dilemma, the Strategy Advisory Group limited its consideration of "urban" to those population concentrations possessing an identifiable corporate or municipal structure, affording municipal services to its citizenry, provided by entities which are accountable for performance. This

admittedly imperfect definition would include all of Africa's larger cities, including those with seaport and airport facilities, but would exclude many population agglomerations which may indeed be large enough to be considered urban but which possess no city structure.

"Peri-urban" -- as here considered -- is the area surrounding the structured urban areas, frequently not enjoying the amenities of the city, its socio-economic advantages, or its municipal or corporate structure, and the locus of much of the in-country relocation of population.

2. Special Problems. The problem of dealing with urban malaria is complicated by the fact that malaria and other vector-borne diseases may co-exist; that the same vector (or other vectors) may transmit both malaria and other diseases; and that the relatively straightforward chloroquine chemotherapy and/or chemoprophylaxis alone will not provide protection from these other diseases (e.g. filariasis). For obvious reasons, then, many urban areas have pursued an additional approach -- mosquito control -- which reduces vector-man contact, since it may be possible to deal with both culicine and anopheline mosquitoes simultaneously. The impact on tourism, industry and general life quality is appa-

rent. In any event, it is evident that the cities will aim for the maximum reduction of the disease, not merely the reduction of mortality and morbidity. This does not mean the elimination of chemotherapy and chemoprophylaxis; it does mean the utilization of a range of measures which require higher levels of administrative capacity, skill in application, knowledge of appropriate use, and supervision.

The peri-urban areas pose a different problem. With fewer educational opportunities than the cities; beyond the reach of many city services; and frequently divorced from the organizations of both the city and the rural culture from which the peri-urban population tends to flow, they may enjoy the worst of all possible combinations -- except for relative propinquity to treatment. The peri-urban areas deserve special attention. While the Strategy Advisory Group is cognizant of the WHO focus on the health problems of rural areas, it recognizes also the special malaria problems of the cities and their peri-urban fringes. External support of well-planned efforts to alleviate these problems is fully warranted, especially to the extent that such support falls into the areas of comparative advantage of a particular donor. The question of priority to be devoted to the malaria problems of urban versus rural

areas is a decision to be made by the individual countries of Africa; the more so in that immediate or near-term attention may be more readily possible in one or the other of these foci of attention, by reason of existing organizational structure, technical and administrative capacity, or other controlling factors.

3. Strategy. Of the two strategic approaches (see Section II. Anti-Malaria Strategies) to the problems of malaria in urban and peri-urban Africa, only the second -- achievement of the maximum degree of control within the limitations imposed by technical feasibility, administrative capacity and resource availability -- appears currently practicable. It should be noted, however, that the maximum degree of control through a comprehensive malaria control program is high enough to reduce the disease to a level where it would no longer constitute major health problem -- were it not for the constant danger of reintroduction from the rural and peri-urban reservoirs of malaria.

4. Approaches and Techniques. Section V.B. Strategies for Rural Areas, above, identified as the recommended approach to its principal goals the use of the cheapest effective drug to reduce malaria-caused mortality and morbidity -- with a modest injection of vector control as it is shown to be technically applicable, administratively feasible and cost-effective. The range of

measures applicable (and, indeed, appropriate) for dealing with urban malaria is broader, requires decisions based on epidemiological, entomological and engineering considerations, requires more management, supervision and logistic support, and an entirely different order of staffing and training.

a. Chemotherapy and Prophylaxis

Within the context of drug treatment, the urban areas (and, in some cases, the peri-urban areas) will frequently possess the required infrastructure -- curative centers, MCH clinics, and similar facilities -- to enable effective administration of drug treatment to all presumptive cases of malaria within an effective radius (3 kilometers). Given adequate health education and motivational support, these same centers may prove adequate for administration of preventive drug distribution as well. However, the clinic structure tends to be inward focused rather than offer a mechanism for outreach which appears necessary in many cases. (Especially in the peri-urban bidonvilles the cohesion of the rural village is frequently lacking.)

The Strategy Advisory Group took note that the urban and peri-urban areas frequently include seaports and airports, and they urged:

- 1) Provision for detecting drug-resistant strains of P. falciparum at these points.

2) Sensitization of the health delivery system to the end that when such cases are suspected provision can be made for confirmation, determination of origin, and application of emergency measures. The impact of such a drug-resistant strain of parasite upon non-immune population (including tourists) could have serious consequences.

b. Vector Control

Recognizing that urban vector control may be not only an effective option but in fact the most cost-effective measure of attack on urban malaria, the Strategy Advisory Group also recognized that within the context of an urban and peri-urban situation it may be difficult at times to separate anti-malaria vector measures from anti-mosquito measures. Nor should it be necessary to do so. Because of the importance of the problem and difficulties foreseen if the non-anopheline mosquito population is ignored, the Strategy Advisory Group recommended that, where appropriate and necessary, external support for general vector control to supplement country and/or city capability and resource availability should be considered a valid element in an anti-malaria

effort -- to the extent that the activity meets criteria of acceptability as outlined in Section VII.A. Prerequisites of Assistance.

1) Source Reduction (avoidance of man-made malaria)

Starting with the planning stage for new projects, (but without neglecting existing man-made foci of infection) and in coordination with the Ministries of Public Works, Urban Development, Planning, Finance, (and, in addition, city officials) health planners should take steps to minimize mosquito breeding potential. The Central Malaria Service should be advisory; responsibility for financing should normally fall on the budget of the Ministry or urban entity which created or is responsible for the problem. Legislation may be required to take measures to eliminate breeding sites, or existing legislation should be enforced, in such areas as urban waste disposal, sanitary land fill use (or creation), proper drainage and drainage maintenance. Where cistern breeding is encountered, suitable measures (e.g., at a minimum, coverage) may have to be taken. Health education as well as appropriate legislative measures will be imperative to the success of these measures.

2) Larviciding. Larviciding is particularly appropriate in urban and peri-urban situations during

dry seasons. Temephos (Abate) for clean, potable water and Dursban or Fenthion for polluted water can be used in a concentration and frequency appropriate to the situation. Insect development inhibitors may merit consideration.

3) Biological Control. In addition to use of larvivorous fish, the use of biological measures such as Bacillus thuringensis israelensis (whose "cottage industry" production is being investigated) warrants serious consideration.

The use of any of the above-mentioned measures should be preceded by a small-scale trial, to prove cost-effectiveness and adaptability under local conditions.

4) Space Sprays, Fogging and ULV. Use of insecticide and thermal fogging or ultra-low-volume (ULV) sprays, from the ground or air, may be practical under certain conditions. These techniques are by no means inexpensive, and should be undertaken only after demonstration of cost-effectiveness and utility under local conditions. They require adequate standardized equipment, adequate supplies of spare parts and, of course, insecticides. Staff training in application methods, equipment maintenance and evaluation of effectiveness is critically important.

Nevertheless, because of their effectiveness under certain conditions (e.g., in case of epidemics), their consideration is warranted.

5) Individual and Group Protective Measures.

In urban and peri-urban areas, individual and group protective measures may assume special importance. Effective use of bed nets, screened doors and windows, mosquito coils and insect repellents merits consideration -- recognizing that such measures are normally individually financed. Securing the popular adoption of such measures and levels of personal expenditure may require special efforts of health education, promotion, co-option of the support of community leaders and, in the final analysis, socio-behavioral change.

6) Residual Sprays. Residual spraying has relatively limited application to urban malaria problems, although it warrants consideration for the establishment of a barrier zone within a peri-urban area. As in the case of all insecticide application, determination of the vector and its susceptibility to the insecticides being considered is prerequisite to the choice of the most appropriate chemical agent. Implicit in the use of residual sprays are trained staff to apply the

insecticide, careful timing, and evaluative measurement of results attained.

D. Strategies for Special Situations

1. Development Projects. Development projects (e.g., irrigation development, water resource development) obviously have a critical possible impact on the malariogenic potential of an area or a country; less obviously, unnecessary water impoundments caused by poorly designed road construction activity can have a similar if somewhat smaller malariogenic impact. In addition, however, such schemes normally result in population movements to enable use of irrigated land; road construction is an inevitable forerunner of commercial activity and population concentration; and mine development requires concentrations of labor. In point of fact, the economic success of such schemes may depend upon control of malaria during construction and after completion, and malaria control acquires a special significance for that reason, over and above the normal considerations.

a. Objective. The objective of malaria control, in such instances, is stated in different terms: first, the prevention of any increase in existing levels, but more important, the reduction of malaria prevalence to a level where it will not impede the productivity of the population in the project area.

b. Strategy. Strategies for dealing with such a situation are:

- 1) Multisectoral participation in the project to define the health component, from design planning through implementation and evaluation.
- 2) Selected and diversified ("comprehensive") methods of malaria control, with the reservation that use of insecticides be held to a minimum consistent with goal attainment.

While the control effort should be carried out through integrated health delivery systems, with heavy emphasis on primary health care and community participation, the organization of effort will more closely resemble a smaller version of the Central Malaria Service than is the case in the normal rural area -- including the formation of a Malaria Committee representing all participants in the project, public and private (a parallel of the Interministerial Malaria Committee described in Section VI.C.3, below). This committee, which will also address other relevant health problems, is responsible for policy decisions in the health field. It will entrust technical responsibility for specific activities to a designated service, which requires, inter alia, technical and managerial expertise as provided by a malariologist, sanitary engineer, entomologist, and health educator, together with administrative and logistical support.

c. Tactics. Malaria control activities concentrate on environmental management (a form of elaborate source reduction), to decrease or eliminate mosquito habitats -- built into the plan from the design stage forward. Other control mechanisms include selective pesticide application, biological control (such as larvivorous fish), and, through the use of a strengthened primary health service, malaria case detection, chemotherapy and chemoprophylaxis. The comprehensive effort requires sustained and continuous health education effort to inform and motivate communities and social units to accept and actively participate in malaria control activity.

2. Nomadism. Nomadism provides a distinctly different but frequently encountered special situation, calling for a malaria control response quite different from the normal rural area pattern. A special phenomenon in Africa, relating to a highly adaptive mechanism of livestock production, nomadism is the periodic and cyclical movement of herders in search of water and grazing for their livestock.

a. Objectives. The objectives of control over "nomadic malaria" are not limited to reducing mortality and morbidity among the nomads themselves: They include the protection of nomadic populations moving from

non-malarious into malarious areas, and, in addition, the prevention of the introduction of malaria into non-malarious areas through the entrance into these areas of gametocyte carriers.

- b. Strategy. The strategy for dealing with "nomadic malaria" is to establish within the nomadic group its own primary health care unit by training a member of the group as a primary health worker, capable of delivering health care, including chemotherapeutic treatment of presumptive malaria cases, at all times and at all points in the nomadic cycle.

Organizational requirements call for the creation within the Central Malaria Service of a special unit to deal with nomadic groups, including periodic evaluation. Members of the Strategy Advisory Group suggest consideration of larvicidal treatment of mosquito breeding places in semi-arid areas within the nomadic orbits.

Special support for such specialized malaria control would require:

- Anthropological/sociological research to analyze and identify patterns and cycles of livestock movement.
- Special training of the nomadic primary health care worker.

3. Islands. At least some of the coastal islands of Africa offer the possibility of pursuing a different strategy; not merely the control of malaria, but its total education.

- a. Objectives. The objectives of an eradication program are well known: the complete and sustained interruption of transmission of malaria to the point where the reservoir of infection no longer exists; surveillance through both active and passive case detection to be instituted in the fourth program year and carried out for three years of consolidation; and vigilance to prevent reintroduction and, if necessary, to take prompt remedial action.
- b. Tactics. The techniques of classical malaria eradication need no elaboration beyond emphasis on careful initial feasibility studies, vertical organization during the initial four-year attack phase, with parallel development (as necessary) of health infrastructure to assure adequate surveillance during the maintenance phase to prevent reintroduction. The principal mechanism of intervention is the application of insecticide to house walls as a residual spray but without discarding the utilization of other anti-malaria measures, single or in combination. Such a program would (unlike malaria control) be time-limited. Its high costs and its require-

ments in terms of commodities, training, skill levels and, above all, capacity for perfect execution demand the most careful of preparatory planning, and recurring external as well as continuous internal evaluation. Like other anti-malaria activities, it requires a high degree of community support and participation, and consequently a major input in the form of health education. Minimal requirements for consideration of external support would parallel those set forth in Section VII.A. Prerequisites of Assistance, below -- with the observation that the inputs of the recipient country to sustain efforts beyond the period of external aid would be less burdensome than maintenance of a comprehensive control effort. In a real sense, a malaria eradication program represents a capital investment, and is susceptible of reasonably precise benefit-to-cost calculations.

