Pan American Health Organization

TWENTY-FIRST MEETING OF THE
PAHO ADVISORY COMMITTEE ON MEDICAL RESEARCH

Caracas, Venezuela
29-30 April 1982

REPORT OF THE ADVISORY COMMITTEE ON MEDICAL RESEARCH
WORKING GROUP ON SOCIAL SCIENCE HEALTH RESEARCH

The issue of this document does not constitute formal publication. It should not be reviewed, abstracted or quoted without the agreement of the Pan American Health Organization. Authors alone are responsible for views expressed in signed papers.
Pan American Health Organization

Advisory Committee on Medical Research
XXI Meeting
Caracas, Venezuela, 29-30 April 1982
REPORT OF THE ADVISORY COMMITTEE ON MEDICAL RESEARCH

WORKING GROUP ON SOCIAL SCIENCE HEALTH RESEARCH
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. OVERVIEW AND SUMMARY</td>
<td>1</td>
</tr>
<tr>
<td>2. REVIEW OF WORKING GROUP'S ACTIVITIES</td>
<td>3</td>
</tr>
<tr>
<td>Prior Work</td>
<td>3</td>
</tr>
<tr>
<td>Terms of Reference</td>
<td>4</td>
</tr>
<tr>
<td>Membership</td>
<td>4</td>
</tr>
<tr>
<td>Work Undertaken</td>
<td>5</td>
</tr>
<tr>
<td>Social Science Health Research</td>
<td>5</td>
</tr>
<tr>
<td>Bibliographical Inventory</td>
<td>5</td>
</tr>
<tr>
<td>Perspective of Working Group</td>
<td>6</td>
</tr>
<tr>
<td>3. MALARIA IN THE AMERICAS</td>
<td>6</td>
</tr>
<tr>
<td>Program Implementation</td>
<td>7</td>
</tr>
<tr>
<td>Epidemiological Situation</td>
<td>8</td>
</tr>
<tr>
<td>Next Required Steps</td>
<td>12</td>
</tr>
<tr>
<td>4. SOCIAL SCIENCE RESEARCH</td>
<td>13</td>
</tr>
<tr>
<td>WHO Support</td>
<td>14</td>
</tr>
<tr>
<td>Institutional Support in the Region</td>
<td>16</td>
</tr>
<tr>
<td>Overview of Research</td>
<td>16</td>
</tr>
<tr>
<td>Principles of Research</td>
<td>18</td>
</tr>
<tr>
<td>5. SOCIAL FACTORS IN THE EPIDEMIOLOGY AND THE CONTROL OF MALARIA</td>
<td>21</td>
</tr>
<tr>
<td>Biological Factors</td>
<td>22</td>
</tr>
<tr>
<td>Social Variables Related to Biological Factors</td>
<td>25</td>
</tr>
<tr>
<td>The Social Factors Affecting the Transmission of Malaria</td>
<td>25</td>
</tr>
<tr>
<td>Social Variables Involved in the Control of Malaria</td>
<td>31</td>
</tr>
<tr>
<td>Further Development of Conceptual Framework</td>
<td>37</td>
</tr>
<tr>
<td>6. RESEARCH AND APPLICATION CASE STUDIES</td>
<td>37</td>
</tr>
<tr>
<td>The Dominican Republic</td>
<td>37</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>40</td>
</tr>
<tr>
<td>Guatemala</td>
<td>43</td>
</tr>
</tbody>
</table>
7. CONCLUSIONS

a. A Research Program 50
b. A Multidisciplinary Approach 51
c. Cooperation Among Developing Countries 51
d. The Participation of National and International Institutions 52

8. FURTHER REQUIRED WORK ATTEMPTS 52

1. Further Development of the Conceptual Framework 52
2. Search of Research Literature 52
3. Data Bank of Socioeconomic Variables 52
4. Strengthening Research Capacity 53
5. Stimulation of Emerging Research Interests 53
6. Economic Aspects of Malaria Transmission and Control 54
7. Training of Researchers 55
8. Adaptation of Conceptual Framework to Other Vector Borne Diseases 55
9. Applied Research for Disease Outbreaks 55

9. RECOMMENDATIONS 56

10. TERMINATION OF ASSIGNMENT 60
1. OVERVIEW AND SUMMARY

Acting on the mandate set by the ACMR/PAHO, the Working Group on Social Science Health Research has: (1) completed a Bibliografía Latinoamericana Sobre Ciencias Sociales Aplicadas a Salud which will be circulated to major libraries and Schools of Public Health in the Region; and, (2) prepared a review of social and economic factors affecting the transmission and the control of malaria identifying those which may foster more effective planning and the organization of existing control programs.

The Report of the Working Group summarizes: (1) the current situation relating to malaria in the Region; (2) the present position of social science research in connection to this disease; (3) social and economic factors which affect its transmission and its control presented as a working conceptual framework; (4) the experience of malaria control programs in three nations which illustrate the direct application and the relevance of the principles identified in the conceptual framework; and, (5) the major conclusions and the recommendations of the Working Group.

The Working Group's recommendations dealt with extensively in Chapter 9, could be summarized as follows:

Recommendation 1 - Plan of Action Review Group.

The Working Group recommends that an interdisciplinary group be convened to review its listing of work to be done and to develop a plan of action how these may be realized.

Recommendation 2 - Establishment of a Social Science Malaria Research Program in PAHO

To serve as a coordinating focal point for the type of activities identified in its Report, the Working Group recommends the establishment of a Social Science Malaria Research Program in PAHO. This program would serve to identify these interdisciplinary interests, act to bring such groups together as warranted and provide assistance to research being developed in this field. The work of this program would be complementary to that of the WHO/TDR/SER Committee, one of whose primary mandates is to serve as a research review and funding approval body.

Recommendation 3 - Establishment of a Technical Advisory Group on Social Science and Malaria

In implementing a plan of action and to provide a balanced breadth for its Social Science Malaria Research Program, it is recommended that an interdisciplinary Technical Advisory Group on Social Science and Malaria be established composed of experienced and well trained malarialogists and social scientists. This resource could assist the Organization in the periodic review of these issues, provide counsel on
proposed and ongoing research and serve as a reference source in adapting
the conceptual framework to other vector borne diseases.

Recommendation 4 - Convening a Meeting on Social and Economic Factors
Related to Malaria

There are strong interests in a number of the Member Nations in
the issues involving the social and economic aspects of the transmission
and the control of malaria. It is recommended that the Organization
convene a meeting of these interested programs which would:

1. draw upon the experiences of the Member Nations;
2. review the conceptual framework;
3. review ongoing research projects; and
4. identify priorities for action.

Recommendation 5 - Publication of Summary of Conceptual Framework on
Social and Economic Factors Related to the Epidemiology and the Control
of Malaria

Because the research literature on these matters is limited and as
a means to stimulate consideration and revision of the conceptual
framework, it is recommended that a condensed version of this Report be
published in sources accessible to malariologists and social scientists.

Recommendation 6 - Appointment of Social Scientists to WHO Expert
Committee on Malaria

Because of the significance of social and economic factors
relating to the transmission and the control of malaria, it is
recommended that this perspective be represented by the appointment of a
social scientist to the WHO Expert Committee on Malaria.
2. REVIEW OF WORKING GROUP'S ACTIVITIES

Prior Work

In recent years the Advisory Committee on Medical Research (ACMR) has reviewed the contribution of the social sciences to various branches of health research. At its XVIII Meeting in 1979 the ACMR established a Working Group on Social Science Health Research whose mandate was to undertake a general appraisal of research in the field and to consider the training and the support of these disciplines.

Based upon the review of the Working Group's Report to the XIX Meeting in San José, Costa Rica, the ACMR recommended the continuation of its work including:

a. "Identifying the potential input of the social sciences by means of interdisciplinary subgroups in the fields of diarrheal diseases and malaria; and,

b. To prepare annotated social science health research biobibliographies dealing with specific diseases and health problems."

In conjunction with the 1980 ACMR recommendations, preliminary discussions were held during the ACMR meeting in June 1980.* At that time it was decided to select one disease: (1) whose control was assigned a high priority by the Organization; (2) where efforts would complement the objectives of the TDR/SER programs; and (3) where social and economic factors were known to affect the prevalence and the distribution of the disease and the operation and the planning of existing control programs. It was agreed that the approach would be interdisciplinary and interagency with the general object to develop a conceptual and research framework applicable to a number of infectious and vector borne parasitic diseases. In this context malaria was selected as a case study in the development of an interdisciplinary model of research identifying the social and economic variables affecting: (1) its prevalence and its distribution; (2) its control programs; and, (3) the planning and the organization of services.

During 1980-81 the Working Group held four meetings one of which included visits to malaria programs in México, Nicaragua and the Dominican Republic. Based on its review the Working Group submitted a preliminary report of its activities to the XX Meeting of the ACMR held in Washington, D.C. in June, 1981.*

* XIX ACMR Meeting, San José, Costa Rica, June 1980.
** XX Meeting of the ACMR, Washington, D.C., June 1981.
Terms of Reference

At its Executive Session the XX Meeting, the ACMR recommended that the Working Group continue its work. The Working Group was requested to:

a. "Complete its work on the development of the inventory on social science health research, and specifically, related to social and economic research on malaria.

b. Continue to develop the conceptual and research framework for the research by the social sciences in relation to malaria.

c. Examine the state of field work and epidemiological research being done on malaria."

Following a review of these terms the Working Group concluded that within its timetable it would not be feasible to complete a sufficient and comprehensive review of item (c).

Membership

The interdisciplinary composition of the Working Group includes malarialogists, pediatrics and tropical disease specialization, sociology and social psychology. The Members of the Working Group during 1981-82 were:

Dr. Robin F. Badgley (Chairman)
Department of Behavioral Science
Faculty of Medicine
University of Toronto
Canada

Dr. Jaime Ayalde
Parasitic Diseases and Vector Control
Division of Disease Prevention and Control
Pan American Health Organization

Dr. Jack Elinson
Division of Sociomedical Sciences
Faculty of Medicine
Columbia University
New York, USA.

Dr. Juan César García
Division of Human Resources and Research
Pan American Health Organization
Work Undertaken

During 1981-82 the Working Group held two meetings to consider the social and economic factors affecting the epidemiology and the control of malaria. Two members of the Working Group (Drs. Elinson and García) visited malaria control programs in Nicaragua and the Dominican Republic and two members (Drs. Nájera and López Antuñano), in their joint capacities as PAHO staff officials and members of the Working Group visited, Nicaragua, the Dominican Republic and México.

At its December 1981 meeting the Working Group benefited from the counsel of several PAHO malariologists who endorsed the need to identify and to study further the impact of social and economic variables associated with the distribution and the control of malaria. These experts and their current stations were: Dr. Milton Arnt, Perú; Dr. Julio Guerrero, México; Dr. Alvaro Rueda, Honduras; Dr. Temistocles Sánchez, Colombia; and, Dr. Alvaro Uribe, Brazil.

The discussions of the Working Group were also joined with valuable counsel received from Dr. George Alleyne, Chief of the Health Research Promotion and Coordination Unit (PAHO), Dr. José R. Teruel, Chief, Unit of Fellowships and Research Services (PAHO); and Dr. Brice Walton WHO/TDR, Liaison Officer.

Social Science Health Research Bibliographical Inventory

With the considerable assistance of Dr. C. Gamboa, Chief of Bibliographic Information for PAHO, and Mr. Germán Bravo, Research Associate, a classification of social science listings was developed, the standardization in the listing of references introduced and an itemized annotation of resources was started. This holding now comprises 1674 references relating to social science health research for Latin America. It has been prepared as: Bibliografía Latinoamericana Sobre Ciencias Sociales Aplicadas a Salud.* There have been a number of requests to obtain copies of this research bibliographical inventory from major

* See attached document.
libraries, schools of public health and some interested researchers. This resource should be extended to other centers and work should continue in expanding this inventory as new references become available.

Perspective of Working Group

In its consideration of the social and economic factors influencing the epidemiology and the planning of malaria control programs the Working Group acknowledged that while these had long been recognized there had no comprehensive appraisal of the relative contribution of these social and economic forces. In its review the Working Group sought to develop a conceptual framework within which these social and economic variables could be identified and ordered. The conceptual framework set out here is a provisional cartography of these complex social and economic forces. At this stage of its review the Working Group did not develop a detailed operational research manual setting out precisely how each listed variable was to be measured. This is because the malaria situation varies sharply between countries, and within them, between regions. In the national case study examples cited in this report, some details of how such research can be done are given.

