EVALUATION OF THE MALARIA ERADICATION PROGRAM IN BRAZIL

1964

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EVALUATION OF THE MALARIA ERADICATION PROGRAM IN BRAZIL

PREFACE

In accordance with Sections 3.02(A) and 6.09 of the Alliance for Progress Loan Agreement No. 512-L-021 dated May 11, 1964, between the United States of Brazil and the United States of America and in accordance with the Agreement between the United States of Brazil and the Pan American Sanitary Bureau, Regional Office of the World Health Organization for the Americas, for the eradication of malaria from Brazil, and in compliance with the request of the Government of Brazil transmitted by the Superintendant of the Campaign for the Eradication of Malaria, a team was organized to evaluate the program of malaria eradication of the country.

The evaluation was carried out during the period of 25 September-7 December 1964 with the full assistance and cooperation of the Brazilian authorities. The team was composed as follows:

Dr. Enrique Villalobos C.

Eng. Eloy Barrera

Dr. José Duret

Mr. Sheldon Miller

Mr. G. Boyd Woods

Based on the observations of the team and with the aim of improving the campaign the Pan American Sanitary Bureau makes the following recommendations with the concurrence of USAID.

RECOMMENDATIONS

I. Legislation, Organization and Administration

1. Legislation is required to permit administrative flexibility if the program is to be carried out efficiently and economically.

Due to the legal facilities provided by the Government it was possible to eradicate *Aedes aegypti* (urban vector of yellow fever), and *Anopheles (M) gambiae* (vector of malaria) from the national territory. The efficiency of these campaigns has served as an example for the organization of similar programs in other countries with results equal to those obtained in Brazil. Considering that the campaign has a limited duration it should have exceptional facilities in accord with the needs. Its duration is in direct proportion to the technical capacity of the personnel at all levels and inversely proportional to the existing difficulties for the execution of an adequate program.

2. At present there are competitive demands from other activities for doctors, engineers, entomologists and other skills in the large urban centers. These make it difficult to recruit capable personnel for the campaign. It is therefore necessary to pay adequate compensation (both salary and per diem) to attract and to hold qualified personnel who, working in the campaign, have no possibility for outside earnings.

3. Funding should be guaranteed in sufficient amounts and in timely manner to assure continuity, prevent interruptions and the possibility of the appearance of further technical problems such as a wider distribution of the chloroquine-resistant strain of *P. falciparum* or the development of physiological resistance in or changes in the behavior pattern of *anophelines*. Interruptions caused by delays in funding have resulted in immobilization of staff and prolongation of program operations.

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4. The organization of CEM is recommended with the objective to establish decentralization and to provide sufficient authority to the Coordinations (Regions). The headquarters should devote itself to the formulation of policy and the securing of funding, etc., leaving the Coordinations free to administer directly their own programs within the policy limits determined. Accordingly, personnel, transport, supply and budget and accounting services should be readjusted to achieve de facto decentralization. This new organization, for lack of an official title and for ease of identification will be referred to hereafter in this documentation as National Malaria Eradication Service (SNEM) as such services are called in other countries.

Since decentralization of administration and operations is felt to be the best way in which malaria can be expeditiously, effectively, and economically dealt with in this vast country, special attention should be given to the recruitment of qualified generalists to work in such a manner as to make each Coordination self-sufficient and so be able to carry out newly formulated policy.

5. There is an urgent need on the part of those at the highest level responsible for the administration of the malaria eradication program, to examine the relative position of the supply and transportation functions, in terms of their relative importance to the overall program.

It is to be noted that at present the transportation organization is responsible for providing, maintaining, and servicing units of equipment having an estimated value of approximately 5.5 million dollars; the supply organization is responsible for acquiring, storing, and providing a variety of supply items valued at approximately 3 million dollars.

As the supply and transportation organizations provide support services for those activities related to the execution of the program, they are established in many locations throughout the country. The problem involved in administering and coordinating the operations of these deployed (remote, widely-dispersed, difficult to reach) facilities and services demand a high degree of organizational development. Such an organization must of necessity be staffed by competent personnel, administrative as well as operational at all organizational levels who are skilled in controlling the operations and activities.

By referring to the Appendix for (a) the table on "Observations of Supply and Transportation Facilities" and (b) the summaries on specific visits to Coordinations, Sectors, Districts, and Sub-Districts it will be seen that there are many deficiencies in the existing situation. It is in order to correct these conditions that the recommendations below are given.