### Conclusions and Recommendations

1. The strategy of malaria eradication is not at this time applicable to any of the countries of continental tropical Africa: eradication is quite possibly feasible on a limited number of off-shore islands.
2. The strategy of malaria control is currently applicable throughout tropical Africa; the extent to which the impact of malaria can be reduced is a function of technical feasibility, administrative capacity and resource availability. Within these parameters, there exist a considerable range of goals, and techniques to achieve such goals.
3. WHO has advanced a series of "Tactical Variants" which relate control tactics to the nature and extent of the malaria problem(s) in a given country and to the level of control which the country selects and can achieve. The Strategy Advisory Group considers this series of tactical variants to comprehend the range of malaria control techniques, approaches and goals which are at this time suitable for anti-malaria activities in tropical Africa.
4. No single variant or specific combination of variants is uniformly applicable to the enormous diversity of conditions in the countries of tropical Africa, since

in some countries (or parts of countries) the parameters listed in Conclusion 2 permit a greater degree of control than is elsewhere possible.

5. It would be presumptuous for the Strategy Advisory Group to attempt to establish priorities for all country program. The countries themselves will establish priorities, which will be embodied in their program proposals and assistance requests. Most are expected to give primary attention to malaria in rural areas.
6. The level of control envisioned under Tactical Variant 1 -- reduction of malaria-caused mortality -- would constitute an enormous advance toward the goal of "Health for All by the Year 2000" if it could be achieved continent-wide.

Recommendation: As an initial and overriding priority, within the limits of the outreach capacity of the health care delivery system, curative administration of an effective drug (chloroquine wherever the drug continues effective) to all suspected fever cases of malaria, regardless of the age of the individual, should constitute the minimum basic service. Innovative techniques of health care delivery are required to extend outreach capacity to geographically remote areas, and particularly to nomadic groups.

Comment:

An earlier WHO estimate of the needs of such a program included a requirement for (average number of tablets per attack, 3, all age groups included) 600 million 100 mg. chloroquine tablets annually -- 60 tons of technical product. The cost (which today would have to be updated) was calculated at \$6 million per year -- exclusive of the costs of distribution and maintenance of a distribution system.

7. Reduction of malaria-caused mortality and morbidity is technically feasible throughout Africa - - through the distribution of anti-malaria drugs as a preventive as well as curative measure.

Recommendation:

As a second priority, and as made possible within the parameters or administrative capacity and cost, malaria chemoprophylaxis should be extended to the groups most vulnerable to malaria: children up to the age of five and pregnant women.

Comment:

Such a program involves an entirely different order of both administrative capacity and cost. The WHO study already referred to set the annual drug cost of such a program at about \$45,000 per million of total population. Assuming an increase of 25% this cost (US \$56,250 per million) to cover rising

drug costs, its application throughout tropical Africa would be on the order of \$36 million annually, exclusive of costs of distribution and administration.

8. Even in rural Africa, measures beyond drug administration may prove cost-effective under special circumstances.

9. Urban and peri-urban malaria represents a special situation where -- always within the parameters of technical feasibility, administrative capacity and resource availability -- chemotherapy and chemoprophylaxis may appropriately be augmented by a comprehensive malaria control effort to reduce malaria prevalence

Recommendation: For reasons of cost, technical constraints and staff requirements, residual spraying has a limited application to problems of malaria control in tropical Africa: barrier zones around urban areas, target of opportunity in forest-surrounded communities, development projects and off-shore islands. Residual spraying should be limited to the few cases where it is cost-effective.

Recommendation: Development projects, where the objective is to reduce malaria to a point where it will not prevent the economic success of the project, require comprehensive malaria control, actively supported by multisectoral participation from all project participants.

10. As permitted by the parameters of technical feasibility, administrative capacity and resource availability, malaria eradication may prove to be feasible on some of Africa's coastal islands. Eradication is a time-limited program; it is a capital investment, susceptible of reasonably precise benefit-to-cost calculations.

## VI. Requirements for Implementation

While there will be variations in the goals of the various kinds of anti-malaria efforts which appear appropriate and at least technically feasible in the several African situations described in Section V, above, and the tactics to achieve these goals will also vary, a number of requirements for the implementation of tactics remain constant.

### A. Organization for Malaria Control

Entirely apart from the technical difficulties to be overcome in conducting a malaria control program, a key problem is the organizational structure through which planning, scheduling, training, supervision, motivation, supply and evaluation take place. This structure must be selected to conduct a program which is not time-limited, which may or may not be conducted throughout the entire country, and which will quite probably vary in methodology and completeness of application from one area of the country to another.

There is no single organizational structure which would prove to be universally applicable to all African countries which may wish to mount -- and to seek external assistance for -- anti-malaria programs. One common thread joins all of these countries, however: their acceptance and support of the conclusions of the International Conference on Primary Health Care, held at Alma-Ata in September 1978. As a result, the African countries consider that primary health care is

"essential care based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community through their full participation ..... It forms an integral part ... of the country's health system, of which it is the central function and main focus..... It is the first level of contact of individuals, the family and the community with the national health system, bringing health care as close as possible to where people live and work, and constitutes the first element of a continuing health care process." (1)

The report establishes a set of minimum responsibilities for the Primary Health Care system, including, to be sure, prevention and control of locally endemic diseases; education concerning prevailing health problems and the methods of preventing and controlling them; and appropriate treatment of common diseases. Clearly, a measure of anti-malaria effort is comprehended in this list. But in addition, Primary Health Care is assigned responsibilities (at a minimum) for promotion of nutrition and safe water supply, maternal and child health and immunizations.

As defined in the Alma-Ata Conference Report, Primary Health Care is delivered by community health workers -- supported by other levels of the health system, and by other sectors of the government and national economy as well --

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(1) Report of the International Conference on Primary Health Care, WHO/Geneva 1978

education, agriculture, public works, industry and the mass media. Relying heavily on community participation, it makes provision for coordinated planning at the community level, to assure its focus on community interests.

Central planning, it is envisaged, should aim at enabling communities to plan their own primary health care activities. Some have termed the system "bottom-up" planning. In fact, the concept of Primary Health Care moves beyond community participation in planning to assign to individuals and families the responsibility for their own health and welfare and those of the community. The community is to be involved in every stage of Primary Health Care, from situation assessment to problem definition to priority establishment; from planning to cooperation in administration to contributed labor to review of progress.

Some observers have interpreted this sweeping change in the focus of health delivery systems as a bar to the mounting of a national effort to attack a problem such as malaria, which may or may not be considered to have a high priority in all communities. In any event, external donors would find it difficult to support the congeries of kinds of effort which might be anticipated to emerge from a mere summation of the proposals of community planning efforts.

The Strategy Advisory Group does not accept this interpretation. The Alma-Ata report goes beyond its initial pronouncements to note the continued need for a national managerial

process -- which includes planning, programming, budgeting, financing, control of implementation, research, replanning if necessary, and information support. While an essential element in the central decisions on implementation techniques may be (and in Africa, will be) to give priority to Primary Health Care at the community level, equivalent attention must be devoted to the supporting levels. Thus, budgeting at the central level -- a key step because it estimates required resources and allocates them -- does not need to be built up from addition of items requested by each community. Further, Primary Health Care, with its supporting services, has to be controlled to insure that it is functioning in accordance with the national policy and strategy. Control of a technical nature comes from the more specialized levels of the health system through guidance, education and provision of the right kind of information, through logistic support, and through readiness to deal with more complex problems.

As evidence of its recognition of the special problems associated with control of, e.g., vector-borne diseases such as malaria in the context of village-level control efforts and severely limited budgets, the Alma-Ata Conference Report advances as a realistic solution to maximum population coverage the utilization (the report itself uses the word "employment") of community health workers who can be trained

in a short time to perform specific tasks -- which may be restricted to certain aspects of health care or may cover a wide range of such activities. They may be drawn from the ranks of traditional medical practitioners and midwives or from other groups as appropriate.

In short, the Strategy Advisory Group does not accept the verdict that the commitment of the countries of tropical Africa to the concept of Primary Health Care constitutes a bar to a planned anti-malaria effort, or a straitjacket to confine the kind of effort to be undertaken. Rather, it provides a mechanism for program implementation on which it is possible to capitalize.

However, reliance of the Primary Health Care system on a "national managerial process" and "specialized levels of the health system" means that there must exist such a process and such specialized levels of the health system.

During the 1950s and 1960s, throughout the world, the operations of most anti-malaria programs were centrally directed, planned, funded and executed -- entirely apart from the rest of the country health system. Staffs were (in relation to basic health services) better equipped; they enjoyed a privileged status, with virtual or actual autonomy. But their objective was time-limited eradication, and their function was believed to be similarly time-limited. Their employees were not tenured civil servants, and attrition among skilled technicians and administrators alike rose to serious proportions.

Over time, the cost of the frequently effective but expensive vertical structure led many countries to devolve malaria responsibilities to the general health services, frequently untrained and without an understanding of the importance of their new function. Some observers attribute the resurgence of malaria in Asia to the premature integration of anti-malaria activities into the general health services, with consequent loss of focus and single-minded attention to the problems of malaria.

The Strategy Advisory Group's discussions of the question of integration led to a number of pertinent observations of which the following represented consensus:

The desire to do too much with too little can have a crippling effect. While there are real savings to be attained from integration, they must not be achieved at the cost of program failure -- of the anti-malaria effort and quite possibly of the other activities being carried out. The range of responsibilities already assigned to existing village-level workers in many countries of tropical Africa is indeed large.

The ideal appears to be an essential combination of central planning, procurement, logistic support and evaluation plus decentralized implementation, maintained in an organization strong enough to seek funds (a line-item malaria budget is considered essential) and to attract and retain well-qualified key personnel

sufficiently flexible to permit decentralized execution but to provide centrally administered essential training, support, encouragement and technical guidance to assure cost-effective execution of plans.

In many countries of the world, anti-malaria activities are conducted under the Communicable Disease Control Directorate within the Ministry of Health -- an appropriate locus of operation.

Initial assignment (or precipitous transfer) of functions and authority to persons not trained to handle them has been a major cause of failure for many anti-malaria efforts.

Significantly, the WHO Expert Committee on Malaria in its seventeenth report<sup>(1)</sup> took note of the practical difficulties being faced in some countries in the execution of anti-malaria programs through integrated health services, and, instead of advocating integration, recommended that WHO "evaluate the experiences gained in various countries on the integration of malaria control within basic health services and make this information available to member countries".

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(1) Technical Report Series 640  
WHO/Geneva 1979 (op.cit.)

### Conclusions and Recommendations

1. Anti-malaria effort should be an integral part of national health planning.
2. Anti-malaria programs should, at a minimum, be planned, directed, supplied, supported and evaluated at as high a level as is required to assure cost-effective achievement of program goals.
3. Anti-malaria programs may be integrated with other communicable disease control activities, but should have organizational identity and designated allocations of funds.
4. Organizational identity means that there must be room for professional recognition of both managers and technical specialists and provision for their career status and promotion potential.
5. The Primary Health Care system offers the possibility of decentralized execution of certain kinds of anti-malaria activities -- e.g., drug distribution, record maintenance, minor source reduction, health education -- which may be expected to dominate anti-malaria programs in most situations encountered in tropical Africa; specifically in rural areas.
6. Community acceptance, support and participation are vital to the success of any anti-malaria effort.

Recommendation: The organizational structure through which an anti-malaria effort is planned and executed constitutes an element in the administrative feasibility of any program. It should be a major concern of external sources from which assistance may be sought.

B. Planning

The importance which the Strategy Advisory Group attaches to proper advance planning stems from two completely separate considerations.

1. The first, in itself a fully adequate justification for attention, is that the key to a successful anti-malaria program is a technically sound and feasible, epidemiologically based selection of intervention methods, - its techniques appropriate to area-specific needs to defined goals and to available (or prospectively available) resources. The plan must be keyed to the organizational structure through which it will be implemented, and must take account of the availability of staff at all levels. It must provide for supervision, administration and logistic support in addition to required technical expertise.

Training needs at all levels must be anticipated -- including not only the needs for initial training, but also for refresher training and, as attrition takes its toll, training of replacement personnel. To hold such

losses to a minimum, the plan should be predicated on the existence (or creation) of a permanent service within the Ministry of Health which will provide career potential to attract and keep key personnel, both managerial and technical.

The plan should identify not only the several elements in the Ministry of Health which will contribute to the plan's execution, but also the elements in the primary health care system on which portions of the execution burden will fall. In addition, it must take into consideration the potential roles of other governmental and non-governmental entities which can help solve the problem of controlling malaria -- or which can actually aggravate the malaria problem if their activities are not designed and executed to eliminate or minimize such aggravation. Techniques to assure the cooperation of such entities should be built into the plan.

Regular internal and periodic external evaluation of program progress, results and possible deficiencies constitute elements in any sound anti-malaria plan.