In addition to focusing on social and economic research which may improve the effectiveness of national malaria control programs, the Working Group believes that a cross-national comparative perspective is warranted. Such a step could draw upon the experience of local programs placing these in the context of broader principles. Adapting a comparative approach would enable the development and the testing of clearly set out and replicable research designs which in turn could be tested in one setting and be drawn upon elsewhere. This step would use efficiently scarce research resources and reduce unnecessary duplication of research efforts.

3. MALARIA IN THE AMERICAS

The Greek physicians of the Fifth Century B.C. were familiar with malaria. They established a rational association between malaria and swamps. As the Greek civilization expanded and new communities were established it was recognized that the sites chosen, not only had to satisfy religious and military requirements but, also had to be healthy.

The Hippocratic belief relating the balance between man and his environment was the first known systematic endeavor to present a causal relationship between environmental factors and disease. Hippocrates' book "Airs, Waters and Places" answers the question: "What are the factors of local endemicity?" The essential factors then identified were: climate, soil, water, mode of life and nutrition. This basic epidemiological premise provided the theoretical basis for more than 2000 years for an understanding of the nature of endemic and epidemic diseases. No fundamental conceptual changes occurred until late in the XIX century when the new sciences of microbiology and immunology appeared.
Prior to the DDT-era, malaria control was carried out in many endemic areas on a selective basis. Environmental management measures were then used such as drainage or other methods involving vector source reduction. The existing chemicals then available to combat the vector did not produce a selection pressure on anophelines. The antimalarial drugs were seldom used systematically for the mass medication of human populations. Therefore, if resistance was not already a characteristic of the parasite, it could not develop.

Program Implementation

The initial residual house spraying of DDT showed the potential for interrupting malaria transmission. After 20 years of malaria eradication activities, the endemicity of the disease had been eliminated in 40 per cent of the 15.7 million km\(^2\) of the originally malarious areas, where 75 per cent of the 231.3 million inhabitants lived (1980).*

The urgency with which the malaria eradication programs were launched was justified by the availability of the insecticides with a prolonged residual effect and the fear that the vector would develop resistance to those chemicals due to their use in both agriculture and public health. The price of the original spectacular results obtained by the total coverage with insecticides and, in some instances, with the large-scale administration of antimalarial drugs was the increased resistance of the vectors to insecticides and the resistance of plasmodia to antimalarial drugs.

The global time-limited eradication program was originally planned as the application of a specific methodology on a "total coverage" basis with extensive use of DDT following predefined stages. A new strategy was recommended at the XXII World Health Assembly (1969)** which called for a closer adaptation to local conditions and a broader epidemiological knowledge by malariologists to identify the problems and their magnitude to select appropriate technologies according to local epidemiological situations and available resources, to design an evaluation system to assess the efficacy of the antimalarial measures applied, and to improve strategies or methodologies in the light of evaluation results and/or changes of epidemiological situations or resources. Although this strategy was recommended in 1969, it still remains to be implemented in a number of countries and multiple causes have precluded the development of antimalarial programs with a different approach and structure.


In recent years there has been a resurgence in the occurrence of malaria. The number of cases in the Americas more than doubled rising from 280,276 in 1973 to 599,216 in 1980 at a time when the case detection activities were maintained at the same level. About 95 per cent of these cases were produced in the areas classified as being in attack phase, with an area of 9.5 million km² and a population of 50.7 million.

Epidemiological Situation

To summarize the malaria situation, the 33 political units in the Region are divided into four groups according to the progress achieved, the problems which have emerged and the projects developed to improve the programs. (Table 1)

Group I includes a third of the population in the originally malarious areas, or a 12.8 million population living in 12 countries where malaria has been eradicated. In 1980, 86 per cent of the 2,249 registered cases were notified in USA. In spite of the higher number of detected cases than in previous years, established local transmission was not demonstrated and malaria infections were classified as imported or introduced.

Group II includes eight countries with 15 million inhabitants (6.5 per cent of the originally malarious area). Several nations are developing efficacious surveillance activities which are leading to the elimination of infection foci. In other countries the level of progress which was achieved in 1975 was not subsequently maintained. The number of cases had doubled by 1980 in Belize, French Guiana and Guyana, or had increased fivefold in the Dominican Republic. The resurgent malaria was originally due to the importation of cases, but it developed mainly by the inability of the service to apply in time, and with sufficient coverage, the appropriate control measures in areas where personnel, supplies, equipment and transport facilities were retrenched due to financial constraints.

Group III comprises 101.6 million population living in 44 per cent of the malarious area, who are currently distributed in approximately 9 million square kilometers which includes the malarious area of five countries. In this group of countries the malaria situation has been relatively stable, and while there have been considerable achievements in many local programs there have also been instances of severe outbreaks mainly due to heavy colonization.

Group IV comprises eight countries with 42 million population (18 per cent of the malarious area). Two-third of the 598,594 registered malaria cases in the Americas (1980) lived in an area of 3 million square km. The endemicity in some areas of these countries is high; the attack measures are insufficiently applied; or, they are inefficient to stop the deteriorating trend.
## TABLE 1
MALARIA CASES REGISTERED, 1977 - 1980

<table>
<thead>
<tr>
<th>GROUP</th>
<th>Population 1980 in originally malarious areas (in thousands)</th>
<th>Cases registered</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUP I</td>
<td>12 countries or territories in which malaria eradication has been certified</td>
<td></td>
</tr>
<tr>
<td></td>
<td>72 844 a)</td>
<td>531</td>
</tr>
<tr>
<td>GROUP II</td>
<td>Argentina</td>
<td>3 342</td>
</tr>
<tr>
<td></td>
<td>Belize</td>
<td>158 a)</td>
</tr>
<tr>
<td></td>
<td>Costa Rica</td>
<td>642</td>
</tr>
<tr>
<td></td>
<td>Dominican Rep.</td>
<td>5 397</td>
</tr>
<tr>
<td></td>
<td>French Guiana</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Guyana</td>
<td>900</td>
</tr>
<tr>
<td></td>
<td>Panama</td>
<td>1 882</td>
</tr>
<tr>
<td></td>
<td>Canal Zone</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Paraguay</td>
<td>2 571</td>
</tr>
<tr>
<td></td>
<td>Sub-total</td>
<td>15 002</td>
</tr>
<tr>
<td>GROUP III</td>
<td>Brazil</td>
<td>49 757</td>
</tr>
<tr>
<td></td>
<td>Ecuador</td>
<td>4 890</td>
</tr>
<tr>
<td></td>
<td>Mexico</td>
<td>36 360</td>
</tr>
<tr>
<td></td>
<td>Suriname</td>
<td>284</td>
</tr>
<tr>
<td></td>
<td>Venezuela</td>
<td>10 365</td>
</tr>
<tr>
<td></td>
<td>Sub-total</td>
<td>101 656</td>
</tr>
<tr>
<td>GROUP IV</td>
<td>Bolivia</td>
<td>2 002</td>
</tr>
<tr>
<td></td>
<td>Colombia</td>
<td>16 659</td>
</tr>
<tr>
<td></td>
<td>El Salvador</td>
<td>4 228</td>
</tr>
<tr>
<td></td>
<td>Guatemala</td>
<td>2 730</td>
</tr>
<tr>
<td></td>
<td>Haiti</td>
<td>4 378</td>
</tr>
<tr>
<td></td>
<td>Honduras</td>
<td>3 267</td>
</tr>
<tr>
<td></td>
<td>Nicaragua</td>
<td>2 733</td>
</tr>
<tr>
<td></td>
<td>Peru</td>
<td>5 867</td>
</tr>
<tr>
<td></td>
<td>Sub-total</td>
<td>41 864</td>
</tr>
<tr>
<td>TOTAL</td>
<td>231 366</td>
<td>398 825</td>
</tr>
</tbody>
</table>

a) Mid-year 1979 last available population figure. b) Information up to August.

*Cuba, Chile, Dominica, Grenada and Carriacou, Guadeloupe, Jamaica, Martinique, Sant Lucia, Trinidad and Tobago, USA (the contiguous States, Puerto Rico and Virgin Islands).*
When it was started in 1955 the malaria eradication program was conceived as an operational program to intensify plans of nation-wide malaria control so that malaria eradication may be achieved and the regular insecticide-spraying campaigns safely terminated before the potential danger of a development of resistance to insecticides in anopheline vector species materializes.* The scientific knowledge at that time was considered to be sufficient to accomplish the task. The demand for action was so strong and the expectation of early success so great that the initiation of careful studies or the design of alternative control methods were inhibited. Then, when "technical" problems began to be identified a number of "corrective" measures were tried before the problems were sufficiently studied. This sense of urgency for action precluded undertaking an adequate assessment of the apparent success or failure of these measures and made it impossible to define thoroughly the possible indications for any alternative courses of action.

The concept of the feasibility of the eradication of malaria with the general application of a single, efficacious, innocuous and inexpensive measure still remains the hope of some malariologists. The idea of finding a single measure for general use, rather than seeking a better understanding of the problems involved and the possible adoption of an integrated approach to control measures with each contributing to the efficacy of the program and adapted to local ecological and socioeconomic factors has hindered progress in this regard. This operative approach and the subsequent reduction of technically competent personnel limited the development of detailed epidemiological and socioeconomic studies which are fundamental for designing a suitable strategy and improving existing technology for malaria control.

The reluctance to consider vector resistance to insecticides as a complex technical problem led the malaria programs to adopt successively different insecticides which in turn was followed by the subsequent progressive development of resistance to each one of them. The selection of parasites resistant to the most commonly used antimalarial drugs constitutes a serious problem, one compromising the adequate treatment of malaria cases.

The persistence of operative, administrative, political and technical problems is leading to the demoralization of the personnel. The proliferation of bad habits associated with a lack of discipline is lowering mystique and prestige; and the lack of support together with the deterioration of the equipment and logistical means are seriously reducing the extent and strength of the control activities. The general picture is still darker if one considers that the investment made during the past decade in the fight against malaria in the Americas does not correlate with the increase in the cost of insecticides, personnel.

* VIII World Health Assembly, Santiago, Chile, 1955.
equipment, supplies and transportation. This situation has seriously affected the capability of the malaria programs to cope with the development of technical problems and to concentrate the available resources for their solution.

The total investment in the malaria programs in the Americas from 1957 through 1980 amounted to more than US$1.4 billion for which 88.4 per cent were provided by national governments and 11.6 per cent by international and bilateral agreements.* Figure 1 shows the annual blood examination rate per 100 population and the annual parasite incidence rate per 1000 population during the period 1960-1980 as compared with the World Consumer Price Index and the US dollar per capita invested in the originally malarious areas of the Region of the Americas. The cost of the malaria programs rose from 34.7 million in US dollars in 1960 to 136.9 million in US dollars in 1980, but the actual cost relative to the real value of the effort has not been sufficient to suppress the increasing trend from 1974 to the present time.

One of the main causes of the failure of the malaria programs in some areas has been the failure to maintain sufficient human and economic resources to create continuous activities against the disease. The relationship between the basic environmental characteristics, the induced modifications, the sociocultural characteristics of the population, the level of socioeconomic development and the biomedical factors of the transmission of the disease which are fundamental elements of the epidemiological approach have been neglected in the planning and the evaluation of the control actions.

In 1978 the XX Pan American Sanitary Conference confirmed that the goal of the Malaria Program in the Americas was the eradication of the disease.** The Year 1980 was proclaimed the "Year of Frontal Struggle with Malaria in the Americas." At the III Meeting of the Directors of the Malaria Eradication Services in the Americas in 1979, the basis for a Continental Malaria Action Program was adopted.***

** XX Pan American Sanitary Conference. XXX Regional Committee Meeting, St. George's, Grenada, Sept.-Oct. 1978, CSP/20/FR, pag. 21, Resolution XVIII.
*** Malaria en las Américas Informe de la III Reunión de Directores de los Servicios Nacionales de Erradicación de la Malaria en las Américas, Oaxtepec, Morelos, México, 26-31 de marzo de 1979, OPS/OMS, Publicación Científica No. 405, 1981.
At the XXVII Meeting of the PAHO Directing Council in 1980 the Member Governments were asked to reformulate the National Malaria Plans.* Up to 1981, the programs of Belize, Bolivia, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Mexico, Nicaragua, Panama, Peru, and Suriname had been reviewed with the technical cooperation of the PAHO/WHO.