5.1 <u>The establishment of a central logistics authority to program on country-wide level supply management and transportation and to take the lead in implementing improvements throughout the supply and transport systems.</u>

There is need for the establishment of a "nerve center" in the proposed SNEM to define policy and establish procedures for supply and transport activities which are presently not related or sufficiently controlled. The central logistics authority should report directly to the proposed Assistant Superintendent for Administration. In order to be effective in correcting the existing conditions, the organization for supply and transport at the Supt.'s headquarters in Rio de Janeiro should:

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(1) Have the strongest possible authority to act, based on both the proposed legislation and the sustained support from top management of the SNEM, and the right to delegate to the Coordinations in the field.

(2) Be staffed by aggressive men who are specially trained and competent to carry supply management and transport responsibility that are heavy and not routine.

(3) Confine responsibilities to programming, planning, and establishing procedural standard functions with very limited operating activities of any kind.

(4) Have access to all information concerning trends of the program operations in which supply and transport activities are an essential part.

5.2 The central logistics authority, working with USAID personnel on matters of supply and transport which involves the USAID Mission, should have the responsibility for assuring that all supplies and transport functions are properly related, including the processes of determining requirements, procurement, transportation (both offshore and inland road and waterway), port clearances and customs, receiving, warehousing, repairing and maintaining equipment, controlling inventories and disposing through survey action unserviceable surplus or excess items through transfer or sale.

5.3 The central logistics authority should initially implement a general program to improve the management of supply and transportation at the regional (Coordination), sector, district,

and sub-district levels. This can be accomplished by conducting a continuing review of the existing supply and transport system, regulations and procedures, the adequacy of proper storage facilities to assure the systematic identification and arrangement of all items in such a manner as to permit the taking of physical inventories at all times, to further assure the adequacy of repair and service the units of transport equipment as assigned.

This continuing review should consider the use of the existing system to the fullest extent possible. The system to be augmented by such procedures and techniques that are necessary to establish a coordinated overall supply and transport system in which each administrative level will become an integral part.

5.4 It is obvious that the central logistics authority cannot perform all the installation work. Each level of the organizational structure (region, or as it is called in Brazil, "Coordination", sector, district, sub-district, etc.) should be organized to take the responsibility for installing the internal improvements in accordance with the overall plan. As progress is made in implementing the necessary initial improvements the central logistics authority should assume the long-range functions of control and coordination for supply management and transport activities in the SNEM.

Specific control responsibilities should include:

(1) The development of procedural standards for supply management reflecting custodial and fiscal responsibilit

commodity standardization, and commodity accountability as a continuing system of records for all phases for supply management activities beginning with commodity procurement, through distribution and extending to the ultimate use or disposition through survey action.

(2) The design of warehouses and proper layout for the systematic arrangement of stocks.

(3) The technique for packing and preserving supplies.

(4) Methods and techniques of transporting supplies at all levels (regions, sectors, districts, etc.) by road, inland, waterways and pack animals.

(5) Methods of conducting physical inventories.

(6) Procurement operations, specifications, competitive bidding, offshore procurement, letters of credit, ocean transportation, insurance, etc.

(7) Programs for developing standard nomenclature, specifications, and catalogues, of all items generally used, together with related warehousing manuals.

(8) Training program, including curriculum, reference materials, visual aids, etc.

5.5 <u>Initiate a program for training key people in the technique of supply and transport management.</u>

The management of supply and transport activities are not simple tasks. If they are to be performed properly competent people with proper training are absolutely essential. It is believed that a sufficient number of fully trained people are

available within the industrial complex within Brazil. It is recognized that these people are specialists in their varied skills. Since their skills are in constant demand in industry, the financial remunerations and other conditions for their services must be competitive with that of industry.

In the event recruitment of fully qualified Brazilians is not possible, the alternative would be to carefully select a small number of potentially qualified people for training abroad. The training courses to be in industries and government agencies which are known to have outstanding systems in supply and transport management. They should be mature and demonstrate their ability to assume heavy responsibilities and have the stamina to withstand a heavy work schedule. They should have sufficient background and prestige in the organization to be considered for important responsibilities.

The courses of training should include such primary subjects as procurement operations, supply management, warehouse and storage techniques, personnel management, budget control, and records management, transportation management, repair and servicing management for transportation, etc.