Finally, the plan must describe the external contribution on which it is predicated, in terms of technical inputs and financial support. Taken together with the national budgetary support commitment (including, as

appropriate, the inputs of resident non-governmental groups), this assessment of resource availability enables a judgment of the financial feasibility of the plan.

2. The second consideration of the importance of sound planning is that without a properly prepared plan the possibilities of attracting major external assistance are remote. The initial request for assistance may indeed take the form of a solicitation of help in plan formulation, or operational research to demonstrate the technical feasibility of a plan (or a key element in the plan). Both kinds of request would warrant support; they might be considered in the light of a request for a feasibility study. Section VII.A. Prerequisites for Assistance, below, sets forth in detail the views of the Strategy Advisory Group on the criteria which should govern consideration of a request for external assistance -- criteria which are in every way consistent with the recommended position of WHO and the position already adopted by AID.

### Conclusions and Recommendations

1. In the absence of a technically, administratively and financially feasible plan, no anti-malaria program can anticipate successful attainment of its goals.

2. In the absence of such a plan, the possibilities of attracting major external assistance are remote.
3. External assistance may appropriately be extended to either plan formulation or the operational research which may demonstrate the feasibility of a proposed intervention technique.

Recommendation: External assistance should be considered appropriate for either plan formulation or the operational research which may demonstrate the feasibility of a proposed intervention technique on which the plan (or an element of the plan ) may be based.

C. In-Country Coordination of Anti-Malaria Activities

1. Role of Ministry of Health. The implementation of a planned anti-malaria strategy of the kind contemplated in the four tactical variants described in Section V.A., above, is the task of the authorities responsible for providing health services. In rural Africa, and in only slightly/<sup>lesser</sup> degree in urban peri-urban and development project is situations, this means the Ministry of Health and those responsible for community welfare. The coordinated activities of these entities (and in some circumstances, other sectors outside the health field) are critically important to the attainment of the targets of anti-malaria efforts.

As is noted in Section VI.A., above, it is vital that in each country undertaking organized malaria control there should be a permanent Central Malaria Service,

possessing the essential expertise, technical and managerial; intimately acquainted with the range of malaria problems faced in local areas; in close touch with other elements in the general health services of the Ministry and with other groups, within the government and without, including groups completely outside the health sector as such, which can contribute to the anti-malaria campaign. Such groups include but are not limited to public works, agriculture, irrigation, education, and broad economic development.

Apart from its planning, implementation, training and evaluation contributions, the Central Malaria Service must not only advise, direct and support the activities of community level workers, but also must guard against local adoption and introduction of anti-malaria policies not suited to local conditions -- or, in fact, to the national program.

As has been noted in Section IV.D.1, above, the creation and support of the Central Malaria Service is a direct responsibility of the Ministry of Health. Similarly, the Ministry of Health is responsible for guaranteeing to the Central Malaria Service the cooperation of other elements in the general health services of the Ministry.

The range of activities comprehended by the four tactical variants constitutes a responsibility shared by the health services of the Ministry -- and the respective communities.

It is to be observed that the Central Malaria Service may have to be replicated at state and provincial health department levels, depending on the area to be covered and the nature of the response to the malaria problem. Organization below the national level to deal with the problems of malaria becomes of even greater importance as a country moves from the simpler tactical variants toward comprehensive malaria control, selecting the intervention method or methods appropriate to a local situation. It is a truism that comprehensive malaria control requires a deeper and wider knowledge of malaria epidemiology than does eradication.

a. Primary Health Care

Section V.A., above, deals at length with the degree to which the countries of tropical Africa can be expected to rely on the primary health care system as the cutting edge of efforts to reduce malaria-caused mortality and morbidity. The Strategy Advisory Group concluded that primary health care as a vehicle is both appropriate and potentially effective, but with several provisos: without adequate initial training, regular support, encouragement, and supervision, and systematic logistic support, failure is assured. Primary health care can be no more effective than its support from the Central (or State or Provincial) Malaria Service

permits. The cautionary note that overloading a rudimentary Primary Health Service with too many responsibilities usually results in failure on all fronts is not too obvious a point to deny its repetition.

One point, strongly urged by several members of the Strategy Advisory Group, deals with the possibility of using the anti-malaria effort as a wedge leading to the creation and subsequent expansion of primary health services, especially in the less accessible parts of the country, both quantitatively (for coverage) and qualitatively (for extent of service).

b. Preventive Health Services

Section VI.C.1., above, took note of the need to incorporate the contributions of other elements of the general health services of the Ministry of Health into the anti-malaria effort. This contribution is not limited to the use of hospitals, clinics and dispensaries for malaria chemotherapy and chemoprophylaxis; it also comprehends health education, case treatment, data collection, and other functions as appropriate and possible.

Clearly, the overall anti-malaria plan must take into consideration the potential contributions of non-governmental medical facilities as well -- including but not limited to

those maintained by medical missionary groups, plantations and other large-scale commercial ventures, and, as possible, cooperatives and labor unions.

2. Community Participation in Malaria Control. Conceptually admirable, community participation in malaria control efforts has been advocated as essential to the success of Primary Health Care; many countries have attempted to elicit such participation, and a number have reported at least initial success. Yet one of the two Field Teams (see Section I) reported that Primary Health Care Programs with secondary characterization as malaria control programs have not worked well.

Normally, the instrument for community participation in health service delivery has been the village-level worker. In too many cases, there appears to have been a decline in worker interest and participation over time. Efforts have included both fully voluntary participation and use of paid village level workers (paid by the community, by the government, or by both). The keys to successful, continuous performance, reported by several members of the Strategy Advisory Group, appear to comprehend:

- a. An initial education program to inform the entire community of the anti-malaria program, of its purpose (what it will and will not do), of the importance of

continuity in the taking of prophylactic drugs (there appear to be few rejections of therapeutic doses), and of the services to which members of the community are entitled by right, not by the whim of an agent who uses anti-malarial drugs as rewards or tokens of his friendship. (Such instances were reported.)

b. Careful selection of the community health worker by the community. It may and frequently will be one of the "traditional" elements in the society -- the healers or the birth attendants -- who is selected.

c. Adequate levels of training, at a site close to the location where the training will be applied.

d. Advice, guidance, instruction, encouragement and recognition from supervisory personnel from the Central or Intermediate-level Malaria Service who visit the community regularly (and, it is hoped, frequently).

e. A symbol of the prestige attaching to the position -- whether in the form of pay or in the form of a visible badge of office (e.g., a logo-bearing T-shirt).

Within a malaria control effort dominated by or limited to reducing malaria-caused mortality, or mortality and morbidity, the functions appropriate to the community-level agent are primarily drug distribution to a designated

clientele and on a designated schedule; maintenance of appropriate records; and health education. As appropriate, he can advocate and motivate acceptance of advice concerning domestic sanitation, minor self-help source reduction efforts, and (with appropriate technical advice from the Central Malaria Service) community efforts to eliminate foci of infection through source reduction. As available and appropriate, he can introduce larval predators into nearby waters where they have the possibility of survival and effectiveness.

He should be mobile rather than static. His effectiveness may depend on capacity for outreach. For implementation of Tactical Variant 2, he must reside in the area where the target group lives. Even in urban and peri-urban areas, and in areas where developmental projects open the possibility of "man-made malaria", the community-level worker will have a role to play, although he becomes a part of the larger efforts appropriate to such situations. Despite a few experimental efforts to use the community-level worker to conduct larviciding and other applications of chemicals to reduce malariogenic potential, few members of the Strategy Advisory Group (or others familiar with such efforts) recommend the practice.

Whatever the level of activity assigned to the community-level worker, one of his primary responsibilities is that of securing social acceptance of the anti-malarial effort,

understanding of its significance to the individual, the family and the community, and participation in the effort by the community.

The Central Malaria Service (or, with the advice of the Malaria Service, the Central Procurement Service of the Ministry of Health) is responsible for drug procurement, drug selection and determination of appropriate posology, drug distribution, and collection of data on patients treated or target groups served. It is also a function of the Central Malaria Service to study the impact of the control techniques employed on local vital health statistics and on trends in morbidity and mortality.

3. Role of Other Governmental Ministries and Non-governmental Organizations. While the Central Malaria Service bears the responsibility for planning, supply, provision of technical guidance and coordination of the inputs of other elements within the Ministry of Health, the problems of malaria control are in fact broader than the scope of either the Malaria Service or the Ministry of Health. In the process of designing and implementing such large-scale projects as irrigation and water development schemes, the responsible authorities can increase the malariogenic potential of a region -- or can avoid the creation of "man-made malaria". Poorly designed highways may impound water;

borrow pits may similarly provide water holes which become breeding foci. Blocked drains, especially in urban and peri-urban areas, inadequate waste disposal and even cisterns for drinking water require attention to prevent their becoming mosquito breeding sites. Industrial establishments frequently contribute to the problem.

Coordination. At the central level there is need for a malaria coordination body -- e.g., a malaria advisory board -- normally chaired by the Central Malaria Service, but including representations of all ministries and other organizations which can contribute to the effectiveness of the anti-malaria program. Such a body, which should at a minimum include agriculture and irrigation, water management, industry and mining, public works and communications as well as health, should play a permanent role in what must be a coordinated interdepartmental and intersectoral effort, and the central nucleus of specialists is responsible for justifying the financial investments in the program, appraising technical measures to be adopted and insuring the intersectoral cooperation essential for an effective anti-malaria effort.

The benefits of such an effort are not one-sided. Without effective control over malaria, the success

of development projects, irrigation, mining and manufacturing, plantation agriculture and re-settlement programs may be threatened.

#### Recommendation

A malaria coordination body should be established that is chaired by the Central Malaria Service but includes representatives of all ministries or other organizations whose activities impinge upon or can contribute to the effectiveness of the malaria control program.

#### D. Training Requirements

Both the Workshop meetings of the Strategy Advisory Group and the reports of the two Field Teams stressed the need for training at all levels, from top leadership to community-level workers.

1. Senior level training. Good leadership is recognized as an essential factor in achieving a successful anti-malaria effort, regardless of the goal selected. Although the quality of leadership is related to the individual character of the leader, it can be built up by appropriate technical training and clear lines of delegation of responsibility within the system. Throughout the world, anti-malaria programs have been greatly assisted

by the support given by WHO, by other U.N. agencies and by AID to both national and international training centers.

Since the change of emphasis from malaria eradication to malaria control, in those countries where eradication has been technically, administratively or financially impossible, it has been recognized that training or retraining of all personnel in the principles and practices of malaria control is of utmost importance. The Executive Board of WHO stressed at its 1976 session (EB 57/19) that "most of the antimalaria programs are actually facing great difficulties in replacing and recruiting technically qualified personnel".

Especially as anti-malaria programs progress beyond drug administration to comprehensive control efforts -- a decision which may be required in urban areas or in special situations even during a period when the major thrust of a national program is directed toward the reduction of malaria-caused mortality -- the programs demand personnel possessing technical and managerial competence as great as, or even greater than, the

levels of expertise needed for malaria eradication. The key point is that the techniques are different, and the managerial responsibility, including the responsibility for making decisions, extends much farther down the chain of command. It is no longer sufficient to have such competence at the top of a vertical structure.

Courses leading to a post-graduate diploma have been provided during recent years in various parts of the world -- yet in Africa the WHO-supported malaria training centers at Lome and Lagos were discontinued a decade ago -- for lack of candidates. The Strategy Advisory Group identified as a key obstacle to the mounting of malaria efforts in Africa the difficulty in motivating the several countries to provide trainees -- and then to provide secure positions for them. In fact, the problem is one of structure, already treated extensively in Section VI.A, above. As presently organized, most health ministries lack the capacity to provide career protection to more than a few technical specialists, and particularly to those with a single specialty. In the absence of absorptive capacity, they refrain from nominating candidates for training.

The problem is not unique to Africa. National governments worldwide are finding that they are unable to

locate enough professionals to manage and operate malaria control programs -- which, as has been observed, involve a broad understanding of epidemiological principles and application of a selection of technical methods, rather than the essentially DDT- and drug-dictated tactics of eradication. This implies, of course, both the training and the equipment for epidemiological work, including theoretical and practical knowledge of control of malaria and other vector-borne diseases. In this way the trained professional acquires the status which should secure his long-term career in the public service. The training of such a specialist should also be directed toward the development of his skills as a teacher and motivator, to provide the national governments with individuals capable of conducting appropriate courses for technicians and auxiliary public health personnel.

The range of skilled manpower required for a successful anti-malaria effort is broad, including those capable of planning and evaluation; the managers whose input includes assurance of timely logistic support, maintenance and allocation of funding as well as scheduling of training, support visitation and follow-up; the technical specialists -- malariologists, entomologists and

epidemiologists, to be sure, but also environmental sanitation engineers; and, to assure popular acceptance and participation, the rural sociologists and the health educators. Not least important are the trainers.