With the financial support of the Malaria Action Programme of WHO a plan is being implemented for strengthening the training activities to prepare personnel for the malaria programs. The field research activities of the national programs are fully supported by PAHO/WHO, and special cooperation has been given to countries for the epidemiological stratification of the malaria problem and the design of possible control measures according to the characteristics of the local conditions and circumstances. Taking into consideration the regional strategies of Health for All by the Year 2000, the national malaria programmes are under review for their reorganization, execution and evaluation.**

Next Required Steps

The existing theoretical consideration of the epidemiology of malaria should be expanded to include functional relationships between microecologic, socioeconomical and cultural factors. Investigation should be encouraged to undertake a quantitative analysis of them. Malarialists should concentrate their studies not only on those variables determining changes in the various balance stages of any biomedical model of malaria transmission, but it is also urgent to weigh the social and economic variables affecting its epidemiology and their interaction in the process of the transmission or the control of the disease.

To stop the trend of progressive deterioration of the malaria programs, new strategies should be developed in small ecologically defined areas to make better use of the available control measures, a recommendation postulated at the 1969 World Health Assembly. Unfortunately, important gaps in our knowledge do not allow the application of such new strategies. These gaps must be investigated.


before the limited experience and expertise available in this area disappears. The technical books and theoretical guidelines which are currently available are not of much use. Many countries are faced with a major malaria problem. Some are struggling seriously using the present unsatisfactory tools. None can afford to wait much longer for better technologies to become available.

In the past the emphasis was placed on the assessment of antimalarial measures. Today, the emphasis is put on the possibility of designing control programs capable of obtaining targets and to maintain progress, no matter how slow. Based on the stratification of the malaria problem the development of an adaptive methodology has been proposed which would include planning, control activities, complementary research and an assessment with a highly efficient feedback system that could be utilized to introduce corrections into the program as soon as new knowledge became available. The conceptual framework developed by the Working Group provides an outline of the social and economic research which can complement the planning and control activities.

A feasible program requires balancing the resources devoted to producing information to improve control with those devoted to the prevention and the control of malaria. The demand for the short-term control measures although having political and medical priority must not limit the progress of work on a long term program that may ultimately furnish the solutions to today's dilemmas.

4. SOCIAL SCIENCE RESEARCH

While the importance of social and economic factors affecting the transmission of malaria and its control have been long recognized, direct research in this regard is only a recent development. When the primary emphasis of control programs relied upon insecticide spraying, it was assumed that these measures were sufficient to limit or to eradicate malaria and the social and economic conditions of the population were incidental to this process. These assumptions were reinforced by the spectacular gains made in malaria eradication. It was only later that serious problems developed, calling attention to classical strategies of environmental control and to the significance of the intervening effects of social and economic attributes of the population.

During the past two decades a few small scale research studies have been undertaken which have identified a number of social and economic variables affecting the transmission and the control of malaria. Typically, these studies dealt with the experience of localities involving a small number of patients. These facts precluded the generalization of the findings which were obtained. Among the studies focussing on the transmission of malaria the three broad categories of variables identified were: (1) the migration of special population groups; (2) the prevailing modes of industry such as the construction of dams or the development of mines and the predominant
types of agriculture; and (3) a concern with the economic consequences in regions where malaria was not effectively controlled. These studies usually did not consider the combined effects of these variables nor did they identify other social and economic factors influencing the transmission of malaria such as the social organization of a population or the political structure of a nation or a region.

More attention has been given in these research studies to the social and economic factors which may influence the effectiveness of malaria control programs. The growing number of variables which have been identified tend now to focus more on the attributes of the population to be served than on how malaria control programs are organized or how such services are provided. In the former category cultural values, housing conditions, and housekeeping standards have been identified as factors partially determining the efficacy of malaria programs. Some studies have reviewed the contribution of different categories of malaria workers, particularly of collaborators or lay liaison personnel.

There has been little attempt in the research done to date to undertake a comprehensive and systematic review of the full range of social and economic variables which may affect the transmission and the control of malaria. The variables which have been identified selectively emphasize one or another attribute without consideration of their relative significance in the context of other social and economic forces. Much of this social science research relating to malaria is not only narrow in terms of its conceptual scope, but as well in the scope of its analysis which has often been limited to a rudimentary tabulation of a handful of variables. These analyses are characterized by an absence of sufficient or appropriate control groups. With few exceptions, the more powerful statistical procedures now available to handle multivariate analysis have not been drawn upon. As a consequence even the limited findings which are available may be an insufficient base upon which to mount more effective malaria programs.

WHO support.

Since it was established in 1948, WHO has provided considerable support to the incorporation of the social sciences in its training programs and to their inclusion in basic and applied health research. This endorsement came initially from health scientists serving on advisory committees in different special programs at a time when only a modest start had taken place in many countries in the recruitment of these disciplines as teachers or researchers. Since then, both the support by WHO in this regard has increased as has the involvement of the social sciences in a wide range of health-related activities in many countries.
During the 1950s and the 1960s WHO called upon social scientists as short-term consultants to a number of its programs. Some secretariat staff with training in these disciplines was appointed. The work in this area became more sharply focussed following the establishment of a Behavioural Science Unit in the WHO Division of Research in Epidemiology and Communication Sciences (RECS) in the late 1960s. The work initiated by the RECS Division was subsequently amalgamated into other activities of WHO. Its initiative involving the contribution of the social sciences in health services research was reaffirmed in the 1979 report of the Global ACMR Subcommittee on Health Services Research. The concerns of the Global ACMR Subcommittee involving the input of the social sciences included: the definition of social health indicators; a people's health behaviour; the role of community participation; and effective means of information dissemination.

The UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases was established in 1976 to foster research involving six tropical diseases (malaria, schistosomiasis, filariasis, trypanosomiasis, leprosy and leishmaniasis). An identification of studies dealing with the socioeconomic aspects of parasitic diseases was completed in 1975 and extended in 1979. Additional steps involving the social sciences were recommended by temporary consultants and the secretariat staff. These recommendations included:

- The assignment of research training fellowships for social scientists studying these tropical diseases.
- Encouraging the establishment of full-time positions for social scientists in national research institutes or programs.
- A compilation of bibliographies of social science research on the occurrence and the control of parasitic diseases.

In 1979 WHO convened meetings of a Scientific Working Group on Social and Economic Research (SER) under its Special Program for Research and Training in Tropical Diseases. The activities proposed by the SER Working Group included:

- Literature reviews on behavioral science methods for use in tropical disease control; and economic studies of malaria, filariasis and human trypanosomiasis.
- Initiation of feasibility studies.

Review of the social perception of these diseases and the role of community participation in their control.
The identification and the listing of researchers and institutions involved in these types of research activities in the Member Countries.

Encouragement to social scientists to apply their talents to the study of tropical disease transmission and control.

Since it was established the Scientific Working Group on Social and Economic Research (SER) has held three meetings and 18 projects have been developed. The activities undertaken have included, inter alia: field research; the convening of workshops and seminars; the promotion and the support of research, bibliographies fellowships and training grants for social scientists in tropical diseases studies.

Institutional Support in the Region.

Several concerns in recent years have served to stimulate and develop social science health training and research in Latin America and the Caribbean. These have included the stimuli provided by: (i) the universities and governments of the member nations; (ii) the impetus given by PAHO from the early 1950s; and (iii) the special technical assistance rendered by a number of international agencies (e.g., UNESCO, World Bank, FAO, or the Special Programs of PAHO/WHO and the programs of some internationally-oriented philanthropic foundations).

The social sciences have been a part of PAHO's programs since the fifties and their use in PAHO has been influenced by their general situation as related to health at particular times. During the fifties cultural anthropology was introduced to ascertain the factors that prevented or hindered the adoption of public health measures. In the late fifties and early sixties it was the turn of economics to contribute to the adoption of these measures in the framework of economic development and planning. In the mid-sixties social psychology and sociology were brought into manpower training, and in the seventies the social sciences were used in the analysis of state and social medicine.

These activities were reviewed in detail in the Report of this Working Group to the XIX Meeting of the AOMR in Costa Rica (1980). Recognition of the importance of this type of inquiry relating to vector borne diseases was reaffirmed in 1979 at the Third Reunion of the Directors of National Services for the Eradication of Malaria in the Americas which called for the provision of consultants to some programs.

Overview of Research.

Since the beginning of the 1950s the field of the social sciences involved in health training and research has expanded sharply. During this period it has made a growing and substantial contribution to research about a broad range of health problems. The dilemmas initially
faced by this field were the paucity of well trained social scientists, a general lack of research experience in health matters and a scarcity of established institutional teaching and research positions where this type of work was supported. While at first during this period the social sciences applied to health were seen by many medical observers as a single academic discipline, there has been a growing recognition of the different conceptual and research strategies followed in anthropology, social psychology, sociology, economics and political science, and also within each of these fields, the coexistence of different approaches which may be incompatible.

The present situation of the social sciences related to health research is one where a considerable body of work has been completed which represents mixed interests and emphases. These groupings of interests co-exist in terms of basic and applied research; micro or macro analyses; the separate subdisciplinary approaches of anthropology, social psychology and sociology; of research alternately emphasizing detailed social survey research techniques, ethnomethodological appraisals or analysis anchored in class divisions and the modes of economic production. As indicated by the review submitted to the PAHO/ACMR in 1980, a substantial body of social science health related research in Latin America has emerged between 1950-80. While unquestionably there is a need for more financial support to expand these efforts, an even greater priority is to consolidate what has been done and to prepare guidelines to assist the development of this type of research in the future. There is a need to establish "bridging" links which bring together and review this body of research from an international perspective.

The compartmentalization of the social sciences to deal with specific diseases or health problems entails both advantages for this type of inquiry as well as posing certain drawbacks. This approach permits attention to be directed to a narrow range of specific social and economic factors which may be involved in the etiology or the control of a particular disease. By this means research attention may be concentrated on a limited number of factors of immediate concern and the extent to which intervention programs may modify particular outcomes. At the present time the standard procedure is to start with a specific disease or health problem and then to survey the research literature for studies involving an analysis of social and economic factors. Relevant social science research which is not indexed in existing bibliographical cataloguing systems may remain unknown or not be drawn upon. In some instances, for example, while little direct research may have been done about the role of community participation in the control of a specific disease, parallel inquiries may be available which indicate under what conditions people participate or do not take part in a broader range of voluntary or public programs, what values are associated with the acceptance or the rejection of social innovation, and under what circumstances a sustained involvement is maintained. Likewise, more
broadly gauged research findings may be available about how people in general recognize disease, who they turn to for assistance, how they use services and what social factors influence accessibility.

Principles for Research.

Based on its review of completed and currently ongoing research, the Working Group identified several principles which it believes are essential if such research applied to malaria is to be effectively strengthened in the years ahead. These principles include:

1. **Full collaboration between Malariologists and Social Scientists.** In order to identify the relevant issues and to ensure that the findings obtained are amenable to application for malaria programs or relate to informing policy decisions, this purpose can only be effectively achieved by the close and continuous working together of well trained and experienced malariologists and social scientists.

While some observers may regard this concern as a self-evident "motherhood" principle which it is irrelevant to state, based on our experience over two years as an interdisciplinary Working Group we have found it easier to give lip-service support to the idea of an interdisciplinary review than to put such an idea into practice. For a number of reasons these disciplines have not worked closely together in the past. Their members have held different conceptual perspectives about the issues involved, the importance attributed to certain variables and about the appropriateness of different research strategies. While we have not resolved these matters, we endorse unanimously that if relevant work on these issues is to be accomplished it must be anchored upon continuous interdisciplinary involvement.

What stands out from our review is how seldom this type of interdisciplinary collaboration actually occurs, or when tried, that such contacts are often of a brief, unconstructive or even a hostile nature. If more solid work is to be developed, then both within PAHO itself and at the level of such research being done in the Member Countries, the institutional means must be assured to establish and to maintain such interdisciplinary collaboration.

2. **Conceptual systematization.** While a number of social and economic factors have been identified in this review which may affect the transmission and the control of malaria, the most urgent need here is to develop a more comprehensive and systematic conceptual framework. This Working Group has
made a start. We recognize that we have only begun to consider: the complex interrelationships between social and economic factors; the actual types of control strategies which may be adopted singly or in various combinations; the current situation involving the prevalence of malaria in different countries; and the political priority given to these control programs. To continue this work on an operational basis, what is called for is the establishment of a special interdisciplinary expert advisory group to the PAHO Disease Prevention and Control Division whose mandate would be the continued development of the systematization of pertinent social and economic variables.