5.6 <u>Initiate a program for training the supporting staff and other personnel assigned at the regional level and below, in the administration and operations of supply management and transportation activities.</u>

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The importance of having training courses for the supporting staff and other assigned personnel at the Coordination (regional) sector, district, etc. levels cannot be over-emphasized. Training courses, conducted at least once each year, as a mandatory requirement is an essential part of the overall program. The basic objectives of the training process is to provide an economical and efficient continuing system of records of accountability and custodial responsibility for maintaining a supply of material, including related functions, in accordance with prescribed principles and procedural standards. These principles and standards should serve as a uniform guide to administration and operating personnel. The training process should include such subjects as personnel and fiscal management; standards for determining requirements; the use of formulae for computing replacement and delivery schedules; transport repair, servicing and related requirement factors; the provision for inspection; records of receipt; inventory and stock records; warehouse storage operation and methods; issuance and transfer records; records of use and records of disposal.

Accountability presupposes accurate information by means of a standardized item description, as to what is available, how much, and where located. The responsible accountable officials obtain accurate information as to items received and issued from the various levels of operations. This information is provided through the prompt receipt of inventories in order to assure the availability of supplies at the point of use when required.

5.7 Collaboration with SPEVIA (Amazon River Valley Basin Development Organization) for the more effective use of waterways in the Amazon River Valley watershed.

The primary means of transporting supplies and equipment to t remote areas of North Brazil, is by the Amazon River Valley watershed, and its vast system of tributaries, of which many are not navigable for a significant portion of each year. Information indicating the time and duration when those waterways would be navigable is not presently readily available. Thus the fullest use of the streams as the only means of transport has thus far not been achieved.

Since the malaria program in the Amazon River Valley watershed is long range in scope, the benefits resulting from weather and water forecasts would be of tremendous economic and logistic value. It is recommended that SNEM collaborate with SPEVIA and other agencies that could make available metereological hydrographic and other weather forecasting data on which to effect the maximum use of the tributaries during flood periods, and to forecast those periods most suitable for active spraying operations.

The information as above described would be of considerable material benefit in determining more appropriately the type and size of craft required for transport demands and services to be rendered over this vast network of waterways.

The radio diffusion system proposed for installation during 1965, in Coordination areas I and III, will contribute

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immeasureably toward improving and expediting communications, so that effective planning for distribution of supplies and better use of suitable craft may be obtained.

5.8 Develop procedural standard manuals for all phases of supply and transportation management operations and activities.

It is of primary importance for supply and transport management personnel to be provided with approved procedural standard manuals developed as basic guideline instructions and information as to the methods and techniques of operations and activities. These manuals will provide uniformity in the reporting and recording operations through the establishment of a continuing system of documents. These manuals when completed and released for implementation will be an important material source for the development of the training course.

Supply management procedural standards operations manuals should include such subjects as planning and programming, procurement, commodity accountability records for the receipt, inspection, protection, storage, maintenance, movement, issuance, utilization and the disposition through survey of unserviceable surplus or excess items.

Transportation management procedural standard operations manuals should include such subjects as the receipt of transport units (automotive and marine), maintenance responsibility, motor pool operations, unit control records, performance records, inventories, parts and materials, storage, facilities, shop equipment and tools, shop facility, vehicle replacement, preventive maintenance, corrective maintenance, and dispatching transport schedules.

5.9 Provide adequate facilities for supply and transport management operations and activities.

The importance for providing more adequate facilities for receiving, storing, packing and shipping supplies as a supply management responsibility is considered most necessary. The present facilities used for storing supplies are totally inadequate for the types and quantities of items to be stored. Corrective measures should be taken at the earliest date. In considering adequate new facilities attention should be given to such methods as functional space breakdown, principles of space layout, space layout factors, controlling and recording layout, receiving operations, storing methods, storage of hazardous material, the care and preservation of supplies, packing and shipping, warehouse safety practices. Recent observations have emphasized the necessity for providing more adequate facilities for servicing and maintaining vehicles as a transportation management responsibility. The present facilities are inadequate to a significant degree. Consideration should be given to providing new facilities with sufficient tools and equipment necessary to perform effectively these services demands. The shop building should be sufficiently large to provide space for servicing a suggested 4% of the total number of vehicles requiring such service. Consideration to be given to provide ample yard parking space to accommodate a suggested 50% of the total number of the assigned vehicles at the individual facility.