Presently there are no comprehensive teaching facilities in Africa which provide for the range of skills required for malaria control as such.<sup>(1)</sup> WHO has continued, however, to cooperate with African nations in training of personnel in broader areas of which malaria control may be a significant part -- at the post-graduate course in public health at the Regional Center for Health Development in Cotonou and at the Training Center for Health Personnel in Lagos. WHO also maintains an inventory of African research institutions involved in research and training in tropical diseases. Some of these have specific malaria research programs.

2. Intermediate-level Training. The problem of the technical level of existing national training establishments for intermediate personnel deserves special attention. The functions to be discharged by such

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(1) Dr. Graham's background paper, prepared for the use of the Washington Workshop, contains an unevaluated listing of five francophone and 12 anglophone institutes, universities, hospitals, malaria services and other entities considered to have potential for providing malaria training. These institutions are listed in Annex 4.

personnel vary, depending on the tactical variant of choice. Under Variant No. 1, for example, the intermediate level malaria staff provides advice, guidance and in-service training to drug distributors; logistic support in distributing the community's stock of anti-malarial drugs; supervision of the work of the community-level workers; and collection of statistical data on numbers treated, appropriately classified by age groups. As the tactical variant (and extent of disease protection) changes, the responsibilities of the intermediate-level staff will increase to include closer supervision, follow-up treatment, collection of epidemiological data and greater emphasis on group health education.

Large development projects, especially if they employ non-immune workers and technicians, require the establishment of a well-equipped malaria control unit and a laboratory which can provide diagnostic facilities. The attainment of a satisfactory level of implementation of a comprehensive malaria control program requires continuous supervision and guidance.

The malaria control unit attached to a large development project may in fact require the training normally considered appropriate for staff of the Central Malaria Service, since it will have to devise (and modify on

the basis of experience) plans to control malaria in the development area and maintain such control after project completion. Members of the Strategy Advisory Group also observed that their experience in the implementation of preventive measures in development projects emphasized the importance of intersectoral cooperation between the health services and the authorities responsible for agriculture, irrigation, hydroelectric power, and others. This has led to the creation of malaria advisory boards to assist the malaria control unit in preventing malaria connected with these schemes and to protect the labor force.

Implementation of variant No. 3 -- involving broad application of vector control measures -- requires the intermediate level staff to maintain liaison with village committees, to guide and advise them on such vector control measures as environmental management, biological control, and, rarely and under particularly careful supervision, the use of larvicides and residual insecticides. The role of the intermediate staff includes training, health education, motivation to continue the anti-malaria effort, together with technical guidance, supervision and evaluation. As skill requirements rise, the staff must also include sanitarians, entomologists and laboratory technicians.

Clearly, the requirements for intermediate-level training, in terms of skill levels and numbers, will vary from country to country, and country decisions on the level of control to be sought will dictate both qualitative and quantitative requirements.

On one aspect of this problem there was complete agreement within the Strategy Advisory Group: intermediate-level training should, to the extent possible, take place within the country where it will be put to use. It was also group consensus that national training centers in Africa should be African-conducted and -directed by the Central Malaria Service at the earliest possible time -- but that, initially and as long as is needed, national training centers require the stimulus of external technical inputs. Their improvement would be greatly accelerated by the existence of a regional center. In no way, however, would the creation of such a center eliminate the need for in-country technical training.

3. Village-level Training. The role of the village-level worker in an anti-malaria program appears essentially non-technical: drug distribution, record maintenance, case follow-up, health education and group motivation. With guidance from intermediate-level malaria staff, the village-level worker may also be instrumental in securing

individual and community participation in source reduction efforts. Under supervision, he may play a role in application of vector control techniques.

In fact, the role of primary health care is crucial for the success of the decentralized effort which, in the judgment of the Strategy Advisory Group, is most readily applicable to the kinds of anti-malaria programs which the nations of Africa -- even if they receive initial external assistance -- may be expected to maintain. Primary health care is expected to be the cutting edge of efforts to reduce malaria-caused mortality and morbidity. The role of the primary health care system in areas where malaria prevalence has to be reduced is equally critical, and its full cooperation in the anti-malaria effort must be insured.

The principal difficulty with this concept is that the primary health care worker is expected to play a wide variety of roles (see Section VI.C., above). Moreover, the system of primary health care is in its infancy in many African countries, and its geographical coverage is by no means total. Nevertheless, training facilities are already in existence or in the planning stage in many or most African countries, and the addition of training for the distribution of anti-malarial drugs, curative or prophylactic, seems feasible. Instruction

on "selling" the need for personal sanitation and the relationship between malaria and infant mortality, underweight newborn children and adult debility may prove more difficult to put across.

In areas where primary health care has yet to be established, Strategy Advisory Group members advanced the suggestion that the initial focus of primary health care could appropriately be the anti-malaria effort -- expanding to additional responsibilities as the initial burden was successfully borne. Under such circumstances, initial training could be truncated; subsequently, through retraining, the primary health care worker could be made polyvalent. Experience in some parts of Asia appears to support the thesis that malaria workers were generally successful in converting to multi-purpose health workers; the addition of malaria responsibilities to the duties of health workers in clinics and other basic health facilities was often followed by poor performance with respect to both the anti-malaria effort and their existing responsibilities.

4. Extent of Training Needs. The magnitude of the requirement for training cannot be precisely measured without information not available to the Strategy Advisory Group. It is a function of the staffing needs of programs yet to be formulated, trained staff on hand in

each country, and anticipated attrition rates. The Group is informed that an evaluation of African training facilities and their capacity in terms of numbers and training content, is now in progress under WHO auspices. With the assistance of UNDP/IBRD/WHO Special Program for Research and Training in Tropical Diseases (TDR), post-graduate courses in medical entomology are being established at the Universities of Abidjan, and Nairobi. The results of the evaluation will provide guidance to external sources of assistance as to the need to strengthen existing centers, to enlarge their facilities, or, quite possibly to establish new centers - both for franco-phone and anglophone Africa. Should the need for such facilities be demonstrated by the survey, external support may prove critical to success, whether in the form of assistance in facility construction or modification, provision of technical expertise in instruction, or training grants. Again, however, the Group stressed the fact that training without the possibility of career potential for the trained leadership would prove to be of short-term value at best.

#### Conclusions and Recommendations

1. There are at present no comprehensive training facilities in Africa which provide for the range of skills required for the leadership of a successful anti-malaria program. WHO demonstration activities (e.g., the Kisumu fenitrothion trial) seminars, study tours, and support of the post-graduate courses in public health (Cotonou) and

the training center for health personnel (Lagos) have been useful but do not meet the anticipated requirement for trained leadership.

2. National training centers constitute a critical need.

Recommendation: While such centers should have African direction at the earliest possible time, they require, initially and as long as is needed, the stimulus of external technical inputs.

3. The improvement of national training centers would be greatly accelerated by the existence of a regional center.

4. Within each country (or, at a minimum, available to each country) undertaking a national anti-malaria effort, there is need for a strong training program to provide competent technical personnel for the various administrative and operational areas. Such personnel must provide a range of skills, appropriate to the local situation where training is to be put to use and geared to the level of control sought. Where possible, WHO should provide the resident foreign expertise; local colleges and universities, research facilities and vector-borne disease institutes should be drawn upon where they possess the essential skills required. The training should be pragmatic rather than theoretical, stressing the management of resources and the decision process.

5. The success of malaria control efforts depends to a preponderant extent on the availability of trained technical personnel of all grades. The investment of any external donor in support of a national anti-malaria program is endangered to the extent that technical personnel are improperly or inadequately trained to carry out the program, however well planned.

Recommendation: National training institutions in control of malaria (and other vector-borne diseases) in countries where anti-malaria programs are receiving or will receive external support should receive external technical and financial assistance whenever this is regarded as important to the success of the relevant programs -- to the extent that the countries themselves are unable to provide training appropriate to the demands of the program.

6. Until a country is able to provide (with or without external assistance) a training facility able to satisfy program demands, it is entirely appropriate to seek the assistance of another African country which already possesses such a facility. (See Section VII.B. Technical

7. The current WHO evaluation of the quality and capacity of existing African training facilities, measured against the estimate of training requirements for present and prospective African anti-malaria programs, may be expected to develop a measure of the need for expansion of existing training facilities or the creation of additional facilities.

Recommendation: Whether the need is for expansion of existing training facilities or the creation of additional facilities, external support is warranted and indeed essential.

Recommendation: To allow long-term planning of regional training programs, an estimate of cost for a period of at least five years should be made so that external sources of assistance may consider their future financial contributions.

Recommendation: A summary of WHO-prepared teaching aids (possibly from the discontinued WHO regional training centers in Lomé and Lagos, but supplemented by more current information) should be made available to all African countries needing such material.

8. Revision of the training curriculum for primary health care workers to incorporate the required level of knowledge of their role in the national anti-malaria effort is essential. Research efforts proposed in Section VII.E.3., Human Constraints, below, should provide a substantial contribution to this revision.

## E. Research

### 1. Requirements for Research in Support of Malaria Control

Many of the critical elements of a successful malaria control program depend upon appropriate analysis of scientific information and acquisition of new information when the existing data prove inadequate. A broad base of information, often area-specific, is required. Success or failure of control may depend on the malariologic data available when strategic or tactical decisions are made. The Strategy Advisory Group considers that a research element is therefore an absolute necessity for a successful program. Selection of appropriate methodology to be employed from among presently available methods requires area-specific data in epidemiology of malaria, vector biology, vector taxonomy, insecticide susceptibility of vectors and drug susceptibility of the parasite, as well as social and economic data. Where such information is lacking or outdated, poor choices of methodology are inevitable.

Development of new control technology must keep ahead of the capacity of vectors and the parasite to adapt to control pressures. Since present programs are heavily dependent on insecticides and drugs, there is a major requirement for applied and developmental research and field trials.

Of equal and perhaps more importance in the long term is research on new control methodology. There are clear requirements for research at all levels, from basic research to field assessment of new approaches to improve control efforts.

Research areas which are directly relevant to control programs include field assessment and demonstration, applied/developmental research and goal- or problem-oriented basic research.

2. Field Assessments (Technical Constraints). Field assessment, pilot projects and demonstration are clearly the responsibility of the Ministry of Health, or other entity supporting operational programs, and indeed are an essential intrinsic part of an operational program. Field research would include, but would not be limited to, efforts to overcome technical constraints.

Examples include:

- a. Studies of ecologic changes relating to malaria resulting from development projects -- dams, irrigation schemes, resettlement, etc.
- b. Assessment of the effects of various anti-malaria measures through relatively small-scale field experiments, using insecticides, larvicides, larvivorous fish or other biological controls, drugs, etc. either singly or

in combination, and with different methods of application and timing.

- c. Ecological studies on the change in the malaria situation that may be brought about through feasible, non-detrimental modification of the environment, and the costs of environmental modification by various techniques.

All such studies require base-line data from which to measure the changing pattern of the disease under the impact of intervention measures; should be conducted over periods of time sufficiently long to include all expected seasonal variations; and should record the habits and attitudes of the study population (not to mention migration) which might affect the malaria situation.

3. Field Assessments (Human Constraints). The WHO Expert Committee on Malaria, in its Seventeenth Report(1) listed a series of research areas requiring attention. Few of these areas express concern with present or prospective technical constraints to a successful anti-malaria effort; most deal with what may be termed human constraints.

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(1) Technical Report Series 640, WHO/Geneva 1979, op.cit.

The Expert Committee list includes the following:

- a. With respect to tactical variant 1 there is need to develop methods of implementing primary antimalaria measures in rural communities affected by the disease and not adequately covered by a health infrastructure. This type of field research should include sociological and demographic studies, examination of logistic problems, development of health education, and techniques of evaluation.
- b. With respect to the other tactical variants, applied research should be oriented towards surmounting problems encountered in the field and should include studies on:
  - 1) methods of encouraging communities to accept the prescribed antimalaria measures and to participate in applying them;
  - 2) the assessment of morbidity and mortality in those areas where the data are at present poorly collected;
  - 3) the extension of vector resistance to insecticides, and prediction of the time when the applied insecticide must be replaced by an alternative compound;
  - 4) the rational use of insecticides in control programs.

- 5) the cost-benefit and cost-effectiveness of control programmes under various ecological and socioeconomic conditions; and
- 6) finding the most effective communications system to support the program.

The final topic identified by the Expert Committee, drug resistance in P. falciparum, is dealt with in more detail in Section VI.E., below. It is apparent that such studies require personnel who are trained in research methodology. The establishment of regional field training and research centers is regarded as the best approach to training workers in that area.