This step was anticipated in Recommendation No. 2 of the Third Reunion of the Directors of National Services for the Eradication of Malaria in the Americas in 1979:

"Reconociendo los resultados tan favorables que han alcanzado los programas de erradicación de la malaria y, al mismo tiempo, las dificultades y obstáculos que se han encontrado, se considera necesaria una revisión de los programas.

Esta revisión deberá basarse en un análisis de las características físicas, ecológicas, epidemiológicas, socioculturales y económicas de las distintas áreas, así como en una evaluación administrativa y operativa de los programas de lucha antimalárica."

3. Strengthening Research Capacity. The Working Group has identified as a major deficiency the need for more competently designed studies in all phases of such work. This includes: the basic design of the questions to be asked; the designation of the groups to be studied; the detailing of how information is to be obtained; and the more rigorous statistical analysis of the findings which are obtained. Grant funding bodies cannot be expected to provide expert consultation in the development of research proposals or during the actual carrying out of research once it is underway. Based on our review the Working Group believes this is a vitally needed function if sounder and more relevant research in this field is to be developed. This could be achieved both by means of the appointment of short-term expert consultants in combination with the counsel of the interdisciplinary advisory committee which it is recommended be established.

4. Application of findings in malaria programs. Because the situation involving the occurrence of malaria is so variable among the Member Countries, and the choice and the efficacy
FIGURE 1.

GRAPHIC COMPARISON BETWEEN MALARIOMETRIC AND FINANCIAL INDEXES PER YEAR IN THE AMERICAS

WORLD CONSUMER PRICE INDEX (%)

ANNUAL BLOOD EXAMINATION RATE (%)

ANNUAL PARASITE INCIDENCE RATE (%)

USA $ PER CAPITA

INDEX

1 1

20 10

YEARS

1960 65 70 75 1980
of control measures being affected by the development of resistance among the vector to certain measures, it is reasonable to conclude that for social and economic forces no single strategy altering these conditions is likely to be effective. What is more probable as a fuller understanding of the effects of social and economic factors is obtained as these affect the transmission and the control of malaria, is the identification of several broad categories of circumstances in terms of their control implications. Certain social and economic forces affecting the transmission of malaria may prove to be unamenable to alteration by established malaria programs with their resolution requiring broader social and political decisions.

At the present stage of our knowledge there is incomplete information about the current range of control strategies where altering social and economic conditions are involved. What is needed is a careful comparative evaluation of available case studies with an assessment of the long-term efficacy of different approaches. Such an evaluation would need to distinguish between the short-term outcomes achieved and the long-term consequences or benefits which may have been realized.

5. SOCIAL FACTORS IN THE EPIDEMIOLOGY AND THE CONTROL OF MALARIA

The Working Group identified a number of social and economic factors which may be involved in the epidemiology and the control of malaria. The purpose of this review is to develop a framework of the relevant social and economic factors that can serve as a guide in the formulation of hypotheses and the analysis of specific situations. As Nájera (1974) has observed relative to the epidemiology of malaria, "research efforts should be encouraged to increase our knowledge of the basic epidemiological factors, their variation and correlations, and to formulate more realistic and useful theoretical models. The mapping developed here is a step towards providing a framework for studies analyzing the relationships of social and economic factors in the epidemiology and the control of malaria."

The biological factors constitute the boundaries within which social and economic factors may influence the distribution and the control of malaria. Among biological conditions, those dealt with here are the ones that can be altered by social factors. For example, certain entomological data such as vectorial capacity of the mosquito depends on man-vector contact, vector probability of survival and vector density, all of which are related to social factors.

Based on its review the Working Group has identified the major dimensions of the ecological and social system/cultural/economic variables impinging upon both vector and host factors. From the accumulated experience of the malaria control programs a mapping of high-low malarial risk areas or regions can be assembled based on the
quantification of the main biological factors related to the host, the vector and the parasite, within the frame of the general macroecological determinants such as climate, altitude, topography, the presence of swamps, lake, rivers and estuaries. This mapping provides an essential information background for any collaborative research venture analyzing the relationship of social variables.

Several measures have been developed to document the occurrence of the three major species of plasmodia which commonly affect man (P. vivax, P. falciparum and P. malariae).

The WHO Malaria Expert Committees have given consideration to the technical requirements of vigilance activities, but it is difficult to forecast whether the general health services are capable of carrying out such activities before their efficiency has been demonstrated.

"Malaria may be assumed to have been eradicated when adequate surveillance operations have not revealed any evidence of transmission or residual endemicity, despite careful search, during three consecutive years in the last two of which, at least, no specific general measures of anopheline control have been practiced.*

A minimum of 50,000 km² is the area for which WHO registration of achieved malaria eradication can be granted, with some exceptions and qualifications.

The ecological host and vector factors constitute the boundaries within which social and economic factors may influence the distribution of malaria, the heightened risks for some groups, and the effectiveness and the acceptance of control measures. The Working Group recognized that certain socially determined ecological modifications can have profound consequences in raising or reducing subsequent risks involving the incidence of malaria. In turning to the social and economic factors, the Working Group acknowledged that while these had long been recognized, the prevailing concern in malaria eradication programs had been to seek directly applicable curative or preventive solutions (a "technological fix"). While as a result of existing control measures, considerable strides had been taken in the worldwide containment of malaria following a marked decline after reaching its nadir, its incidence had risen in recent years.

The Biological Factors

A list of biological factors was established as a point of departure to identify those aspects of the transmission chain that can be effected by social factors and to establish the boundaries within which

Figure 2. Biological variables in the epidemiology of malaria

VECTOR

NOT INFECTED

INFECTED

INFECTING

INFECTED

NEGATIVE

POSITIVE

NEGATIVE IMMUNE

SUSCEPTIBLE NEGATIVE

INFECTED NEGATIVE

NON INFECTIVE

INFECTING

DEGREE OF EXPOSURE

MAN
social factors may influence the transmission of this disease. The listing of the biological factors given in Figure 2 is incomplete and serves only to explain one direction in the dynamic of transmission. Further detailed explanation will be given somewhere else about the interaction between these factors. It is recognized that transmission is due to additional forces beyond high-man vector contacts and density, either of man or mosquitoes. The high survival of vectors, for example, are more important than their densities in determining transmission. Likewise, a low density of mosquitoes surviving to old age may be more dangerous than a high density of young mosquitoes. However, social factors are not related to the survival of vectors, but is related to their density. Because the density of mosquitoes explain some of the variability of the prevalence of malaria, this variable was incorporated in the listing of biological factors.

This first approximation of a listing of biological factors which can be affected by social and economic variables could be considerably enriched by subsequently taking into account as a point of departure the specific cluster of social variables that may affect the transmission chain.

The biological conditions that permit the disease to occur or to spread are:

a. Presence of a population of vector mosquitoes

The density of vectors depends primarily on the number of mosquito breeding places which in turn is affected by certain social factors. It is important to take account of the economic changes occurring in a given area which could cause a change in the number of such breeding places, such as the large-scale cultivation of rice or the construction of dams.

b. Exposure of the human population to vectors

The level of exposure of the human population to mosquitoes depends on a number of social variables such as recreation, work or rest habits.

c. Existence of a human population

An increase in the density of the human population provides mosquitoes with a larger potential source of food. The degree of population concentration in the presence of one or more malaria cases is important, because if the density is high and the population is near mosquito breeding places, there will be an increase in cases of malaria. The human population is divided into three epidemiological classes: susceptible, infected and infecting. The relative proportions of these three classes have an effect on the transmission of malaria and can depend in part upon migratory patterns. The impact of migration in this regard is considered later in this Report.
Social variables related to biological factors

Two groups of social variables related to the biological factors include:

A. Variables affecting mainly the intensity of transmission and its distribution. These social variables can favor or inhibit the spread of malaria causing direct or indirect changes in the conditions of transmission.

B. Variables which mainly affect the control measures, including the organizational aspects of antimalarial programs. These two groups of social variables can be represented schematically as given in Figure 3.

The social factors affecting the transmission of malaria, represented with the letter (A) in Figure 3 may produce changes in the density of the population of mosquitos A-1 in Figure 3; in the degree of exposure, A-2 in Figure 3; and in the density of the human population in A-3 in Figure 3.

The social factors affecting the control of malaria, represented with the letter (B) in Figure 3 may produce changes in the physical, biological and chemical control of mosquitos represented by B-1 in Figure 3; in the measures directed to reduce the degree of exposure, B-2 in Figure 3; and in the treatment of the human population, B-3 in Figure 3.

The social factors affecting the transmission of malaria, (Letter A in Figure 3)

A social variable may influence several points or aspects of the transmission chain and produce a concatenation of effects with final favorable or unfavorable results in relation to other factors or conditions (biological, ecological, social). However, some social factors, specially those causing direct changes, may produce specific effects in the transmission chain. The study of these mediating or intervening variables must be accompanied by an analysis of the structural variables. Thus, the cluster of social variables affecting the transmission of malaria can be classified in two subgroups: those causing direct changes and those causing indirect changes in the conditions of transmission.

The social factors directly affecting the transmission of malaria are classified according to the changes that they may produce in the density of the mosquito population, (A-1 in Figure 3), the degree of exposure (A-2 in Figure 3) and the density of human population (A-3 in Figure 3).
Figure 3. Social variables related to the biological model.
Social factors which may alter the density of vectors can act by increasing or decreasing the number of mosquito breeding places or increasing the resistance of mosquitoes to insecticides. These include:

- The type of crop cultivation (e.g., sugar, rice, cotton).
- The mode of irrigation of crops (e.g., immersion, spraying, ditches).
- Increased pesticide use.

The type of crop, the mode of irrigation and the use of pesticides are factors contingent upon the dominant system of production in a given region. Some modes of production can create an entirely new kind of agroecosystem favorable to the transmission of malaria. Several problems are worthy of study which could improve planning and the control of malaria. What is the relationship, for instance, between different modes of production such as large commercial agriculture versus small subsistence farms? The mode of irrigation may serve to increase the breeding places of mosquitoes or the overuse of pesticides that produce vector resistance.

The social factors affecting the level of exposure of the human population to the vector (A-2) are those that produce a concentration of people during the time of the greatest density and activities of mosquitoes. Thus, the relative concentration of dwellings and the degree of crowding of people in dwellings and work places result in different seasonal grouping of the population. If this concentration occurs at a certain time of the year or during the day when the density and the activity of mosquitoes are at a maximum, the conditions for the transmission of malaria are increased. Social factors which can affect this concentration of the population include:

- **Living arrangements**, e.g., the type of dwellings, whether bunkhouses, hostels, individual dwellings; the density of housing.
- **Working arrangements**, e.g., harvesting, night fishing, mining.
- **Social life**, e.g., neighboring customs, types of entertainment, "night life."

Figure 4 illustrates those human activities which take place in areas of population concentration during the maximum activity of the vector.

The concentration of human activities in space and time can be assessed in regard to how they may influence the transmission of malaria. For instance, sports events that lead to a concentration of people in open spaces, if these occur during the time of the year or the time of the day of the maximum activity of the vector, increase the probability of malaria transmission. Once such social activities are
Figure 4. Temporal and spatial organization of human activities as related to vector activities.
identified, they can be more closely studied in regard to how they may be modified to control malaria transmission. However, the time and space organization of some social activities, like those related to labor, are difficult to change. In cases like these where social forces are not readily altered, the solution would be to devise a control activity that takes such a situation into account and works around it.

One of the basic social factors that affects the density of the human population is migration. The social factors involved in migration should be studied in relation to the origin and the destination of migratory movements. Malaria may or may not exist in the place of origin. Those who emigrate may be susceptible or infected, thereby altering the epidemiological pattern of the population at the place of destination. Some studies have found that when migration is organized such as when workers are hired for certain temporary jobs, there is better control of the state of health of the migrants than when this is not the case. The risks have been found to be greater when migration takes place on foot, because of different routes and the long distances involved and with migrants often sleeping in the open. The risk is greater when immigrants enter a country illegally, because they may escape control at the place of destination. The type of settlement of migrants can result in significant concentrations of population near mosquito breeding places, and like other factors, increase the risk of exposure and thereby increase the incidence of malaria. The living conditions of the migrants may be more important than the origin and the destination of migratory movements. This point was already noted under the social factors affecting the man-vector contact. Foci of attraction of migrant labor, often of diverse and sometimes dispersed origin, could be important because the conditions where the migrant population is forced to live are often those having high transmission and little accessibility of control.