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II. Program Planning

1. Program planning must emphasize the expeditious initiation of attack phase activities in the 15 sectors currently following the "progressive spraying" policy. In converting to attack phase those sectors currently in the so-called "emergency" phase, first priority should be given to selected areas which are contiguous with the sectors already under total coverage. This may require a re-focusing of attention on fundamental aspects of conventional preparatory phase tasks, including:

a) Completion of geographical reconnaissance.

b) Accomplishment of epidemiological and entomological reconnaissance essential for the definition of the malarious area and planning of attack phase activities.

c) Establishment of essential field bases and logistical support facilities.

2. In highly endemic areas or in economic development projects where the emergency or interim protection of exposed populations demand the use of spraying personnel or of epidemiology personnel, special financial participation should be sought from the State governments or the economic development project agencies to help meet the cost of such measures.

3. Geographic reconnaissance would be greatly accelerated if the spraying in "emergency" areas were stopped, or at least reduced to a single application per year, applied opportunely in relation to the estimated season of maximum transmission.

4. If the administrative and financial support essential for progress toward country-wide malaria eradication remains at less-than-necessary levels, then the retention of gains, to date, will require continued or greater

exercise of preferential geographic application of resources in lieu of broader dilution in efforts not meeting recognized malaria eradication standards.

5. Areas presently classified as "vigilance areas" (under observation) should be programmed for studies of sufficient intensity to permit their confirmation as non-malarious, or if malarious, as "attack" or "consolidation" areas with adoption of the corresponding measures.

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III. Geographical Reconnaissance

It is recommended that:

1. The highest priority be given to geographical reconnaissance, as it is internationally accepted, in all sectors where this activity has not been completed.

2. That the personnel of insecticide operations in these sectors work exclusively toward completion of geographical reconnaissance.

3. The policy of combined geographical reconnaissance and "partial spraying" operations be abandoned, with the possible exception of a few isolated areas which meet all the following conditions: difficult, expensive, and time-consuming, transportation and travel; extremely small number of houses; accessibility only during short periods. These areas constitute a small percentage of the areas in the country.

4. That Geographical Reconnaissance Agents should be of sufficiently high caliber (potential ability) to enable them to assume the duties of squad chiefs. Their pay should be adequate and not less than the spraymen's.

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IV. Epidemiology

1. It is necessary in order to strengthen eradication activities in the 9 Sectors (Ceará, Rio Grande do Norte, Paraíba, Pernambuco and Alagoas in the Northeast; Sergipe and Rio de Janeiro, in the East; Paraná in the South; and Roraima in the North after 1964), to conduct epidemiologic studies which will make possible an accurate knowledge of areas which can be placed under the Consolidation phase. The Consolidation phase is of value in determining the time of discontinuance of spraying and also the situation of the areas which are now under "observation". The delimitation of such are with the consequent suspension of attack operations will serve to demonstrat the efficiency of the campaign and the interruption of the transmission of malaria. The success of the eradication program in São Paulo may serve as an example that it is possible to attain a good final result.

2. To expand the number of sectors under eradication within the annual budgetary resources of SNEM. Preference should be given to those sectors bordering on other countries and to those adjacent to or between the present 10 sectors which are under total coverage, in order to assure a continuous area under eradication.

3. To improve professional supervision. Supervision on a professional level has declined to such an extent that epidemiological activities do not reach the professional level as a result the accuracy of the information obtained from the field is questionable.

4. To increase the epidemiological studies in the areas under "observation" in the sectors under eradication in order to define them as areas under consolidation, non-malarious areas, or as areas under attack, whenever this is deemed technically necessary.

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5. To know in advance the plans for those activities involving labor migrations in order to avoid as much as possible the importation of malaria parasite carriers, and to take the proper epidemiological measures when the migration movement occurs, as, for example, in areas of highway construction, dam construction on the rivers, mining activities, rubber extractions, agricutural projects, and recreation activities (e.g. hunting, fishing, etc.) involving temporary migration from non-malarious areas to malarious areas, and vice-versa.

6. To obtain the cooperation from Petrobras, Companhia Vale do Rio Doce, SUDENE, SPVEA, CHESF, DNOOS and others. Such cooperation will reduce the cost of the epidemiological operations in those areas where the activities carried out by them is apt to result in "malaria-spread-by-man".