4. Stratification. The identification in one country of the measure or combination of measures which is proved to be successful in a particular malariogenic situation (climate, vector, parasite, endemecity, degree of afforestation, land-use, etc.) may prove to have broader application. Even within a single country, different malariological situations will call for differing responses, but the proven patterns of response may prove applicable to similar situations in the country. They may also prove applicable in similar situations in other countries. A sharing of research results may be beneficial to all. The "strategy" is to adapt proven techniques of activity

and operation to a particular country (or area within a country) and to the resources available.

5. Developmental and Basic Research. In the area of basic research, the responsibilities of the Central Malaria Service in each country are less clear, and careful selection of activities warranting support and coordination with other agencies is essential. It is appropriate for external sources of assistance to support applied research in areas where a direct impact on control is obvious (e.g., vector biology), where the capacity to conduct such research exists, and where no parallel research effort is being or has been carried out. Support of such research through international organizations and through bilateral sources of assistance is appropriate.

The long-term support of basic research by WHO's TDR and by AID is of great value, and should be continued.

- a. Drug Resistance. One area of research which drew the repeated attention of the Strategy Advisory Group, and particularly of its African members, deals with the problem of drug resistance of P. falciparum. Already a severe problem in Southeast Asia and the Western Pacific, and now reported (if not conclusively demonstrated) in East Africa, drug resistance can

be expected to increase both in geographic distribution and spectrum of drug resistance.

Several factors related to present and planned control programs will tend to exacerbate the existing problem. Since control will not be complete, treatment of cases will put continuous drug pressure on the parasite. Further, in many if not most parts of Africa chemoprophylaxis and/or chemotherapy may be the sole method employed to control malaria, with resultant long-term continuous drug pressure on a parasite which is highly adaptable and capable of developing drug resistance. Drug usage resulting from private purchase and government distribution has greatly increased in the past decade and will continue to increase, especially where control programs receive outside support.

In addition to the resistance problems, all existing drugs have deficiencies; many are unacceptable for long-term prophylaxis because of side effects; other stimulate gametocytemia or have other undesirable effects.

For the foregoing reasons, a major continued effort in drug development research is essential.

## Conclusions and Recommendations

1. Field (operational) research is a valid and essential part of any anti-malaria program. Its purpose is to solve problems, to make better use of available means, or to improve available means of dealing with a problem.

Recommendation: Operational research should be considered for external support. It may be the course of action through which a program is formulated or its efficacy demonstrated.

Recommendation: External support should be considered appropriate for applied research by African institutions in areas where:

- a. A direct impact on malaria control is obvious (e.g., vector biology).
- b. Capacity exists to conduct such research.
- c. No parallel research effort is being carried out.

2. Goal- or problem-oriented basic research is equally important to the long-term success of anti-malaria efforts, but is less clearly the responsibility of country-level research.

Recommendation: In view of the fact that chemoprophylaxis and chemotherapy may be the sole methods employed to control malaria in many or most parts of Africa, and that chloroquine-resistant P.falciparum, already a severe problem in Asia, has been reported in East Africa, basic research in drug development is critically important to malaria control in Africa and other parts of the world.

The development of new anti-malarial drugs should be a primary focus of research, under the aegis of WHO's Tropical Disease Research ((TDR) and of AID-supported research as well.

3. With few exceptions, the countries of Africa lack the facilities and the training essential to basic research. The development of such capacity is a long-range matter.

Recommendation: Priority on the part of external donors should be given to immediate needs.

Comment: A vigorous minority of the Strategy Advisory Group insisted that if Africa is to stand on its own feet, it needs basic research capacity, as well as the capacity for operational and applied research. External support of facilities construction, equipment and, especially, long-term training was strongly urged.

#### F. Small-Scale Projects

A topic which did not in itself appear to warrant major attention emerged as possessing particular significance for several African members of the Strategy Advisory Group. There appeared to be a strong and in fact unalterable opposition to the concept of "pilot projects". The opposition traced to a number of considerations, among which the following stood out:

1. The "Showplace" Image. Past pilot projects appear to have represented an ideal situation, which for reasons of cost or inability to provide technical and managerial personnel could not be replicated.
2. The "Short-term" Character. Past pilot projects (and, in addition, demonstrations and field trials) have been of too short a duration to provide any permanent effect. Termination of the project results in prompt recrudescence of malaria -- for which the national government is criticized.
3. The Established Solution. The reverse of "showplace" criticism is the determination that the pilot project can be replicated -- without taking into consideration the conditions under which it was initially successful, and which may not exist elsewhere.
4. The "Focus for Expansion" Concept. To the proposal that successful pilot activities be used as a basis --

suitably modified as dictated by conditions in other areas -- for subsequent geographical expansion, some African members of the Strategy Advisory Group noted the political problems caused by the selection of a specific site for initiating a malaria control effort -- and the consequent non-selection of others. They preferred to start with a program geographically widespread if relatively modest in its initial goals, the subsequent expansion of effort to be qualitative. Over time, they felt, the sights could be raised.

Within such a framework, there would be room for operational field trials or, as requested by individual countries, small-scale projects, to establish the applicability of intervention methods which would enable the achievement of qualitative improvement.

Acknowledging the force of the internal pressures which led to these views -- and, in particular, the desire for broad initial geographic application of a malaria control effort, Strategy Advisory Group consensus was that acceptance of such a position would require a very large initial training effort, at every level in the hierarchy, before a national anti-malaria effort could be mounted. Further, the logistic support of an "all at once" national effort would require the establishment of a "port-of-entry to periphery" trans-

port system and supply line which would extend to every part of the country before the program could be started.

The majority view of the Strategy Advisory Group was that it was preferable to work within the limits of the possible. Financing, administrative capacity and the enormous diversity of malariological situations faced -- taken in conjunction with the rudimentary or merely prospective primary health care structures in many African countries -- constituted constraints to the "all-at-once" approach. The majority concurred, however, that Tactical Variant 1 -- reduction in malaria-caused mortality through chemotherapy -- should be extended as broadly and as quickly as possible. Achievement of even this minimum goal, requiring no diagnostic training (since the curative drug would be administered to all suspected malaria cases -- interpreted as fever cases), would represent an enormous step forward to the goal of "Health for All by the Year 2000".

### Conclusion

1. The establishment of priorities with respect to program content, size, geographic coverage, all in relation to goals sought, is a country responsibility. The decision to support the country program is a donor responsibility.

## G. Evaluation

Section VI.A. Prerequisites for Assistance, below, details a number of the criteria which have, over time, governed the consideration of many sources of external assistance -- AID included -- to country malaria programs. A key criterion is the condition that the country's malaria control plan should prescribe a process of continuous internal but also recurring external program evaluation.

1. Continuous Evaluation. The malaria situation in a country -- or in an area -- may vary over time. In view of this fact, evaluation must be a permanent feature of any malaria control program so that the program can be revised quickly to meet changing conditions. Planning, implementation, evaluation and replanning must be a continuous exercise and an integral part of any anti-malaria program.

Evaluation methods and the kinds of data to be collected must be strictly related to the activities, expected outputs and goals of the program. For example, when aiming at a reduction of mortality, or mortality and morbidity, or even illness duration, it would be irrelevant to spend time in assessing changes in malaria prevalence; it would be useful, however, to study hospital and dispensary records and death registrations, or to evaluate the effects of the anti-malaria measures on school attendance or on agricultural production.

The WHO Expert Committee on Malaria in its Seventeenth Report,<sup>(1)</sup> taking into account the characteristics of the disease and the expected returns from its control, listed the variables of continuous evaluation as follows:

- those related to the technical and operational assessment of the program, e.g., malariometric and entomological indices, specific morbidity and mortality rates, population coverage, and cost-effectiveness ratios;
- those related to the general health situation, e.g., effects of the program on general incidence of sickness indices, life expectation at birth, abortion rates, specific morbidity and mortality rates of other diseases directly or indirectly affected by malaria infection, bed occupancy in hospitals, and health service costs; and
- those related to socioeconomic factors, e.g., effects of the program on national income, industrial and (particularly) agricultural productivity, school absenteeism or scholastic results, labor force output, commerce and tourism, and existing development plans.

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(1) Technical Report Series 640, WHO/Geneva 1979, op.cit.

a. Operational and epidemiological criteria

1) The indicators that may be used in the operational assessment of Tactical Variant No.1 are:

the number and distribution of drug centers (as a percentage of the number anticipated at the planning level) and the number of people collecting anti-malarial drugs from these centers;

availability of the necessary quantities of appropriate anti-malarial drugs at the drug distribution centers, knowledge of the drug distributors' skill in compiling statistical data; and

capability of the health personnel in diagnosing malaria and managing the treatment of malaria cases.

The epidemiological assessment indicators of this tactical variant are:

reduction in mortality rates;

proportion of severe malaria cases among all fever cases recorded by the health institutions;

number of deaths due to malaria; and

number of laboratory-confirmed malaria cases.

2) The operational assessment indicators used for Tactical Variant No. 2 are the same as those used for No. 1. The epidemiological assessment of this variant can be made using the following indicators:

- six-monthly spleen and parasite indices; case detection expressed as malaria incidence rate;
- parasite density index; reduction in absenteeism from work and school; and
- reduction in infant mortality rates.

3) For Tactical Variant No. 3, the operational assessment indicators are:

- indices showing larval and adult vector densities;
- proportion of vector breeding sites effectively covered by larvicide application; and
- proportion of vector resting sites treated with residual insecticides.

The epidemiological assessment indicators of Variant No. 3 include those listed for variant No. 2 and in addition the following indicators:

- selective periodic Anopheles density indices (assessment of man-vector contact);
- indoor vector mortality; and
- vector susceptibility rates.

4) For Variant No. 4, the assessment should be carried out on the basis of malaria eradication procedures.

2. Recurring External Evaluation. Regular reviews, normally biennial, of the operation of every malaria project should be provided for at the very outset of the program. These reviews should be conducted by teams consisting of experts in the malaria field, selected from the professional communities of the cooperating country, WHO and outside expertise, including AID and other U.S. agencies. Provision for such external situation analysis appraisals should be made in any agreement governing external assistance; such provision is routinely incorporated into all agreements for support of malaria control to which AID is a party.

There is, it is believed, no other field in which there exists a comparable system of systematic, continuous, dispassionate, expert, international appraisal of the results achieved, problems faced and improvements required, conducted for all countries maintaining a program in the

field which deals with a problem common to all. The evaluation of world-wide malaria programs is unique.

#### Conclusions and Recommendations

1. A well-conceived malaria control plan should prescribe a process of continuous internal but also recurring external program evaluation.

Recommendation: External donors should consider as a key criterion of a decision to support an anti-malaria program the incorporation into the plan of a prescribed process of continuous internal and recurring external program evaluation.

2. Apart from considerations of external support, evaluation -- and feedback to replanning -- is critical to program success.

## VII. Mechanisms of Cooperation

### A. Prerequisites for Assistance

#### 1. For Donors: Criteria of Assistance

a. Broad Policy. As a general policy, external sources of assistance limit their financial support, in the field of health as in other fields, to those countries where a health problem constitutes a major barrier to overall socio-economic development or a deterrent to specific development programs. The nature of malaria throughout tropical Africa quite apparently falls into this category -- provided that donor nations may be assured that the assisted country's strategy of anti-malarial effort to be mounted is sound, that the program of attack is well-planned and technically feasible, and that there is a demonstrated national will to support the project for as long as may be required -- usually well beyond the period of external assistance. (1)

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(1) In their preconditions before extending assistance, donor nations may be expected to follow the five-point set of principles enunciated by the World Health Assembly as guides to anti-malaria activity:

1. National will to deal with the problems of malaria must be demonstrated -- as evidenced by a government commitment to long-term support of the activity.
2. Malaria control should be incorporated into the country's health development plan.
3. Community participation should be an explicit element in implementation plans; community participation in planning should be incorporated to the extent possible.
4. Any activity undertaken must be feasible.
5. Whatever external cooperation and support may be available, there must be the capacity for national continuation as long as may be required.

b. Planning Requirements. External donors -- AID included -- will normally insist that as a pre-condition for consideration of assistance, the country requesting assistance should demonstrate its own interest and concern through the development of an appropriate plan -- in this case, to control malaria -- and the provision of an adequate budget and staff to carry out the country program.

The anti-malaria plan should be technically, administratively and financially sound, as determined by the donor after review of the recommendations of a joint WHO and country evaluation team.

Such a plan may well be beyond the capacity of a number of countries to prepare unaided; it will normally be possible for the country to seek and secure WHO assistance in formulating its program. Since WHO is not a source of financial assistance, plan preparation should also be an appropriate subject for bilateral assistance in those cases which may require financing -- e.g., small-scale projects to demonstrate the feasibility of an approach, or assistance in training manpower, essential for the very initiation of a program, as well as for the preparation of a suitable plan.