All the direct social factors or mediating variables do not act in isolation; their interaction with other social factors must be taken in account. However, the particular contribution of each variable affecting the specific points of the transmission must be assessed in research projects involving multivariate analysis. The social factors causing indirect changes in the conditions of transmission act through the direct variables. A significant component of these indirect variables is the economy. The economic structure includes the production, the distribution, the exchange of goods and their consumption. In every production process a distinction can be made between production relationships and productive forces. The social relationships of production are defined as those established between owners of the means of production and the direct producers in a given production process; productive forces are those elements of work which result in a given productivity.
Figure 5. Social variables in the epidemiology of malaria
The development of productive forces affects the natural environment through the improvement of work methods. For example, the number of mosquito breeding places can increase with the introduction of irrigation. At the same time the development of productive forces affects the concentration of workers because of changes in the technical division of labor. Likewise, the development of productive forces can improve the construction of housing through the introduction of new materials, thereby protecting the individual from mosquito bites or facilitating control measures. The progress of productive forces is slow. Studies of the malarial regions along the Mississippi River in the United States have documented its actual disappearance in the XIX century resulting from the introduction of capital intensive methods in agriculture. Malaria flees before the plough.

Production relationships influence several aspects in the transmission of malaria: the forms and the temporal and the spatial organization of human activities, and migration. Thus, in small-scale production where the owner also is the worker, paid labor is not required. Those Regions where this type of relationship predominate are usually not centers of immigration, although they can be centers of emigration. Areas of large-scale capital intensive production using paid labor can be centers of attraction for migratory movement and the landscape can be changed as a result as workers concentrate to perform certain tasks such as planting and harvesting. Like changes in productive forces these shifts in production evolve slowly. For example, agricultural production of the capital intensive type can permit an improvement in the housing of immigrants, but may act to resist attempts to curtail the immigration of labor that is required and cannot be obtained in the region.

The legal-political, cultural, educational and ideological structures also influence the transmission of malaria. Instances of these forces include pilgrimages to religious shrines, sports events and local fiestas. While these social and cultural forces are well recognized as influencing the transmission of malaria, there is inadequate documentation of their direct impact. A better knowledge of these factors may strengthen the capacity of those in charge of malaria control services to mount more effective action programs.

Social variables involved in the control of malaria
(Letter B in Figure 6)

Because a large number of social variables can affect the control of malaria, it is necessary to distinguish between: (a) the political and organizational aspects of antimalarial programs and their relations to general health services; and, (b) variables which relate to the effectiveness or the acceptability of control measures.
Figure 6. Social variables in the malaria control
Political and organizational aspects of antimalarial programs. (letters A and B in Figure 6). Field experience with malaria control programs indicates that these may vary considerably in terms of: the scope of the activities; the strategies which may be adopted; and the sporadic or continuous character of applications (spraying, sanitation, etc.). What are the social factors involved in the determination of the intensity of control measures? Under what circumstances are control measures likely to be adopted by government or private enterprise? The actual decision to adopt particular measures results from a combination of social factors present at a given moment as they relate to the decision on this important matter. A knowledge of the local epidemiological situation is a crucial element affecting these decisions. Thus, for example, an awareness of a possible threat to the labor force resulting from malaria may result in political pressures from different groups on the State to take or not to pursue certain measures. Government officials themselves may perceive the danger represented by a deterioration of the labor force. In order for this perception of a threat to be translated into action, there must be interest or pressure groups with sufficient power and influence to exert pressure for government action when they perceive the benefits that could result from control measures. In some cases there may be a broad consensus in society regarding the threat represented by malaria, which may be expressed in terms of a "collective threat" or a "national threat." The study made by Menéndez on the factors that led the government of Mexico early in this century to take measures against yellow fever and malaria in Yucatán is an example of this type of a situational or "coyuntura" analysis.* Menéndez cited the following factors that led the government of the day to take control measures: a) the local and national importance of sisal production and the awareness that malaria and yellow fever would damage this production; b) the lack of local manpower and the need to promote the migration of a non-immune population; c) the development of the State in economic and social terms which encouraged a policy of improved health status; and, d) the development of an organized working class in the region that exerted pressure for government action in the area.

In addition to these political factors the organization of the control programs and their application may influence their efficacy. These may include the following attributes of control programs:

- **Sporadic or continuous application.** Are these measures (spraying, education programs, etc.) based on a sporadic focal attack, or undertaken on a routine and continuous basis?

---

Program or people convenience. When implemented, are control measures introduced to meet the convenience of the people to be protected, or to meet program targets?

Enforcement or cooperation. To what extent are control measures enforced for all persons, selectively introduced, or based on the elicited cooperation of the persons to be protected; are these health workers trusted, feared, or worse, ignored?

Social visibility. What prewarning strategies are adopted by control measures; are they well known before the actual measures are applied, or brought in without much advance publicity or prewarning?

Attributes of control program health manpower. Who are the people involved in providing control measures; are they seen as intruders or locally trusted persons? Do they know local circumstances? What are their professional training skills -M.D.'s, nurses? Who monitors the adequacy of the work which is done?

Cost involved. To what extent do control measures involve additional, perhaps substantial, costs for small farm owners, plantation owners, or houseowners? What are the informal but expected additional costs which may be involved, viz., expected gratuities, tips.

Attendant production and lifestyle changes. To what extent to achieve reasonable success does a control program involve --none, or substantial changes-- in established ways of farming, housing or living arrangements (e.g., irrigation-immersion; obtaining water supply; living and sleeping arrangements.

Technical proficiency and health promotion. To what extent are health promotion programs built-in to a malaria control program? How well adapted are these programs to meet the needs of the people involved? (i.e., if pamphlets are used, can the people read; do they have the money to be able to comply with the recommended changes in their housing)? To what extent are health promotion programs superimposed or built-up from an intimate knowledge of the people whom it is intended to serve? What instances are known when such health promotion programs have been well recognized as being highly successful, or alternately, as program failures?

How medical care services are organized, paid for, and seen to operate by a population, may influence the delivery and the effectiveness of both curative and preventive programs. In the instance of malaria eradication programs, it would appear relevant to document, inter alia:
Prevailing mode of health services. Centralized vs. local; government vs. private; universally available vs. selective distribution; the extent of health manpower resources; continuous vs. sporadic coverage.

Cost of health services. Whether directly paid for by government, central or local; the extent to which communities, farmers or plantation owners pay or do not pay for health services including malaria eradication; the extent to which individuals/patients incur direct recognized medical service charges, or the extent of accepted informally-made payments, e.g., to have homes sprayed for protection.

Philosophy of preventive regulation. The extent to which disease control services are backed up by legal powers, the extent to which control enforcement is implemented, or exists only on paper; the exemptions to control measures which may be allowed and under what circumstances; the extent to which the control of malaria is seen as a significant priority or a necessary pro forma public health service obligation—all on the side of how health services actually operate.

Integrated or separate specialized services. Both strategies, those unified with other health services and the separate organization of malaria control programs, occur. Among the former such programs become part of the broader provision of health services, while under the latter, autonomous control strategies are followed. There is a broad consensus that while a properly organized vertical program is generally effective, it is seldom justified to maintain such a program if there is no foreseeable solution in a limited time period.

Traditional medicine. To what extent are traditional sources of health care turned to for assistance and with what results? To what extent are traditional and modern medicine sources compatible, or at variance with each other? To what extent are traditional resources ignored, bypassed or incorporated in modern malaria control measures? What is the range of traditional cures used in a region in connection with preventing and curing malaria?

Acceptance and use of control measures (Letter C in Figure 6) The circumstances and the values of people may significantly influence: their evaluation of malaria as a problem; what they do about it; the nature of the self-protective measures taken; and their attitudes to control measures.
Cooperative participation. As in the case of most health campaigns initiated by the State, these may require for their success a high degree of confidence by society in the government, a perception by the majority of the population that malaria poses a common threat, a clear awareness of the benefits that society will derive from antimalaria measures, the existence of "suggestions" for action, and pressure by reference groups. Several problems remain to be studied further: to what extent are the people at risk accustomed to participate in cooperative community or public ventures, or is the emphasis more on a basis of individual responsibility? In what types of social activities do people work effectively together? What is the prevailing view held by people about government-sponsored malaria control programs? Are they feared, rejected, seen to be imposed or costly, or as a necessary public benefit? From the people's side, how do they see the operation and the effectiveness of malaria control programs? What "unexpected" liabilities (e.g., inconvenience, extra costs, intrusion into domestic privacy. Do they attribute to these public programs?

Individual behavior toward disease. The most important variables with respect to individual behavior that have been studied and may be relevant to explain and predict individual behavior relative to malaria control measures are: 1) the perception of susceptibility; 2) the perception of individual threat; 3) the suggestions of other for action; 4) the pressure by reference groups; and, 5) social class. Many questions require further study. How do people "at risk" of contracting malaria perceive this disease, alternatively, as a major condition to be avoided, or as an inevitable and accepted outcome about which little can be done? Is it feared or accepted as a "fact-of-life" nuisance? What are the direct costs involved to people in adopting control strategies, viz., improving sanitation, protection in housing, or changes in personal perception of therapy/preventive measures, the degree of acceptance of medications and their possible side effects? What are the perceived gains or benefits?

When a case of malaria is suspected, to what extent are its symptoms clearly recognized? What is usually done and who is usually turned to for assistance, and when? How do the informal "pathways" of care speed up or hinder the seeking of modern medical care? To what extent are these informal pathways recognized and incorporated in malaria control programs?
Further Development of Conceptual Framework

The Working Group recognized that the conceptual "chart" outlined here is a provisional framework, one intended to stimulate further discussion, to be drawn upon as a guide in the development of research designs, and to serve as a basis in the planning for the more effective organization of malaria control programs.

6. RESEARCH AND APPLICATION CASE STUDIES

As a means of identifying the range of relevant social and economic variables and as a basis to test the conceptual framework which was developed, the Working Group drew upon the experience of three nations. These national case studies illustrate selected components listed in the conceptual framework, the research methods used and the operationalization and the definition of specific variables, and in some instances, the adopting of an interdisciplinary approach to those problems.

The Dominican Republic

After a virtual interruption of malaria transmission for several years since 1977 the Dominican Republic has experienced a gradual increase and a spreading of the malaria problem. This increased incidence has been attributed to the migration of Haitian laborers for sugar cane and other crops. The Ministry of Health has been concerned with the increase of the malaria problem and considered that a long-term antimalaria strategy should be based on a better knowledge of its socioeconomic determinants.

History of Research Proposal. In the Dominican Republic a team of investigators had been assembled consisting of malariologists, a health educator, an agronomist, a social research technician and consultants in epidemiology and sociology. This team led by one of the malariologists, who was about to take charge of the malaria eradication program in the Dominican Republic, submitted a research and training proposal to the TDR/SER in Geneva. The investigators were given a grant and encouraged to revise their proposal. The encouragement was accompanied by advice from WHO/TDR to seek competent consultation in social science research.

On the first visit of the Working Group to the Dominican Republic research team, it was noted that the major research question being asked, namely, what is the relation between the modes of production and the incidence of malaria, was an important one, but that the research proposal could be strengthened. This could be accomplished by:

. A more adequate review of the pertinent research literature.
. Describing the independent variables to be studied more concretely and by more adequately defining them in operationally.
Greater specification of the methods of analysis of data.

Separating the research questions to be answered from the training objectives; and by separating the two resultant budgets.

Presenting the curricula vitae of all the investigators and presenting them in a more consistent fashion.

Improving the English translation (the one submitted for funding) of the Spanish version of the proposal.

After these and other more specific observations were made by the Working Group, the Dominican Republic research team strengthened the aspects noted above through a subsequent consultanship and the employment of a socio-medical research consultant and a malariologist in order to revise the proposal for re-submission to WHO/STDR/SER. This was done.

Initially, the proposal included both research and training components. In the revision of the proposal only research was included. The training component will be developed and submitted to another program of the TDR. The research proposal specified clearly the variables to be studied, described in detail the operations to be performed in collecting the necessary data to measure these variables, and indicated the modes of multivariate data analysis to be performed. The budget provided for the part-time services of a socio-medical research consultant who assisted in the development and the writing of the revised proposal which was subsequently approved for funding.

Research outline. The general objective of the Dominican Republic research proposal is to analyze the relationship between the modes of production and the incidence of malaria in the Dominican Republic. Two related studies will be done, one retrospective and the second prospective. The retrospective study, using data from the National Agricultural Census, will examine the relationship between the type of tenancy, the extent of surface exploitation and the number of salaried workers in the "tareas" involved in agriculture and animal husbandry in nearly all municipalities (100+) and the incidence of malaria. (The two major cities, Santo Domingo and Santiago consisting of eight municipalities will be excluded from this study). The indicator of malaria incidence will be the API (annual parasitic incidence) or the number of cases with a positive malaria parasitoscopic test per 1000

inhabitants. Statistical analysis using both cross-tabulations and multiple correlation analysis will be done for each of three index years: 1970, 1975 and 1980.