7. To intensify the efforts in obtaining the cooperation of the federal, state, semi-governmental agencies, foundations, and private medical assistance services to achieve the necessary increase in the passive detection cases, thus easing the economic burden on SNEM.

8. To stress instructions in existing CEM circulars on radical treatment of cases in the Sectors under eradication.

9. To establish routine procedures for qualified personnel to be responsible for the epidemiological investigation of all malaria cases in the Sectors under eradication and in the border areas adjacent the great cities.

10. To adapt procedures in accordance with the letter and spirit of the document CEM Superintendency, dated 1 September 1962, entitled "Instructions and Policies for the Organization and Operation of the Malaria Control and Eradication Campaign".

V. Entomology

1. Use of DDT

The use of DDT inside houses should continue to be the basic weapon to combat malaria in Brazil.

No problems originated by vector anopheles are known which are of such a magnitude as to counter-indicate the use of DDT in houses and which might eventually jeopardize the final success of the Malaria Eradication Program. Nevertheless, its use will not be exclusive in some areas which must be well defined:

a) Certain areas with transmission by Kerteszia, as was shown in the description of the problem of that region.

b) Sites where, after careful studies, it becomes a confirmed fact that DDT is not adequate and the use of other insecticides and/or other complementary measures are indicated.

2. Entomological Studies

The entomological data available is insufficient and must be improved upon urgently. This work is to be conducted with all the magnitude and importance required in an eradication program. Thus the present delimitation of the malarious area will be much facilitated, it will be possible to give the appropriate specifications to each region of the country and, epidemiology will be effectively assisted, orienting its work towards the common fight. To this end it will be necessary to:

a) Update information on the geographic distribution of vectors and in respect of their density in the different times of the year.

b) Intensify studies already started on the behavior of vectors, with priority to be given to investigations on Kertèszia cruzii

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and bellator (States of Paraná and Santa Catarina); A. darlingi of Engenheiro Dolabela (Minas Gerais); A. aquasalis of Belém (Pará) and A. nuneztovari of the Amazon region.

c) Carry on routine tests which measure the susceptibility of vectors to DDT.

d) Study the protection barriers of those cities, the present pattern of which is not based upon adequate entomological and epidemiological data.

e) Keep a routine surveillance over the areas of distribution of A. darlingi, chiefly those which are not going through a coverage phase, in order to alert the personnel of Sectors concerned, whenever a verified increase in its density may cause one to predict a further expansion cycle of this species.

f) Use the Epidemiology personnel in investigations to be carried out in such areas where malaria persists.

3. Personnel

Existing Entomology personnel is insufficient at all levels. Therefore it is necessary to:

a) Increase the staff by hiring well selected and adequately trained personnel until all existing vacancies in the SNEM staffing pattern are filled. This number of positions is considered sufficient for the present requirements of the Program.

b) Provide them with indispensable work facilities: helpers, adequate laboratories, transportation for their exclusive use and sufficient lab and field equipment.

VI. Spray Operations

1. The programmed number of houses must be limited to the number of sprayable houses existing. At the operational level, this number of houses programmed for spraying in any given cycle should be obtained directly from the previous spraying cycle, during which the geographical reconnaissance was brought up to date. In this manner, the number of missed houses, visited or not visited, could then be analyzed. At the planning level, allowances must be made in cycle operations for the estimated demographic increases.

2. Consideration should be given to identifying the non-sprayable houses in the field and eliminating them from the records. If this is done, then the number of non-sprayable houses would not be carried over in the number programmed for the spraying cycle.

3. The supervision of spraying operations is extremely difficult in many areas of Brazil, where many localities are only accessible during some months of the year. This is also true in many areas where distances are so great that a vast amount of time has to be spent to reach these localities. In all of these areas most of the supervisory duties have to be left to the squad chief.

Bearing this fact in mind, it is recommended that a higher caliber, better trained and qualified, and more reliable, better paid person (than the average squad chief observed) be selected for these areas.

4. It is recommended that in areas of difficult access the spraying cycle should be done in as few working days as possible to take advantage of the periods when the best accessibility to these places occurs.

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5. To reduce the high percentage of missed houses (refusals and shut) the following are recommended:

a) Consideration should be given to such factors as climatic conditions, accessibility of localities, seasonal resort migrations and seasonal occupational migrations in planning spraying itineraries to take advantage of the periods when localities can be reached and houses can be available for spraying.

b) Adequate advanced notification of spraying should be emphasized, even if a special person has to be designated for the job.

c) Spraying operations in certain places may have to be scheduled for the days and hours when some houses are opened, even if it is on week-ends or early or late in the day.

d) Health education of the public and instruction of the malaria personnel should be intensified.