At a minimum, a plan proposal for external support should describe:

(1) The broad strategy to be adopted - normally, one or more of the four tactical variants as defined by WHO, and not necessarily applied uniformly throughout the country. Such a plan would distinguish the attack measure(s) to be applied in rural areas from those to be employed in urban or peri-urban areas, and would identify special situations requiring a different strategy.

The plan should look forward to performance beyond the period of external assistance and describe measures to be taken at that time.

(2) The organization(s) through which the plan is to be implemented, including staffing requirements.

(3) The nature of and provision for meeting national training and applied research requirements. (It should be noted, however, that both training and essential applied research constitute appropriate subjects of external assistance.)

(4) The extent of national budgetary support for the life of the project (here defined as the period of external assistance, but clearly extending beyond such assistance for any but time-limited efforts). Note that national budgetary support

will not necessarily be limited to the line-item malaria budget within the overall budget of the Ministry of Health. Many other elements may and usually will play a role in the anti-malaria effort. The role of these elements should not, however, be considered to be cost-free; they should be identified and their contribution to the malaria effort quantified. Resource mobilization includes the inputs of all elements within the country which play a planned part in the program -- including inputs of voluntary groups within the country. One of the judgment factors which any donor will consider is the extent of internal resource mobilization.

(5) Foreign financing and (as may be essential) staffing requirements for the life of the project

(6) Provision for regular, continuous and recurring external program evaluation.

c. Support of Plan Preparation. One of the first actions which an external donor might appropriately undertake (in most cases, jointly with WHO) in any country which requests support of its anti-malaria effort is to provide assistance to the country in

getting its long-range plans in order -- in part because a feasible and supportable plan is essential to the realization of a multi-donor effort.

d. Appropriate Forms of Support. Ideally, the external donor should not restrict itself to a particular input or class of inputs. (This is especially applicable to AID, which over its history has demonstrated commendable ability and willingness to provide those kinds of support which, taken together with the inputs of other donors and of the recipient country, are necessary to make possible the successful implementation of the approved plan.) Such inputs may include commodity support, funding of training and research when essential to program success, and cooperation with WHO in recurring evaluation of malaria programs. In some cases, it may be desirable to provide direct technical assistance, although for the most part, bilateral donors will rely on WHO to meet the primary needs of the individual country malaria programs for specific scientific advisory services.

Whatever the practices of other donors, it is clear that AID will provide, on a full-time or part-time basis, a technically qualified and experi-

enced representative to each malaria program receiving AID support, to assist in the technical project monitoring aspects of the program and, in those instances where appropriate, in the management of any AID-financed pesticides used in the project. It is a legal obligation of AID to consider possible environmental effects of any proposed project, and particularly projects involving pesticides.

2. For Recipients of External Assistance

While each of the subjects discussed in subsection VII.A.1., above, is of critical interest to any donor nation, it is of even greater importance to the country receiving assistance, since without an adequate response to the questions raised the country can have no prospect of a successful anti-malaria effort.

But if the assisted country has an interest in its own preparations -- including its preparations to mobilize its in-country resources -- it must perforce have an equal interest in the resource commitment of external donors - including but by no means limited to AID. A successful anti-malaria effort is not a short-term activity; and at the same time that a recipient country pledges its resources -- over a multi-year period -- to its anti-malaria program, it is fully justified in requesting a multi-year pledge from its external partner. AID's five-year support --

committed in advance -- to the health program (malaria included) in Zaire suggests AID's ability to respond to the challenge of a long-term commitment of funds.

#### Conclusions and Recommendations

Recommendation: In the absence of a long-term national commitment to a goal-oriented, well-planned, organizationally sound, technically and administratively feasible and costed plan of anti-malaria activity which takes full account of the country's physical and human resources down to the community level, external support is not warranted.

Recommendation: The preparation of such a plan may be beyond the immediate capacity of a number of African countries. Plan preparation, including "feasibility studies" as embodied in small-scale projects to test the applicability of an intervention technique, or assistance in training, warrant support by international (WHO) and by bilateral sources of external assistance.

Recommendation: Within the limits of constraints imposed by the laws, regulations and national interests of donor nations, such nations should provide support in as flexible a form as possible.

Recommendation: A successful anti-malaria effort is not a short-term activity. The Strategy Advisory Group has recommended that external support to an anti-malaria program should be withheld unless the recipient country gives evidence of its national will, as evidenced by its pledge to support the program over a multi-year period. The Group considers that there should be a parallel commitment by the external partner. A pledge of five-year support would be responsive to this need.

B. Cooperation among African Nations

While the assigned task of the Strategy Advisory Group was to reach conclusions on the need for anti-malaria programs in Africa, the kinds of programs which appeared to offer the greatest possibility of success, and the preparations which African countries should make to elicit external support, the Group also attempted to identify ways in which the countries of Africa could be of mutual assistance to each other, which could prove beneficial to a number of countries -- not excluding the external donors themselves.

1. Exchange of Information

At little or no cost, the knowledge available to national malaria services can be multiplied by exchange of experience and information gained by other African countries. This includes but is not limited to results of operational research, train-

ing materials, and successful efforts in stimulating a continuing participation in the malaria program at the primary health care level. Visits by technical staff to other countries will encourage and supplement documentary exchanges.

## 2. Exchange of Complementary Commodities

An effective form of cooperation between countries is mutual assistance in obtaining materials, especially drugs and insecticides. Some African countries are reported to possess equipment for tableting bulk-procured chloroquine; use of such equipment for preparation of chloroquine pills for other African countries could prove to be cost-saving and might also cut the length of the supply pipeline. At a later date, African manufacture of anti-malaria drugs is not beyond the bounds of possibility.

## 3. Training of Personnel

Training of, at a minimum, senior-level personnel on an inter-country basis should be considered as an alternative to overseas training. Such training should, optimally, be organized at different regional centers to avoid problems of language and to locate the training in an environment similar to that of the eventual place of work. There is urgent need to re-establish

African training centers (the former Malaria Eradication Training Centers were converted into Training Centers for Health Service Personnel a decade ago).

Until adequate national training centers are more generally available, it is appropriate to train the critically important intermediate-level personnel in other African countries where effective national training may be more quickly available.

#### 4. Research

Inter-country coordination in the development of field research -- not merely to exchange information on results of accomplished research, but to assure against repeated overlap, duplication and "rediscovery of the wheel".

#### 5. Joint Planning

Joint planning extends beyond border conferences, exchange of information and facilities use to adoption of complementary or even matching programs. These advantages in terms of the economies of scale made possible by joint procurement warrant exploration.

#### 6. Standardization of Supplies and Equipment

Implicit in joint planning is the standardization of supplies and equipment, but joint planning is not a prerequisite of such standardization. In addition to the implicit economies of scale in joint procure-

ment, the possibility of inter-country equipment loans and common-use procurement and maintenance of some of the more expensive elements in the anti-malaria arsenal may offer cost-effective alternatives to country self-sufficiency.

Equally or more important is the need to reach agreement on standards of dosage for both chemotherapy and prophylaxis, on the technical drug product content of the pill, on the desirability of relating drug dosage to body weight and, as possible, on the outside time limits on the effectiveness of a malaria-suppressive dose of chloroquine. Such agreement may not be easy to achieve; different countries in Africa have become habituated to pill sizes introduced by the former colonial powers; nevertheless, such agreement would simplify training and provide additional insurance against either overdosage (wasteful) or underdosage (totally wasteful).

#### 7. Quality Control

There is need for vigilance to protect African nations from receiving faulty equipment and mislabeled supplies. WHO's supervision of the quality of some items is recognized and useful, but does not extend to equipment. Moreover, individual country procurement (including procurement by the private sector) will not always be undertaken in response to WHO guidance; a "bargain price"

may be hard to resist. (Testing of privately imported fansidar, an antimalarial drug of importance in areas where chloroquine-resistant strains of P. falciparum exist, revealed in an Asian country that the "fansidar" was in fact chloroquine.) One or more testing facilities in Africa could be of major benefit to all African countries.

### Conclusions

1. The countries of Africa can be of mutual assistance to each other, and to external donors, through exchange of information, multi-country use of training facilities, and inter-country coordination of operational and field research.
2. The possibility of common-use facilities such as quality control laboratories, drug pelleting equipment and, at a later date, drug production capacity should be explored.
3. Standardization of both the technical product content and the appropriate dosage by body weight of anti-malaria drug preparations can simplify both program administration and training requirements.
4. Joint planning, exchange of expensive equipment, common-use maintenance facilities and combined procurement may make for future efficiency and economies.

### C. International Cooperation

The Strategy Advisory Group undertook to make at least an initial assessment of the various sources from which support for appropriately planned African anti-malaria efforts might reasonably be sought. It is apparent that willingness to support such efforts will be a function of a well-planned, technically and administratively feasible and fully country-supported proposal -- in addition to such other considerations as the donors' financial or technical capacity, political motivation, interest in Africa or purely commercial interest.

In addition to bilateral assistance (from a single country or from a consortium) there are a number of international funding agencies which either have a past history of interest in anti-malaria programs or are now expressing the possibility of interest in supporting activities intimately related to the problems of malaria.

WHO has played and will continue to play a key role, not only in providing both training and technical expertise and guidance, but also in coordination of research efforts and possible external donor resource identification.

In the final analysis, however, donor resource mobilization is the responsibility of national governments, which must negotiate with potential donors for such resources on the basis of mutually acceptable plans of action.

1. Bilateral Assistance. It is apparent that external assistance may be required in as many as seven areas, although fewer may be required in any particular country:

- a. Training (within the country)
- b. External training
- c. Applied research (including field trials)
- d. Commodities (drugs, insecticides)
- e. Equipment, transportation
- f. Technical assistance (all donors will presumably place primary but not necessarily total reliance on WHO for supplying the bulk of essential technical support)
- g. Facilities construction (regional training centers, if needed)

Support in the form of an untied cash grant is considered an unlikely possibility.

The Strategy Advisory Group identified as potential bilateral sources a number of nations which have supported anti-malaria efforts in the past -- including Belgium, France, Germany, Japan, the Netherlands, the United Kingdom, the United States and the USSR (training). To these should be added all TDR contributors and all donors to WHO's Malaria Special Account.

Bilateral sources which have supported related efforts

in the health field include Canada, Denmark, Finland, Norway and Sweden, and, more recently, some of the OPEC countries.

Other potential sources of support are nations with previous presence in Africa or with known interest in Africa, countries with human resource potential and, as noted in Section VII.B., above, other African countries.

2. Consortium Approach. To the extent possible, the Strategy Advisory Group considered it preferable to combine the several kinds of assistance to a malaria control program which may be available from different sources (at the recipient country's request) in support of a well-planned and evaluated plan of attack on malaria, at a level of activity which the recipient country may be expected to be able to maintain.

In this connection, the Group took note of a relatively recent example of such financing. On its own initiative, but with AID and WHO assistance, Sri Lanka prepared a five-year anti-malaria program, which was considered, on the basis of an internationally staffed in-depth review, to be technically, administratively and economically sound. The Sri Lanka Government approved in principle a five-year budget for the project, assigned malaria control its top priority for external assistance, and then sought assistance from a number of the governments

of the countries which have resident diplomatic representatives in Sri Lanka. Three governments -- the United States, the United Kingdom and the Netherlands -- responded favorably.

Such a course of action is possible in other countries, although it is conceded that Sri Lanka possesses a technical and administrative infrastructure which can be matched by few African countries.

3. International Funding Agencies. The past use of international funding agencies (such as the World Bank) as coordinating mechanisms for consortium-financed development projects led to a consideration of their playing such a role for malaria programs. Reservations were expressed by members of the Strategy Advisory Group, since many potential donors are not members of such possible coordination mechanisms. The role is, quite clearly, appropriate to WHO.

The international funding agencies can nevertheless play an important role in the anti-malaria efforts of African countries.

a. African Development Bank (ADB). ADB is financing several health projects in a number of African countries, in the main through its subsidiary agency, the African Development Fund, which is empowered to make soft loans. Working in collaboration

with WHO, the ADB is preparing a health policy and strategy; priority will be given to support of Primary Health Care. ADB financing takes the form of loans to cover, in the main, the foreign exchange costs of the building or infrastructure components of projects.

Since many bilateral donors prefer to supply services (in training or technology) and supplies and equipment which they produce, a fruitful collaboration appears readily possible.

ADB is not at this time supporting malaria control as such, but ADB participation could include the following kinds of input:

- 1) Indirect contributions. Examples include
  - (a) Financing for research programs
  - (b) Financing national or regional quality control laboratories
  - (c) Financing national or regional pharmaceutical industries. With local production, prices might be better controlled and distribution be made more efficient for anti-malaria drugs.
- 2) Direct contributions. Examples include:
  - (a) Agricultural or rural development projects, in which the health component, including malaria, is investigated and may become part of the project. The

financing of the health component may in some cases be the responsibility of another agency, but it will at a minimum be taken into consideration.