The second study will be a prospective one whose objective is to examine the relationships between socioeconomic structures, migration patterns, macro and micro socio-ecologic conditions, the activities of the Malaria Eradication Program and the incidence of malaria in eight operative areas of the SNEM (Servicio Nacional para Erradicación de la Malaria). In the prospective study the incidence of malaria in the Dominican Republic will be analyzed in terms of five broad sets of factors:

- **Modes of production**, e.g., industrial farming, privately owned farms, share cropping (aparcerías) tenant (arrendatarios) and plots (parceleros).
- **Migration patterns**, e.g., permanent residential migration, periodic geographical mobility of migrant workers.
- **Macro-environmental variables**, e.g., housing altitude, relative humidity, temperature, rainfall, mosquito feeding places.
- **Micro-environmental variables**, e.g., housing protection, presence of animals in the peri-residential area, anophelinic density.
- **Labor conditions**, e.g., crowding in the work place, work schedules.

Each of these variables has been set forth in detail in conceptual and operational terms. Indicators and measures have been meticulously specified, including the sources of data for each measure.

The research design listed six specific hypotheses to be tested and the methods of multiple regression/correlation analysis which would be used to test these hypotheses. One of these hypotheses is given here as an illustration. (The details of the six specific hypotheses are cited in the Dominican Republic research proposal, pp. 42-47). Hypothesis 6 states that: "There is a relationship between the modes of production, the migration patterns, the macro-and-micro-environmental-socio-ecologic conditions, the activities of the malaria control program and the incidence of malaria." This hypothesis will be tested by multiple regression analysis. To quote from the proposal:

"The data from the five sets of independent variables will be entered into the multiple regression equations in the following order: modes of production, migration patterns, macro-ecological conditions, micro-environmental conditions, and the sets of variables relating to malaria program activities."
Each set of variables will be entered hierarchically into the regression equation. At each point of entry into the equation it will be possible to determine the proportion of variance in the incidence of malaria explained by each set in the equation (controlling for those already entered into the equation). In the final equation (i.e., when all the sets have been entered) it would be possible to analyze the proportion of variance ($R^2$) in the incidence of malaria explained by each set of variables, controlling for every other set in the equation.

From 154 operative areas in the SNEM programs two will be selected for study within each of four strata ordered according to the mean annual rates of malarial incidence over the past three years. Data will be collected by means of structured interviews with the heads of households. There will be monthly follow-up interviews. A pilot project covering 100 households is provided for to pre-test the sampling frame, the methods of data collection (questionnaires), the development of a quality control and record-keeping system for the interviews as well as the steps involved in data processing and analysis. Data processing will be done by the Office of National Statistics, an institution in the country with experience in large scale data management, and which has the statistical programming packages needed for the multivariate analysis of the data.

Significance of the proposed research. The significance of the proposed research lies in its potential contribution to knowledge about socioeconomic antecedents of disease with particular reference to malaria. This knowledge can be useful in furthering the coordination and the collaboration between health programs and policies, on the one hand, and economic planning and development, on the other. The proposed research will analyze the relationship in a prospective way between antecedent socioeconomic factors and the incidence of malaria in a representative sample of the rural population of a country. Whatever the specific findings of the study, the application of its conceptual framework, its methods of data collection, its hypothesis testing and the methods of statistical analysis will be applicable to other countries where similar questions and problems may be addressed. The specific results of the study should provide the Malaria Control and Eradication Program (SNEM) of the Dominican Republic with needed information to develop new strategies which may serve to reformulate and restructure the various activities of the program.

Properly executed, this inquiry could serve a model for the design and the conduct of this type of research in other countries in Latin America and the Caribbean relating to malaria and for other vector borne diseases.

Nicaragua

Nicaragua reviewed its antimalaria strategy with the collaboration of PAHO/WHO in January 1980, following the guidelines of the Continental Plan of Action. This Nation had expressed its interest in studying on an
in-depth basis the socioeconomic factors affecting the intensity and the distribution of malaria and its control. It was recognized that these factors may play a decisive role in the main malaria problem areas and will affect the orientation of the government antimalaria strategy which intends to use to its maximum potential the developing primary health care system.

Of particular interest to Nicaragua is the evaluation of the efficiency and acceptance of the health programs being conducted and planned through mass organizations (Jornadas Populares de Salud), one of which was subsequently aimed in 1981 at reducing the malaria reservoir through an antimalaria treatment of the whole population.

The problem presented to the Working Group in Nicaragua was different from that in the Dominican Republic. In the Dominican Republic the problem was to develop a viable research proposal dealing with the socioeconomic aspects of malaria incidence. By contrast, in Nicaragua attention was vividly focussed on the unusual opportunity (coyuntura) which presented itself at this time in the history of the country for mobilizing mass population support for a nationwide campaign to control the spread of malaria. There was extraordinary motivation in launching a massive program of action ("una jornada") against malaria. The objective was to induce the entire population to take antimalarial medication for five days in succession in order to interrupt the cycle of transmission, and thereby, to reduce the incidence of malaria. Previous "jornadas" had attacked the problems of immunization and illiteracy. It was the conviction of the leaders of the malaria program that a similar approach could be used successfully to attack the persistent problem of malaria.

At the time of the visit of the Working Group and PAHO staff, concrete advice was sought from the visitors as to how to make the proposed "jornada" successful. There was no particular interest in basic social science research on malaria at this juncture (coyuntura); rather, what was wanted were practical suggestions that could be offered by social scientists regarding improving the success of the forthcoming "jornada." A number of suggestions were elicited:

There should be a systematic review of the records of the experience of the previous "jornadas" to try to understand the reasons for the successes and the failures in given regions.

To test the feasibility and the efficacy of mass participation in health programs, there should be a systematic inquiry of a small but representative number of the significant actors who had been involved in previous "jornadas", for example, "brigadistas", "multiplicadores", "colaboradores voluntarios", and former malaria patients--namely, the people who would be on the front line of the "jornada"--as to what problems they might anticipate and what suggestions they might have for overcoming them. A
positive factor was the spirit of community participation which could be expected following the Revolution. Failures of mass immunization campaigns in other countries were reviewed. The need to involve leaders and popular figures as well as the health professionals to induce the population to accept the proposed medication was emphasized.

Following these suggestions, interviews were subsequently conducted by the Research Unit of the Ministry of Health with several hundreds of "brigadistas", "multiplicadores", and other relevant personnel.

Completed questionnaires were subsequently available for review by the members of the Working Group. These completed questionnaires were collectively read by the visitors and the local personnel and hurriedly tabulated. A draft of a report was written on the spot, and presented. The possible obstacles to the proposed "jornada" and how they might be overcome, as seen by the respondents to the questionnaires, were discussed.

The difficulties involved in maintaining a program of 5-day medication for the entire population was pointed out. Of particular relevance was the issue that—unlike immunization which was durable or permanent, as was the removal of illiteracy from a given population—the antimalaria medication could only interrupt the cycle of transmission. Low coverage of the medicated population could result in reinfection and transmission of malaria. That is to say, a crucial qualitative difference was noted between the objectives of the previous "jornadas" which attained permanent effects and the proposed one against malaria which could attain possibly temporary effects if it were only partially successful.

In October, 1981 an antimalaria "jornada" took place. It has been reported that a high level of coverage of the entire population was pointed out. Of particular relevance was the issue that—unlike immunization which was durable or permanent, as was the removal of illiteracy from a given population—the antimalaria medication could only interrupt the cycle of transmission. Low coverage of the medicated population could result in reinfection and transmission of malaria. That is to say, a crucial qualitative difference was noted between the objectives of the previous "jornadas" which attained permanent effects and the proposed one against malaria which could attain possibly temporary effects if it were only partially successful.

In October, 1981 an antimalaria "jornada" took place. It has been reported that a high level of coverage of the entire population was achieved for a three-day (not a five-day) series of antimalarial drugs. Higher coverage rates were reported for areas with the highest incidence of malaria (e.g., León, Chinandega). When the report of this Working Group was drafted, no official reports on the "jornada" were available nor were data available relative to its efficacy with respect to malaria incidence.

Significance of Social Science Input. The malaria jornada of 1981 in Nicaragua was a unique program in controlling this disease. For this reason it merits careful documentation as a national case study to assess its short and long term efficacy and the implications of this control strategy for other nations. The Nicaragua experience also highlights the need to have an experienced interdisciplinary group of malariologists and social scientists who can be called upon to provide counsel on increasing the effectiveness of such control programs.
Guatemala

Passive case detection systems for malaria identification and treatment were developed in the late 1950s with the introduction of a volunteer network of collaborators who served at a local level to recognize and treat presumed cases of malaria.* In practice, the volunteer collaborators took a blood smear from the patient, recorded basic demographic data on a short reporting form and provided the patient with an oral drug on the presumption that the patient's symptoms were due to malaria. Initially, their primary function was malaria surveillance. However, over the course of years, this function was changed and the volunteer collaborators became more identified as antimalarial drug distributors. This change was particularly true of Mexico and Central America where the development and the spread of multiple insecticide-resistant strains of mosquitos minimized the usefulness of spraying operations and put the emphasis on the distribution of antimalarial drugs by volunteer collaborators. Despite this modification, it became apparent that there was a pressing and continuing need to have an accurate and uniform surveillance system to measure the incidence and the prevalence of malaria. This required accurate information, particularly in areas with the highest incidence of malaria.

Malaria has undergone a resurgence in recent years in Guatemala. Of the total surface of the country, 74 per cent (80,350 square kilometers) is considered malaric with 4,030 cases reported in 1974; 4,979 in 1975; 9,616 in 1976; 34,907 in 1977; 59,755 in 1978 and 69,030 in 1979.

The Working Group drew upon information from a series of studies initiated in 1980 to determine the strength and the weaknesses of the volunteer collaborator network in the Pacific Coast of Guatemala. These studies were designed to answer some of the following questions:

- How effective is the volunteer collaborator network as an antimalarial drug distribution and malaria surveillance system?
- What is the cost of maintaining the volunteer collaborator network?
- What do residents of the Pacific Coast of Guatemala know about malaria—its symptoms, transmission, diagnosis and treatment?
- How do the attitudes and the behavior of these persons in relation to malaria affect the function of the volunteer collaborators?
- How do evaluators, sector chiefs and the volunteer collaborators view the collaborator network and how do they feel it could be improved?

Eight communities were selected, each of which had a history of high prevalence of malaria in the previous two years. A series of blood smears and questionnaire surveys were carried out to determine the rate of detection and the treatment of symptomatic malaria by volunteer collaborators.

Of 2,822 blood smears taken in these eight communities, 205 (7.3 percent) showed malaria parasites. Fifty-two percent of the patients examined gave a history of chills and/or fever during the two weeks before and the two weeks after the blood smears were taken. (Table 2). Only 25 percent of the symptomatic malaria patients had been detected by the volunteer collaborators, health centers, and private clinics or infirmaries (Table 3). Another fifty-five percent had medicated themselves, usually with inappropriate drugs or doses. There was a striking variation noted in the ability of different volunteer collaborators to detect symptomatic malaria in their communities. In one town 50 percent of symptomatic malaria patients had been identified, whereas in another town none of the 11 symptomatic malaria patients identified during the survey had visited a volunteer collaborator.