6. The fact that many sectors have devised their own individual records means that a review and an analysis of the spraying records is needed. It is recommended that the best method for accomplishing this is through a national meeting of all SNEM engineers with the international advisors to eliminate and modify some of the existing records and to devise new ones.

7. Spraying progress charts and maps should be kept up-to-date in order that they can be used as a supervisory and planning tool.

8. Condideration should be given to a redefinition of "sprayable surfaces" to include roof eaves (where walls do not reach up to the slanting roof) and to include the lower portions of the walls (floor level up to 25 cms).

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VII. Training

1. For Brazil to continue the program of Malaria Eradication in the nine sectors now under the attack phase and to start the attack phase in the others, the need for high echelon qualified personnel is great. Priority training should include the following:

a) The carrying out of special courses in Malaria Eradication for physicians, engineers, and entomologists—courses that are revised to meet the current needs of the malaria eradication program—at the University of São Paulo, Faculty of Hygiene and Public Health. See Appendix for description of present courses as outlined in the University's 1964 prospectus.

b) CEM's senior personnel, qualified by both experience and training conducting seminars and workshops together with the active participation (both in planning and instruction) of other national authorities such as may be available from the State of São Paulo malaria program for example, as well as international authorities such as could be made available from AID and PASB/WHO.

2. The Health Education and Training Section should continue to develop comprehensive, coordinated, procedural standards manuals which would serve as uniform guide instructions.

3. Regular courses are urgently needed for administrative personnel.

4. All training should be done in as few places as possible in order to have better standardized instructions; to provide adequate training facilities; to make better use of teaching personnel and of audio-visual aids; and in general to improve and expedite training. It is obvious that many more training sites are needed to train spraymen than to train district chiefs.

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5. Refresher training should be a continuous activity carried out through courses, seminars, workshops, professional meetings and staff meetings.

VIII. Health Education

Based on experience in other countries, the public's support and acceptance of the program diminishes as the program progresses. Only effective health education can obtain and maintain the public support and acceptance required throughout the life of the program.

1. The plan for adding professional health educators to the program should be implemented as soon as possible. This plan calls for 32 health educators; three at the central headquarters, one at each of the five Coordinations, and one at each of the twenty four sectors.

2. The recruitment and the training of the health education aides should continue. The present training of these aides would be immensely improved if carried out by professional health educators. All sectors should have at least one health education aide; most of the sectors, however, need two aides.

3. Consideration should be given to recruiting male health education aides for such sectors as Amazonas, Maranhão, Mato Grosso, Pará, Piauí, Goiás, etc.

4. Until the plan (No. 1 above) can be implemented, the following is recommended as an urgent immediate requirement of the program:

   a) Obtain a professional health educator for headquarters.

   b) Employ a professional health educator for each of the five Coordinations.

   c) Continue to provide professional training to some of the aides now working in the program.

5. Instruction in health education should continue in all the training courses given by Headquarters, the Coordinations and the Sectors.

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6. Sector chiefs, epidemiologists, engineers and other high echelon personnel should receive orientation in health education through seminars or workshops. Knowledge in health education could also be improved for these higher echelon personnel in staff meetings specially planned for this purpose.

7. Provisions of an adequate budget to acquire and use audio-visual and educational aids.

8. Use of a much greater degree the proven educational approach of community organization by forming coordinating committees at all levels. This is particularly true in those sectors which require the understanding of the population and of political leaders in the work involved in the preparatory phase, particularly geographical reconnaissance.