(b) The African Development Fund is already involved in bilharzia-control programs and the extended program of immunization (EPI). ADF financing of a specific program of malaria control has not yet been requested; it might be particularly appropriate for certain urban programs which could pose funding difficulties for bilateral donors.

b. The World Bank (IBRD). IBRD is reported to be ready to take direct interest in projects involving tropical diseases. An example of collateral interest arose in IBRD insistence on a major malaria control effort in the outer islands of Indonesia as a precondition for IBRD financing of a major population relocation effort.

c. UNICEF. Formerly a financial supporter of anti-malaria programs, UNICEF has in recent years withheld support of single-disease efforts. UNICEF has indicated willingness to support the development of health services through primary health care, to which anti-malaria programs in

rural Africa will be directly related. UNICEF participation is a distinct possibility which must be explored.

d. UNDP -- which has supported malaria activity in relation to development projects.

e. UNEP -- which can support research.

4. Role of WHO. The WHO Expert Committee on Malaria, in its Seventeenth Report<sup>(1)</sup> identifies a wide range of coordinating functions of WHO; among the more significant are:

a. Program Planning -- a national responsibility for which WHO may provide external assistance on request.

b. Provision of Technical, Administrative and Program Guidelines

c. Mobilization of Multisectoral Support for Malaria Programs. Internally, such mobilization is a national responsibility. WHO is responsible for developing multisectoral support interregionally; cooperation is required from international organizations directly engaged in economic development programs -- UNDP, IBRD, OECD, ADB, and others -- as well as sources of bilateral assistance.

<sup>(1)</sup> Technical Report Series 640, WHO/Geneva 1979, op.cit.

- d. Dissemination of Information. WHO provides a world-wide system of reporting on malaria incidence in individual countries and regions.
- e. Epidemiological Surveillance. Collection and coordination of information on inter-country migration and the spread of drug resistant parasites.
- f. Technical Cooperation. WHO has a particular concern with the mobilization and provision of appropriate malaria technical expertise at the interregional and regional levels. Subject to country request, WHO has a major role in providing technical advisory services in support of national programs -- a role which on occasion requires the participation of bilateral sources of assistance.
- g. Multidonor Resources. Major responsibility for donor resource coordination was assigned to WHO by the World Health Assembly as early as 1955, and was reiterated in 1978. WHO may indeed assist in serving as "honest broker" on behalf of member states soliciting assistance; ultimately, however, donor resource mobilization remains the responsibility of national governments.

- h. Training. The need for reorientation of training focus toward control rather than eradication of malaria places a heavy burden on WHO to prepare training guidelines, to sponsor senior professional training, and to develop regionally-oriented common training.
- i. Research. In addition to the need for the active participation of WHO (and of bilateral sources of assistance) in basic and applied research, the coordination of malaria research and the monitoring of new technological development is a primary WHO function.

#### Conclusions and Recommendations

1. While a broad range of nations and international organizations have shown themselves willing to support anti-malaria programs (and related activities in the health field), no multinational pre-commitment to the support of such efforts, world-wide or in Africa, exists at this time. WHO has a major responsibility for donor resource coordination and is studying alternatives for mobilization of multidonor resources.
2. Nevertheless, donor resource mobilization is the responsibility of national governments, which

must negotiate for such resources on the basis of mutually acceptable plans of action.

3. Donor nations will normally supply assistance in a form which utilizes the technological, scientific and material resources which they have a comparative advantage in providing.
4. International funding agencies have the capacity for and are showing an interest in financing the kinds of inputs -- brick-and-mortar, infrastructure, etc. -- which most bilateral donors prefer to avoid.

Recommendation: Complementary association of bilateral donors and international funding agencies should be explored in relation to anti-malaria activities.

Recommendation: Conversely, the health component of development projects financed by international funding agencies should be examined; where attention is inadequate, or where the health component is not included in coverage provided by the international funding agency, it may be an appropriate focus for complementary association with a source of bilateral assistance.

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STUDY GROUPS AND COMMITTEES (Washington Workshop)

Study Group I: Identification of techniques and approaches suitable for use in anti-malaria programs in sub-Saharan Africa.

Membership: Drs. Noguer (Chairman), Buck, Jeffrey, Kilama, Newton, Pant, Ware

Study Group II: Resources available within African countries for reducing the incidence and prevalence of malaria, from the standpoints of technology, manpower, organizational structure, materials and funds.

Membership: Drs. Dennis (Chairman), Hogan, Jarmon, Gelfand, Graham, Malan, Chung Tung

Study Group III: External resources available for providing support to malaria activities in sub-Saharan Africa, including multilateral organizations; bilateral (governments other than the United States); non-governmental; and the United States Government.

Membership: Drs. Leger (Chairman), Kaiser; Messrs. Farwell, Schliessmann, Smith

Scope of Work Committee: Scope of work of the field teams

Membership: Drs. Jeffrey (Chairman), Jarmon, Kilama, Noguer

Composition of and Countries Visited by Field Teams (Phase 2)  
(The field teams also participated in the Washington Workshop.)

French Language Team:

| <u>Name</u>  | <u>Specialty</u>             |
|--|------------------------------|
| 1. Richard L. Buck, M.D.,M.P.H.<br>School of Public Health<br>Yale University<br>New Haven, Conn. 06511  | Epidemiologist/Malariologist |
| 2. Pierre Leger, M.S.S.E., Dip.S.E.<br>Director, International Division<br>Medical Care Development, Inc.<br>3000 Connecticut Avenue, N.W. (Suite 138)<br>Washington, D.C. 20008 | Environmental Engineer       |
| 3. Roy Mark Malan, M.D., D.P.H., D.I.H.<br>10 Park Avenue<br>New York, N.Y. 10016  | Public Health Physician      |
| 4. Robert T. Taylor, Ph.D. (Team Leader)<br>Bureau of Tropical Diseases<br>Center for Disease Control<br>1600 Clifton Road N.E.<br>Atlanta, Georgia 30333                        | Entomologist                 |

Representative countries visited: Congo, Senegal, Togo, Zaïre

English Language Team:

|   |                         |
|---|-------------------------|
| 1. Henry M. Gelfand, M.D., M.P.H.<br>School of Public Health<br>University of Illinois (P.O. Box 6998)<br>Chicago, Ill. 60680               | Public Health Physician |
| 2. Donald J. Pletsch, Ph.D.<br>Apartado Postal 20-688<br>Mexico 20 D.F.<br>Medico   | Entomologist            |
| 3. Donald J. Schliessmann, M.S.<br>707 Bay Cliff Road<br>Gulf Breeze, Florida 32561   | Sanitary Engineer       |
| 4. Martin D. Young, D.Sc. (Team Leader)<br>College of Veterinary Medicine<br>University of Florida (Box 5136)<br>Gainesville, Florida 32610 | Malariologist           |

Representative countries visited: Kenya, Sierra Leone, Sudan, Tanzania

PARTICIPANTS IN PHASE III (Abidjan Workshop)

Workshop Staff

|                         |   |
|-------------------------|---|
| Workshop Chairman       | Thomas W. Georges, Jr., M.D., M.P.H.<br>Principal Public Health Advisor<br>Office of Development Resources<br>Bureau for Africa/AID   |
| Workshop Co-Chairman    | Edgar A. Smith, B.A.<br>Chief Malaria Section<br>Office of Health<br>Bureau of Development Support/AID                                |
| Rapporteur              | Albert E. Farwell, M.A.<br>Health Economist<br>Alphi Associates   |
| Project Monitor         | Joseph Stockard, M.D.<br>Tropical Disease Specialist<br>Health and Nutrition Division<br>Bureau for Africa                            |
| Project Director        | Herbert T. Dalmat, Ph.D.<br>Tropical Diseases Program Director<br>International Health Programs<br>American Public Health Association |
| Project Manager         | John C. Eason, Jr., M.S.<br>Tropical Diseases Program Manager<br>International Health Programs<br>American Public Health Association  |
| REDSO/WA Representative | Isaiah Jackson, M.D.<br>Public Health Advisor<br>REDSO/WA<br>Agency for International Development<br>Abidjan, Ivory Coast             |

ABIDJAN WORKSHOPInvited Workshop Participants

| <u>Name</u>   | <u>Specialty</u>  |
|---|---|
| Dr. Edwin G. Beausoleil<br>Director of Medical Services<br>Ministry of Health<br>Government of Ghana<br>Accra, Ghana                            | Malariologist/Administrator<br><br>(Note: Unable to attend) |
| Richard L. Buck, M.D., M.P.H.<br>School of Public Health<br>Yale University<br>New Haven, Conn. 06510   | Epidemiologist/Malariologist                                |
| Emmet Dennis, Ph.D.<br>Director<br>The Liberian Institute for<br>Biomedical Research<br>Box 31<br>Robertsfield, Liberia                         | Parasitologist  |
| Dr. Samba Diallo<br>Chef de Service de Parasitologie<br>Faculty of Medicine and Pharmacy<br>University of Dakar<br>Dakar, Senegal               | Parasitologist<br><br>(Note: Unable to attend)              |
| Dr. O. J. Ekanem<br>Consultant Malariologist<br>Malaria and Vector Control Unit-Yaba<br>Federal Ministry of Health<br>Lagos, Nigeria            | Malariologist   |
| Z. Samuel Gangbo, M.D.<br>Quartier Ayimlonfide<br>Porto Novo<br>Republique Populaire du Bénin   | Public Health Physician                                     |
| Henry M. Gelfand, M.D., M.P.H.<br>School of Public Health<br>University of Illinois (P.O. Box 6998)<br>Chicago, Ill. 60698                      | Public Health Physician                                     |
| Bettie J. Graham, Ph.D.<br>Health Scientist Administrator<br>National Institutes of Health<br>Building 31, Rm. 6A62<br>Bethesda, Maryland 20205 | Health Scientist Administrator                              |

| <u>Name</u>   | <u>Specialty</u>                                     |
|---|--|
| Charles Jarmon, Ph.D.<br>Department of Sociology<br>Howard University<br>Washington, D.C. 20059   | Sociologist  |
| Geoffrey M. Jeffrey, Sc.D.,M.P.H.<br>Bureau of Tropical Diseases<br>Center for Disease Control<br>1600 Clifton Road, N.E.<br>Atlanta, Georgia 30333                                       | Malariologist  |
| Robert L. Kaiser, M.D.<br>Director, Bureau of Tropical Diseases<br>Center for Disease Control<br>1600 Clifton Road, N.E.<br>Atlanta, Georgia 30333  | Tropical Medicine Specialist                         |
| W. L. Kilama, M.D.<br>Professor and Head<br>Department of Parasitology/Entomology<br>Mohimibil Medical Centre<br>P.O. Box 20693<br>University of Dar es Salaam<br>Dar es Salaam, Tanzania | Parasitologist<br><br>(Note: Unable to attend)       |
| Pierre Leger, M.S.S.E., Dip.S:E.<br>Director, International Division<br>Medical Care Development, Inc.<br>3000 Connecticut Avenue, N.W.(Suite 138)<br>Washington, D.C. 20008              | Environmental Engineer                               |
| Roy Mark Malan, M.D.,D.P.H.,D.I.H.<br>10 Park Avenue<br>New York, N.Y. 10015  | Public Health Physician                              |
| Dr. P.I.E. Mossumbuco<br>Primary Health Care Advisor<br>Onchocerciasis Control Program<br>Ouagadougou, Upper Volta  | Health Administrator<br><br>(Note: Unable to attend) |
| Donald J. Pletsch, Ph.D.<br>Apartado Postal 20-688<br>Mexico 20 D.F.<br>Mexico  | Entomologist   |
| Robert T. Taylor, Ph.D.<br>Bureau of Tropical Diseases<br>Center for Disease Control<br>1600 Clifton Road, N.E.<br>Atlanta, Georgia 30333   | Entomologist   |

| <u>Name</u>  | <u>Specialty</u> |
|--|------------------|
| Theresa A. Ware, Ph.D.<br>Africa Studies and Research Center<br>Box 231<br>Howard University<br>Washington, D.C. 20059         | Anthropologist   |
| Martin D. Young, D.Sc.<br>College of Veterinary Medicine<br>University of Florida (Box J-136)<br>Gainesville, Florida 32510    | Malariologist    |
| A. M. Haridi, Ph.D.<br>Chief Entomologist<br>Malaria Control Division<br>Ministry of Health<br>Khartoum P.O. Box 1204<br>Sudan | Malariologist    |

WHO Representatives:

Augusto Noguer, M.D.  
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Representatives from Other Organizations

Pierre Carnevale, D.Sc.  
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People's Republic of Congo

Silvio Berthoud, M.D.  
Epidemiologist  
African Development Bank  
B.P. 1387 Abidjan  
Ivory Coast