There were a variety of reasons offered for not visiting the volunteer collaborators for antimalarial treatment. These varied from not knowing the location of the post to reporting that the volunteer collaborator was not found at home. (Table 4).
<table>
<thead>
<tr>
<th>Localities</th>
<th>Patients with Malaria</th>
<th>Patients with Chills and/or Fever</th>
<th>Patients' Opinion of Cause of Chills and/or Fever</th>
<th>Patients with other Symptoms</th>
<th>Asymptomatic Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Malaria</td>
<td>&quot;Flu&quot;</td>
<td>Cold</td>
</tr>
<tr>
<td>Cuyuta</td>
<td>25</td>
<td>9</td>
<td>6</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>El Milagro</td>
<td>17</td>
<td>6</td>
<td>5</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Tuleate</td>
<td>35</td>
<td>24</td>
<td>19</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>El Carrizal</td>
<td>35*</td>
<td>16</td>
<td>10</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Huitzizil</td>
<td>54</td>
<td>30</td>
<td>21</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>San Juan</td>
<td>16</td>
<td>11</td>
<td>5</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>La Noria</td>
<td>8</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>.0</td>
</tr>
<tr>
<td>San Patricio</td>
<td>8</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>.0</td>
</tr>
<tr>
<td>Bugambilia</td>
<td>15</td>
<td>7</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>205*</td>
<td>106</td>
<td>72</td>
<td>8</td>
<td>7</td>
</tr>
</tbody>
</table>

* Three patients refused to provide a history.
** Indigestion - 3 patients; hand infection - 2 patients; ascariis, diarrhea, boils, weakness and growing pains - 1 patient each.
<table>
<thead>
<tr>
<th>Locality</th>
<th>Patients with Malaria</th>
<th>Patients with Chills and/or Fever</th>
<th>Source of Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Patients with Malaria</td>
<td>Patients with Chills and/or Fever</td>
<td>Volunteer Collaborator</td>
</tr>
<tr>
<td>Cuyuta</td>
<td>25</td>
<td>9 (6)*</td>
<td>0 (0)</td>
</tr>
<tr>
<td>El Milagro</td>
<td>17</td>
<td>6 (5)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Tulate</td>
<td>35</td>
<td>24 (19)</td>
<td>8 (8)</td>
</tr>
<tr>
<td>El Carrizal</td>
<td>35**</td>
<td>16 (10)</td>
<td>2 (2)</td>
</tr>
<tr>
<td>Huitzizil</td>
<td>54</td>
<td>30 (21)</td>
<td>6 (6)</td>
</tr>
<tr>
<td>San Juan La Noria</td>
<td>16</td>
<td>11 (5)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>San Patricio</td>
<td>8</td>
<td>3 (3)</td>
<td></td>
</tr>
<tr>
<td>Bugambilia</td>
<td>15</td>
<td>7 (3)</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>205</td>
<td>106 (72)</td>
<td>16 (16)</td>
</tr>
</tbody>
</table>

* Numbers in parentheses refer to patients who thought they had malaria.
** Three patients refused to provide a history.
*** One patient treated by SNEM evaluator; 1 by school teacher; 1 by Health Center nurse in his home, and 1 at Health Center of another locality.
TABLE 4

Reasons for not Visiting a Volunteer Collaborator (VC) in 43 Patients with Symptomatic Malaria

<table>
<thead>
<tr>
<th>Reason</th>
<th>No. of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>VC usually busy or not at home</td>
<td>7</td>
</tr>
<tr>
<td>Patient doesn't know VC or doesn't know where he lives</td>
<td>6</td>
</tr>
<tr>
<td>Patient went to VC but he was out of pills</td>
<td>5</td>
</tr>
<tr>
<td>Previous treatment of VC did not cure patient</td>
<td>2</td>
</tr>
<tr>
<td>Patient never received blood smear results</td>
<td>1</td>
</tr>
<tr>
<td>Patient doesn't like fingerstick</td>
<td>1</td>
</tr>
<tr>
<td>Side effect of the pills</td>
<td>6</td>
</tr>
<tr>
<td>Patient had medicines at home and felt better after taking them</td>
<td>3</td>
</tr>
<tr>
<td>Patient too sick to leave home</td>
<td>3</td>
</tr>
<tr>
<td>Patient had another medical condition and went to a physician</td>
<td>2</td>
</tr>
<tr>
<td>Patient thinks injections are better than pills</td>
<td>2</td>
</tr>
<tr>
<td>Patient improved without treatment</td>
<td>1</td>
</tr>
<tr>
<td>Patient was awaiting the results of the blood smear taken during the survey</td>
<td>1</td>
</tr>
<tr>
<td>Reason unknown</td>
<td>3</td>
</tr>
</tbody>
</table>

43
The results of these studies indicated that surveillance data from the source could be used only in large geographic areas and any effort to stratify communities in malarial areas could not be done with reliance. As an antimalarial drug distribution system, the volunteer collaborator network was found wanting as only one quarter of symptomatic malarial patients had received presumptive treatment from this source. There were other drawbacks in the case of radical treatment with an even lower percentage receiving adequate therapy. In addition, there were delays in the delivery of drugs, to the extent that some people had a relapse of malaria before antimalarial treatment became available.

There were 5,400 volunteer collaborators working throughout the malarial areas of the country. The average annual maintenance cost of a volunteer collaborator in the Pacific Coast of Guatemala was some 82 quetzales. Since approximately 40 percent of the volunteer collaborators in the Pacific Coast of Guatemala made fewer than 50 blood smears per year, it was concluded that it would be preferable to withdraw the money spent in relatively unproductive posts and to allocate these funds to support and improve more active and productive posts.

On consulting senior members of the malaria program (evaluators and sector chiefs), it was concluded that the role of the volunteer collaborators could be improved if the number of posts requiring supervision was reduced. This would in turn reduce the time interval between the visits of the evaluator.

The second greatest problem arose from the absence of the volunteer collaborator from his post. As only one person had been trained to take blood smears, patients had to be turned away during his absence. In addition, the administration of drugs in these circumstances was difficult.

On the basis of the shortcomings of the existing volunteer collaborator network, a pilot project was proposed in which there would be a change in the role of the volunteer collaborators separating their drug distribution and malarial surveillance functions and placing these in the hands of a new group of volunteer drug distributors. In addition, the volunteer collaborators would be reduced in number and work only in communities with high malarial incidence. The role of taking blood smears and in developing and evaluating community education programs would continue. However, they would not distribute drugs and keep data on febrile patients.

The new proposed investigation will be a pilot study to evaluate a volunteer collaborator/volunteer drug distributor system on the Pacific Coast of Guatemala. The proposed operations research will have four phases: planning, intervention, evaluation and analysis. The study would take three years to complete. The study and control areas were selected in the Pacific Coast of Guatemala in a region recognized as part of the country with the highest annual incidence of malaria. This is the region
where over 50 per cent, or 31,000 of all reported cases of malaria in Guatemala, is found annually. Seventy percent of these are classified as "malignant" malaria. The study area will contain 100 communities with a total population of 30,000 to 35,000 people. A control area of about one-half the size will be located adjoining the study area. The illiteracy rate in the area varies from 30-40 percent in urban centers and up to 70 percent in rural villages. These data are relevant as the investigators plan to recruit illiterates to operate many components of the programs.

The pilot project objectives are:

To develop a new system of volunteer collaborators and volunteer drug distributors which would be shown to be:

- more effective in reaching and treating febrile patients;
- more sensitive in detecting infected patients;
- provide comparable incidence and prevalence data from locality to locality;
- would be simple to supervise.

To evaluate the effectiveness and cost of such a system.

To develop and to evaluate a network for use by illiterate persons in the role of either collaborators or drug distributors.

To develop and evaluate community education program.

This would be directed to modifying attitudes of the public to the volunteer collaborator network and the National Malarial Service.

Significance of Proposed Research. The experience in Guatemala illustrates the joining of two research approaches, the collection of blood smears and the use of social surveys. The findings highlight the role of community participation and how people use these services. The Working Group believes such work could be even strengthened further had a fuller analysis of obtained social survey data been undertaken before making proposals about altering the service system. Such a program would also be strengthened if information could be drawn upon about community reactions and the factors involved in the selection of volunteer collaboration.

7. CONCLUSIONS

In its Report to the PAHO/ACMR in 1981*, the Working Group reported that:

"In addition to developing a conceptual and research framework for the study of the social aspects of malaria, it would be useful to lay down general lines for the conduct of programs of research on pathological entities in which social and economic factors are of importance.

Research in the social aspects of a given pathological entity would require, in the judgement of the Working Group:

(a) **Research program**, that is, a set of interrelated projects combining basic and applied research on different levels.

(b) **A multidisciplinary approach**, for addressing the relationship between biological and social variables.

(c) **Cooperation among developing countries**, inasmuch as malaria and similar diseases occur in several countries and in association with social conditions that are not confined to any single country and, therefore, make it necessary to consider certain subregions as social and ecologic units.

(d) **The participation of different national and international institutions**, in view of the variety of the sectors and institutions operating in the social and ecological units in which the pathological phenomenon under study occurs."

In respect to these steps the Working Group developed the general features of a conceptual framework relating social and economic variables to the epidemiology and the control of malaria. In addition, the Working Group provided consultation in connection with "the general lines for the conduct of programs of research" in one instance, and identified the potential for this type of research investigation in other settings.

Relative to the four steps identified in 1981 by the Working Group involving research on the social and the economic aspects of a particular pathological entity, in this instance, malaria, these are summarized here based on the experience gained during the 1981-82.

(a) **A Research Program**. One research proposal was developed (in the Dominican Republic) and approved for funding by the WHO/TDR/SER. Depending on when funding becomes available, this research project will be conducted over a period of two years. The title of the project is: "Socioeconomic Aspects of Malaria Incidence in the Dominican Republic."

As applied research, its primary objective is to assess the role of certain socioeconomic factors as they relate to the ongoing malaria control programs and their effect on the incidence of malaria throughout the country.
As basic research, the project will use sample survey methods and multiple regression techniques to test an interrelated series of socio-epidemiologic hypotheses involving five broad sets of independent socioeconomic variables and the incidence of malaria.

In Nicaragua, the recent program of mass antimalaria medication, instituted in the last quarter of 1981, presents an opportunity for applied research. There is the possibility of comparing malarial incidence rates before and after this mass antimalarial campaign. The variation in population coverage in various geographic sectors (departamentos) in different, demographic groups could be investigated. In addition, a study could be done to explore those factors which contributed on a socioeconomic basis to high coverage of the population group.

A limited, brief questionnaire survey was made among groups who were likely to be actively involved in the mass treatment campaign and among those who had been involved in previous similar campaigns (brigadistas, colaboradores voluntarios, más multiplicadores). In addition, a small sample of the population who had been treated for malaria in one region of high malaria density was queried with respect to their knowledge and attitudes about malaria and its treatment. The suggestions of these groups were analyzed and reported to the organizers of the campaign (jornada).

Based on the experience of these two examples, both basic and applied research are feasible and warranted. The range of instances is as yet too limited to have developed sufficient experience involving interrelated projects at different levels.

(b) A Multidisciplinary Approach. In addressing the relationship between biological and social variables, we believe such an approach is mandatory, and for research, it must involve a balanced partnership of well trained and experienced malariologists and social scientists. Where an imbalance occurs in these respects involving training and experience, little more than token gains are likely to be realized.

(c) Cooperation Among Developing Countries. Our continuing review of the social and economic factors affecting the transmission and the control of malaria reaffirms the absolute necessity of an intercountry approach. Because of long established economically rooted migratory flows occurring between countries, if malaria is to be contained or eradicated, cooperative international research studies
leading to more effective and jointly undertaken control programs are required. This is not now the case with the result that national control programs ignoring these factors are of limited or short-term efficacy, or both.

(d) The Participation of National and International Institutions. In the Working Group’s judgment such participation is still warranted. The work done to date has involved the effective cooperation of two branches of WHO (TDR/SER and the PAHO Working Group), consultation in two nations and the Working Party itself drew members from six nations. In our identification of the next required steps, we suggest how a broader participation of the member countries might be realized.

8. FURTHER REQUIRED WORK ATTEMPTS

In its review of the social and economic factors related to the transmission and the control of malaria, the Working Group identified a number of matters requiring further attention if more successful planning and intervention are to be achieved. These required next steps include:

(1) Further Development of the Conceptual Framework. The Working Group identified and ordered what it believes are the most salient social and economic variables affecting the epidemiology and the control of malaria. The weighting and relationships of these variables require further and more detailed specification and more extensive work involving their operationalization. Such a step was taken in connection with some of the variables listed in the research project in the Dominican Republic. Comparable work is required involving the other social and economic variables which were listed.

(2) Search of Research Literature. Establishing a data bank on the social, economic and health variables of the political-administrative subdivisions (localities, municipalities, provinces, etc.) of subregions identified as social and ecological units. This information, based on secondary data, would permit an exploration of the relations between biological and social variables and the identification of areas where further information was required.

(3) Data Bank of Social-Economic Variables. Making searches of the literature to identify the socioeconomic variables that have already been studied in relation to the generation, the distribution, and the control of the diseases on which reasearch is to be done. For each identified variable, the conceptual and working definitions used and the instruments
employed to measure them, and the reliability and validity of these instruments, should be compiled. In addition, this search should list the existing findings in the literature on the contribution of each variable in contributing to an explanation of the phenomenon studied.

(4) Strengthening Research Capacity. The type of interdisciplinary research called for by the Working Group involves training in conceptual and research methodologies which a majority of malarialogists and social scientists have not had. For such interdisciplinary research dealing with the transmission and the control of malaria to be competently and efficiently undertaken, expert consultant assistance may be required in the developing of research proposals, the provision of an ongoing advisory resource while such studies are underway, and in the analysis of the final presentation of findings. These steps could be achieved inter alia by expert consultants, an expert advisory panel, and working meetings bringing together researchers involved in these research projects.

(5) Stimulation of Emerging Research Interests. As it has proceeded with its review, the Working Group has had contacts or visits with a number of programs where it is apparent that strong interests exist to undertake both basic and applied research falling within the conceptual framework which has been developed. In these instances there is both a concern and a willingness to undertake such research and an openness to interdisciplinary collaboration. What is often not present is a familiarity with the development of research proposals tailored for research funding approval.

The Working Group strongly endorses the principle that these interested groups, which are in Brazil, Colombia, Ecuador, Mexico, and Peru, should be encouraged and assisted in developing and undertaking such inquiries.

In this context it may be pertinent to distinguish the general processes in which this type of knowledge may be needed and the perspective from which it should be viewed:

a. A conception of the past, the present and the future of malaria control within the evolution of health policies and the potential moves towards "health for all." For this purpose a broad historical analysis of the main forces which maintain the present political and social structures, the generation of plans for health promotion and which forces exist or may be mobilized for their improvement. In this context, intercountry analysis of experiences may be useful. The aim is to define which type of health (and
therefore) malaria programs may be pursued. Although these analyses are important, they may have little relevance for a concrete malaria program, unless the government is engaged in a review of its development policy.

b. Elaboration of the short and medium-term plans for antimalarial activities. Most antimalaria programs are engaged in a review of their strategy, aiming at the development of plans of action suited to local conditions. Such plans, if they are to be realistic, should be based on: i) a better definition of the local epidemiology of the disease, based on biological, ecological, and social characteristics; ii) the feasibility of control based on the different attitudes towards the disease and the potential antimalarial activities; and, iii) the possible resources, available or capable of being mobilized (as community participation and intra and intersectorial cooperation).

Such planning should be based on the best available knowledge of the social determinants of (i) to (ii) and should include not only the selection of the most likely "best" antimalaria activities but also the designation of the essential studies to improve our knowledge of the key factors to that selection (long-forgotten social factors will often require such studies).

c. Necessary corrective actions to stop an even further deterioration of a malaria situation. For this purpose, detailed micro socioepidemiological studies should be devised and conducted. They should be focussed on problem areas and concentrate on immediate relations between sociocultural factors and the exposure to transmission or the attitudes towards control. Perhaps these may represent for the moment the higher priority for antimalaria programs. The recommended "PAHO" program for social science malaria research should provide the necessary methodological support for the planning, the execution and the evaluation of such studies.

(6) Economic Aspects of Malaria Transmission and Control. The Working Group has identified a small and useful body of research focussing on the economic aspects and implications of the transmission and the control of malaria. The problem here lies not with what has been done, but what needs to be done. On the control side, too little is known about the relative efficacy and efficiency of different intervention strategies, the nature of short and long-term economic gains, how economic policy decisions are made regarding malaria programs, or the costs which may be involved for the public, government programs and private enterprise. Detailed and ongoing economic research is required here so that maximum gains can be realized.
Training of Researchers

At the present time, a dual dilemma occurs. In their academic preparation, malariologists receive little or no training involving a detailed consideration of the social and economic aspects of malaria. For their part, social scientists are not trained about the pathological aspects of malaria, its transmission, and its control or about other vector borne diseases. What is required is the development of a curriculum which would include:

- a conceptual framework;
- a review of major research;
- national case studies of recently completed and ongoing research; and
- research methods.

Once developed, such a curriculum could serve as the basis for special short training courses sponsored by PAHO, or be adapted within university and institute curriculum requirements.

Adaptation of Conceptual Framework to Other Vector Borne Diseases. The Working Group's review involving malaria was intended as an example of how social and economic factors might affect a particular disease. While the course of each other vector borne disease is distinctive, the Working Group concludes that the conceptual framework which it has developed could and should be adapted to identify social and economic factors affecting these other vector borne diseases. In each instance, we believe this review should bring together specialists in these diseases and social scientists who would work together closely in developing projects involving basic and applied research.

Applied Research for Disease Outbreaks

While the research review and development steps considered in this Report will take time for their implementation, the Working Group also recognizes the information needs required when an unexpected outbreak of a vector borne disease occurs, or when decisions are made to put into operation a short-term "crash" program. Long-term research in these instances is neither feasible nor wanted. However, because the implementation of these programs involves both pathological and social/economic considerations, the Working Group believes it would be valuable to be able to call upon an established interdisciplinary advisory group, a principle developed elsewhere, for instance, in connection with unexpected disasters.
9. RECOMMENDATIONS

At the Twenty-Second World Health Assembly in 1969, resolution WHA 22.39* on the Re-examination of the Global Strategy of Malaria Eradication was endorsed. Resolution WHA 22.39 recommended inter alia:

a) that the Organization continue to provide assistance for the study of the socioeconomic impact of malaria and of its eradication and develop a methodology for the socioeconomic evaluation of the programs underway; and

b) that the Organization stimulate and intensify multidisciplinary research on malaria involving the biological, epidemiological, economic, social and operational sciences with a view to simplifying and improving methods of malaria eradication as well as program implementation.

These broad purposes involving a comprehensive interdisciplinary assessment of malaria were acknowledged at the XXVII meeting of the Directing Council of the Pan American Health Organization in 1980 in its Report on Health for All by the Year 2000: Strategies. In its review of the malaria situation in the Region, the Directing Council reported:

Malaria is a problem of very long standing. The appearance of insecticide-resistant strains of the vector and drug-resistant strains of the parasite have produced a number of difficulties. This, together with the administrative and operating problems besetting the programs, has held back progress in recent years with the result that the target of interruption of transmission for 90% of the population living in the originally malarious area could not be met. The percentage of interruption achieved was only 75.3%, and a veritable explosion of the disease was observed in some countries in the latter part of the past decade. The new measures now being applied by the Governments warrant the expectation that the Ten-Year Plan goal can be achieved within the next decade.

Based on its appraisal of health conditions in the Americas in 1980 and in regard to the steps that were required to develop Regional Strategies of Health for All by the Year 2000, the Directing Council endorsed recommendations with implications for the nature of the work to be done in connection with malaria. These recommendations in Resolution XX included inter alia:

b. to reorganize the health sector, to include community participation and to improve the linkages among the different components;

d. to analyze and program the human, physical and financial resources needed to comply with national programs;

e. to encourage the development of research and appropriate technologies in accordance with the needs of the national development process;

f. to improve the programming and coordination of international cooperation needed in various sectors of each country;

i. to review and evaluate periodically their strategies and to introduce the necessary adjustment within the context of national development.

The Directing Council also requested the Director of PAHO inter alia:

a. To prepare a plan of action for the development of all strategies agreed upon, including technical and administrative support measures, promotion of the identification and mobilization of resources, research promotion, development of appropriate technologies and information exchange, promotion of intra and intersectoral coordination within a monitoring and evaluation system for the above strategies;

c. To develop the necessary instruments and to take the appropriate initiatives to strengthen the technical cooperation and international coordination functions of the Organization;

d. To adopt the necessary measures to improve the programming, information, control and evaluation system in relation to the Organization’s short-and-medium-term program of technical cooperation.

In submitting its Report to the XX Meeting of the ACMR/PAHO, the Working Group believes that its recommendations relating to the social and economic aspects of malaria are in accord with the broad concerns and priorities which have been established for the Organization. As recommended by the 1969 Meeting of the World Health Assembly, the Working Group seeks to identify steps in regard to "The study of the socioeconomic impact of malaria and of its eradication and develop a methodology for the socioeconomic evaluation of the programs underway." The Working Group also recognizes and firmly endorses the need to "stimulate and intensify multidisciplinary research on malaria involving the biological, epidemiological, economic, social, and operational sciences."

In connection with Resolution XX of the 1980 Meeting of the Directing Council of the Organization*, the conceptual framework developed by the Working Group and its identification of required interdisciplinary research projects recognizes the importance of "community participation" and the need "to improve the linkages among the different components." The steps subsumed in the Working Group's recommendations would provide a mechanism in connection with malaria "to analyse and program the human, physical and financial resources needed to comply with national programs." We believe the recommendations of this working group, if acted upon, would also serve "to encourage the development of research and appropriate technologies" for malaria "in accordance with the needs of the national development process."

Because the transmission of malaria cuts across national boundaries and international cooperation is essential for the effective control of this disease to be achieved, the recommendations of the Working Group suggest steps "to programming and coordination of international cooperation" in this regard. Finally, the recommendations of the Working Group could provide the means "to review and evaluate periodically" program strategies related to malaria and as one source to draw upon "to introduce the necessary adjustments in the context of national development."

In setting out its recommendations the Working Group recognizes that the steps called for will require considerable time and continuous support for their successful implementation. The gains which may be realized will not be achieved as it were by a magic wand, but rather by means of a deliberate and detailed consideration of the complex issues which are involved. Hence, if support is given, it cannot be just for the present moment, but must involve a more durable commitment over a period of time.

The Working Group also acknowledges that in its development of the conceptual framework and its specification of research strategies that it is only at the "starting gate" in the consideration of these issues. More careful and critical work is required here for a sufficient understanding of these complex issues. In this regard we believe that it may be timely that the further development of the mandate given to the Working Group be incorporated within the ongoing activities of the Organization. This would permit both the direct operationalization and the implementation of the work listed in the recommendations of the Working Group.

Based on these several considerations and the work done since 1980, the Working Group submits the following recommendations:

Recommendation 1 - Plan of Action Review Group.

The Working Group recommends that an interdisciplinary group be convened to review its listing of work to be done and to develop a plan of action how these may be realized.

Recommendation 2 - Establishment of a Social Science Malaria Research Program in PAHO

To serve as a coordinating focal point for the type of activities identified in its Report, the Working Group recommends the establishment of a Social Science Malaria Research Program in PAHO. This program would serve to identify these interdisciplinary interests, act to bring such groups together as warranted and provide assistance to research being developed in this field. The work of this program would be complementary to that of the WHO/TDR/SER Committee, one of whose primary mandates is to serve as a research review and funding approval body.

Recommendation 3 - Establishment of a Technical Advisory Group on Social Science and Malaria

In implementing a plan of action and to provide a balanced breadth for its Social Science Malaria Research Program, it is recommended that an interdisciplinary Technical Advisory Group on Social Science and Malaria be established composed of experienced and well trained malariologists and social scientists. This resource could assist the Organization in the periodic review of these issues, provide counsel on proposed and ongoing research and serve as a reference source in adapting the conceptual framework to other vector borne diseases.

Recommendation 4 - Convening a Meeting on Social and Economic Factors Related to Malaria

There are strong interests in a number of the Member Nations in the issues involving the social and economic aspects of the transmission and the control of malaria. It is recommended that the Organization convene a meeting of these interested programs which would:
1. draw upon the experiences of the Member Nations;
2. review the conceptual framework;
3. review ongoing research projects; and
4. identify priorities for action.

Recommendation 5 - Publication of Summary of Conceptual Framework on Social and Economic Factors Related to the Epidemiology and the Control of Malaria

Because the research literature on these matters is limited and as a means to stimulate consideration and revision of the conceptual framework, it is recommended that a condensed version of this Report be published in sources accessible to malarialists and social scientists.

Recommendation 6 - Appointment of Social Scientists to WHO Expert Committee on Malaria

Because of the significance of social and economic factors relating to the transmission and the control of malaria, it is recommended that this perspective be represented by the appointment of a social scientist to the WHO Expert Committee on Malaria.

10. TERMINATION OF ASSIGNMENT

By its submission of this Report to the 1982 meeting of the ACMR/PAHO, the Working Group believes it has fulfilled the mandate it was initially assigned. Pending review of this Report by the ACMR, we believe it would be appropriate for the ACMR to recommend that these activities be assumed operationally by the Organization.

Unless otherwise instructed by the ACMR, we will consider the mandate of this Working Group as now ended. We have appreciated the opportunity of working together as an interdisciplinary group on these important and complex issues. We have gained a deeper understanding of how pathological and social factors are deeply intertwined in each aspect affecting the epidemiology and the control of malaria. If this disease is to be controlled effectively in the future, we believe, firmly and unanimously, that this will only be achieved by a continuous interdisciplinary consideration of these issues.