INVITED GUESTS AND OBSERVERS

Honorable Nancy V. Rawls  
United States Ambassador to  
Republic of Ivory Coast

Gordon W. Evans  
Director, REDSO/WA  
Agency for International Development  
Abidjan, Ivory Coast

Ms. Rudella Berry  
Health Planner  
U.S. Peace Corps  
Abidjan, Ivory Coast

John Dorman  
Agricultural Economist, REDSO/WA  
Agency for International Development  
Abidjan, Ivory Coast

Ms. Mellen Duffy  
Nutrition Officer, REDSO/WA  
Agency for International Development  
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David French, M.D.  
Director, Strengthening of  
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Harry Godfrey, CDC  
Institut d'Hygiène  
Abidjan, Ivory Coast

N. d'Konan, M.D.  
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Robert Palombo, M.D.  
CHU  
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Hadley Smith, Ph.D.  
Economic Advisor, REDSO/WA  
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Abidjan, Ivory Coast

(cont'd)

Lewis Atayi, M.D.  
Country Representative  
World Health Organization  
Abidjan, Ivory Coast

Professor A. Angate  
University of Abidjan  
Abidjan, Ivory Coast

Professor N'Dri Assale  
Centre Hospitalier Universitaire  
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Mr. C. Diarrascuba  
Rector  
University of Abidjan  
Abidjan, Ivory Coast

Professor B. Yao Rede  
Centre Hospitalier de Treichville  
Abidjan, Ivory Coast

STUDY GROUPS AND COMMITTEES(Abidjan Workshop)

1. Strategy Document Outline Drafting Committee

Mr. A. Farwell Chairman  
Dr. E. Dennis  
Dr. G. Jeffrey  
Dr. A. Noguier  
Mr. E. Smith  
Dr. J. Stockard

REPORTING GROUPS ON TECHNIQUES, APPROACHES AND GOALS

2. (a) Rural Areas

Dr. H. Gelfand Chairman  
Dr. P. Carnevale  
Dr. Z. Gangbo  
Dr. Iha Gueye  
Dr. C. Jarmon  
Dr. R. Malan

(b) Urban and Peri-urban

Dr. D. Pletsch Chairman  
Dr. O. Ekanem  
Dr. R. Giri  
Dr. P. Leger  
Dr. C. Pant  
Dr. M. Young

(c) Special Situations

Dr. R. Taylor Chairman  
Dr. R. Buck  
Dr. R. Chung Tung  
Dr. L. Delfini  
Dr. M. Haribi

Appropriateness of AID Involvement in Anti-Malaria Activity

Should there be AID involvement in ameliorating the impact of a disease which has proved to be so resilient, so resistant to control? Dr. Thomas Georges, Principal Health Advisor of the Bureau for Africa, carefully defined the parameters of the task of the Strategy Advisory Group in his opening remarks to the Washington Workshop:

"AID's mission is to help the people of the developing nations to correct the growing disparity in the quality of life for poor people between the 'rich' and the 'poor' countries. Through both bilateral and multilateral assistance, AID is trying to respond to the problems that poor people, in the world's poorest nations, face every day. But AID's resources are limited, and so to get maximum results AID focuses its efforts on:

- (1) Priority sectors (agriculture, health, education and population;
- (2) The poorer countries (three-fourths of U.S. assistance is to countries with per capita incomes of \$300 or less;
- (3) Projects and activities that reach the poor majority directly;
- (4) Activities that utilize those technological, scientific and material resources the U.S. has a comparative advantage in providing; and
- (5) Projects and activities where the ratio between the overall costs and the benefits to the target group are relatively best."

"Poor health is one of the most important of these problems which poor people must suffer. Reduced well-being is one of the major negative effects of poor health, but others include reduced productivity and a heightened susceptibility to other diseases. These result in still further deterioration of health and productivity. In the countries of Africa

"malaria is a major factor in poor health. Anti-malaria programs which are properly planned and well administered can meet each of the criteria suggested by the five foci of AID assistance. .... The criteria form a set of necessary conditions for AID assistance under the Agency's current policies, and examination of each of them in turn provides a strong case for involvement in anti-malaria activities.

"Health is one of the four priority areas of AID involvement. The spill-over or interaction upon other priority areas is substantial and widely recognized. It is sufficient here to note the commonly accepted correlation between better health and better performance in education. The relationship to the AID priority area of agriculture arises because productivity in agriculture, which with its related industries employs a majority of the work force in the less developed countries and provides the bulk of their incomes, is strongly affected by health. Malaria ... is a major factor in the lives of many of these farmers, to such an extent that in many countries it is fatalistically accepted as an unalterable fact of life. This has the paradoxical result that the perceived or felt need for the alleviation of this major scourge is reduced or, in some instances, practically non-existent. But, despite this lack of perception, the impact of malaria and other vector-borne diseases upon the well-being of this major target group is great.

"If this workshop agrees that there should be AID involvement in anti-malaria activities, then other questions remain to be answered:

- o What should be the goal of AID assistance? Eradication or control?
- o What should be the criteria for AID assistance in anti-malaria activities?

- o What techniques and approaches are suitable for use in anti-malaria activities in Africa?
- o What resources are available within African countries for coping with the malaria problem?
- o What external resources are required to develop effective anti-malaria programs in African countries?
- o What future steps are necessary for the development of effective anti-malaria programs in African countries?
- o What assistance strategy should AID formulate in support of anti-malaria activities?

"Faced with these kinds of questions, AID has asked you, as leading experts on malaria and related subjects, to meet in a workshop setting, consider and discuss among yourselves the current status of malaria in Africa, the past history of malaria control efforts, pilot projects and approaches attempted, the implementation status of the 1977 WHO African Malaria Strategy, the impact of social, cultural and political factors on anti-malarial activities, and the anti-malaria assistance options that are open to AID.

"When this body has considered the material and the issues, a determination can be made of what additional information is necessary. We are prepared to have two field study teams visit selected African nations to collect additional information which you deem necessary. WHO has stated that it will augment our study teams with WHO experts.

"It is planned that this workshop shall convene again in March of 1980 on the continent of Africa to discuss the additional material provided by the field teams and to address the questions necessary to the formulation of an anti-malaria strategy recommendation.

"AID appreciates the immensity of the problem presented by malaria in many African countries, and recognizes that significant resolution of the problem will require resources beyond the capability of many nations, and beyond the capacity of the assistance program of any single nation.

"Nevertheless, we are guided by World Health Assembly Resolution WHA 32.35, in which the Member States are urged:

"(1) to establish technical cooperation for the urgent development of realistic antimalaria activities in the spirit of Resolutions WHA 31.41 and EB 63.R31 on technical cooperation among developing countries and based on technical guidelines developed by the World Health Organization's Malaria Action Programme;

"(2) to intensify coordination with WHO and other international, bilateral and voluntary agencies in the mobilization of the necessary resources in support of antimalarial activities, including the production of antimalaria drugs and insecticides in countries in need of such supplies;

"(3) to intensify cooperation and collaboration with WHO and other cooperating agencies as appropriate."

"We, in AID, recognize that you, as a workshop of experts, could give us advice over a spectrum of assistance options ranging from 'do nothing' to 'support malaria eradication'.

"We hope and expect that whatever anti-malaria assistance strategy we may undertake will be based upon your professional consideration of all available and appropriate knowledge.

"It is essential to us that our assistance strategy be supportive of the World Health Organization efforts against malaria, and that our strategy provide a constructive response to the initiatives and needs of national governments."

SCOPE OF WORK OF FIELD TEAMS

Report of Scope of Work Committee

On behalf of his colleagues, Drs. Jarmon, Kilama and Noguera, Dr. Jeffrey proposed that the scope of work of the field teams should include efforts to acquire information on the following subjects:

1. Epidemiologic information on national health problems, e.g.,
  - Morbidity and mortality statistics
  - Ten main causes of morbidity and mortality and the rank of malaria
  - Methods of collecting health statistics
2. History of health organizations, particularly malaria control
3. Existing health plan of the country
  - a. Country Health Profile
  - b. Current malaria component in health plan
  - c. Details on national health and malaria control expenditure
4. Current status of malaria control
  - a. Options or variants proposed
  - b. Current sources of external support for malaria programs and other health programs
  - c. Malaria program (or other health program) evaluation procedures in progress, planned or feasible

(cont'd.)

- d. Constraints to progress in malaria control
  - Economic
  - Organizational (administrative)
  - Personnel availability (inventory by area of expertise and perceived needs)
  - Materiel (commodity availability)
  - Technical (e.g., community participation)
5. Feasible Operations or Variants
  - Mortality reduction
  - Mortality and morbidity reduction
  - Reduction of mortality, morbidity and prevalence
  - Eradication
6. Potential involvement of other governmental departments  
e.g., Public Works, Interior, Education, Agriculture, etc.
7. Existence of allied resources (universities, etc.)  
(for provision of expertise in engineering, sociology, anthropology, etc.)
8. Current role of sub-national official or quasi-official agencies  
in support of malaria programs (e.g., state, province, municipality, indigenous organizations and structures -- tribal, sultanates, etc.)
9. Social structures common in country for potential community participation
10. Urban situations (principally for prevalence reduction)
  - a. Methods of control used or appropriate
  - b. Inventory of resources
  - c. Perceived needs

(cont'd.)

11. Training facilities and programs
  - Three classes: National (high level professional)
  - Middle level
  - Peripheral level
  - a. Inventory of present facilities
  - b. Needs for additional facilities
  - c. Availability and utilization of intercountry training opportunities
  - d. Opportunities for extra-continental fellowships
12. Existence of national will to initiate and provide sustained support for national programs
13. Possibility of combined disease control programs
  - e.g., maternal-child health; immunization; nutrition; diarrheal disease control, etc.
14. Attitudes and influence of mass media (press, radio, TV, etc.)
15. Perception of extent and seriousness of the malaria problem by affected populations.

AFRICAN RESEARCH INSTITUTES

Dr. Graham's background paper identifies (without evaluation) some 17 African institutes, universities, hospitals, malaria services and other entities considered to have potential capabilities for providing malaria training programs as well as research capacity.

FRENCH

1. Cameroon, Yaounde (1)  
Institut de Recherches Medicales  
et de Plantes Medicinales  
(Scientific staff of 55)
2. Cameroon Yaounde (1)  
Institut de Recherches  
Scientifique du Cameroun  
(Scientific staff of 32)
3. Cameroon, Yaounde (1)  
Organisation de Coordination pour  
la Lutte Contre les Endemies en  
Afrique Centrale  
(This institute has a one-year  
training program for health workers  
in several areas.)
4. Upper Volta, Bobo-Dioulasso  
Centre Muraz  
(Scientific staff of 18)
5. Upper Volta, Bobo-Dioulasso  
Mission Engomologique aupres de  
OCCGE
- (1) Special Programs for Research and  
Training in Tropical Disease  
WHO L/76.46.
1. Nigeria, Ibadan  
Faculty of Medicine  
University College Hospital
2. Nigeria, Lagos  
Federal Malarial Service
3. Nigeria, Zaria  
Ahmadu Bello University  
Department of Medicine  
(Scientific staff of 40)
4. Sudan, Khartoum  
Institute of Research for Tropical  
Medicine (Scientific staff of 15)
5. Sudan, Khartoum  
Malaria Control Service
6. Sudan, Khartoum  
Medical Research Council
7. Sudan, Khartoum  
National Council for Research
8. Sudan, Omdurman  
Hospital for Tropical Diseases (run  
jointly by the Ministry of Health and  
the National Council for Research)
9. Tanzania, Amani  
East African Institute for Malaria  
and Vector-Borne Diseases  
(Scientific staff of 9)
10. Tanzania, Arusha  
East African Medical Research Council
11. Tanzania Arusha  
East African Tropical Pesticides Re-  
search Institute(Scientific staff of 12)
12. Tanzania, Dar-es-Salaam  
Faculty of Medicine, University of  
Dar-es-Salaam

FIELD TEAM REPORTS

The reports of the field teams, prepared in consonance with the 15-point outline drawn up by the Scope of Work Committee (Annex 3), were reproduced and made available to the members of the Strategy Advisory Group prior to the inception of the Abidjan Workshop.

The reports included the observations and conclusions of two four-man teams, one of which visited French-speaking African countries, the other English-speaking African countries. (Annex 1, page 4)

A. French Language Team Reports cover visits to the following countries:

1. Congo
2. Senegal
3. Togo
4. Zaire

B. English Language Team Reports cover visits to the following countries:

1. Kenya
2. Sierra Leone
3. Sudan
4. Tanzania

The fact that a country was not visited by either of the field teams is not to be considered as having any negative influence over consideration of a potential future request for external support of its anti-malaria program.

The Field Team Reports are incorporated by reference into this document.