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REPORT

OF AN

ASSESSMENT

OF THE

NATIONAL MALARIA ERADICATION PROJECT

OF THE

UNITED STATES OF BRAZIL

BY

PASB/WHO - US AID TEAM

Enrique Villalobos C.
Eloy Barreda
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25 September through 7 December 1964

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I. INTRODUCTION

In accordance with SECTIONS 3.02 (A) and 6.09 of the ALLIANCE FOR PROGRESS LOAN AGREEMENT No. 512 - L - 021 dated May 11 1964, between the UNITED STATES OF BRAZIL and the UNITED STATES OF AMERICA -----

and in compliance with the request of the Brazilian Government as transmitted by the Superintendent of the Campaign of Control and Eradication of Malaria in his C.E.M. letter No. 118/64 dated 31 May 1964 -----

there entered on duty in Rio de Janeiro, Brazil, on Monday 28 September 1964, a

MALARIA EVALUATION TEAM

consisting of the members listed below, representing either the Malaria Eradication Branch, TCR, United States Agency for International Development (U.S.A.I.D.), or the Pan American Sanitary Bureau, Regional Office of the World Health Organization for the Americas (PASB/WHO):

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The team members wish to acknowledge the assistance and courtesy extended by the Superintendent of CEM, Dr. Mario Ferreira, and his entire staff as listed an the Itinerary which follows. Invaluable assistance and support was also given by USAID/Brazil's Malaria Eradication Division Chief, Arthur V. Regnier, Jr.; and his staff.

Finally, the team extends particular thanks to the following:

Sta. Dinorá Pereira de Souza

Sr. Edilberto de Jesus Mello

Sra. Sylvia Costa Mendes

Sta. Neusa d'Alvear

Sta. Maria José Tumang

Sra. Maria A. Moraes -----

without whose capable and wholehearted dedicated assistance this complex and extensive report, both Portuguese and English, could not have been prepared.

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SUMMARY

In order that the reader may have an overview of the findings and recommendations ofthe Evaluation Team, this brief extract and summary is presented as an introduction. It is not intended that it will enable the reader to understand the situation thoroughly. It is the intention to provide orientation to the material that follows in the body of the report, reinforced by the supporting data in the appendices.

The Evaluation Team visited the National headquarters office and 12 of the 24 sectors of the Campaign for Control and Eradication of Malaria (CEM), as well as the state of São Paulo separate program. Selected data were obtained, discussed and analyzed in the sectors, supplemented by visits to specific, typical working areas.

The Team found serious deficiencies in organizational structure due essentially to the total absence of enabling legislation. CEM has functioned thus far only on continuing self-limiting presidential decrees which are inadequate, restrictive, and do not provide sufficient authority or flexibility to carry out the required program. Such decrees can never take the place of the necessary basic enabling legislation.

The lack of enabling legislation (establishing a separate legal entity) has imposed on CEM the severe restrictions suffered across-the-board by many government agencies, whose policies are based upon part-time personnel. Malaria can only be eradicated with personnel at all levels which are full-time, mobile, with adequate financial support, and sufficient freedom to operate effectively.

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Geographical reconnaissance has been carried out jointly with spraying in all sectors with the exception of 8 out of 9 sectors currently in the attack phase. This combination of activities called "emergency" or "partial progressive coverage", deviating from internationally accepted techniques has been prejudicial and detrimental to the successful results of both. Even after three years, the preparatory phase has not been completed, and spraying carried out has not produced the required results. To date the results obtained are far from being consistent with the time, money and effort invested.

Epidemiological operations started in 1962. At present a satisfactory network for case detection has been installed throughout the country. These operations have been developed with almost the same intensity in both sectors under attack, and those in the "emergency" phase. The defining of malarious areas within "emergency" sectors has not as yet been completed. Nor have epidemiological operations in the attack sectors been properly classified. Entomological activities have suffered due to the lack of sufficient support and personnel. Attention has been concentrated on data obtained during the control period which are now outdated. One of the most critical problems is the lack of sufficient qualified personnel. Such deficiencies are concentrated mostly in the top level planning and supervisory positions. For example, the lack of physicians (trained specialists in malariology) has resulted in the carrying out of unsatisfactory epidemiological investigations by non-professionals. University graduates other than physicians, sanitary engineers, and entomologists have had to carry out these functions. A related problem is that many of those trained in malariology have either left Brazil to join international organizations or are no longer working in malaria eradication.

Other administrative problems, in addition to personnel, are those of budget, supply, and transport. These administrative services must be designed to S E R V

(rather than control) the technical objectives incorporated in the presently deficient broad policies of the national malaria eradication program.

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Friday
25 September

Discussions in Washington by Team with other PASB/WHO and State Department - U.S.A.I.D. representatives of Guidelines and Terms of Reference. See Appendix.

Monday
28 September

Team arrived in Rio de Janeiro, Brazil, and was joined by Dr. Duret. Team met with those listed below for preliminary review of proposed itinerary and established work program:

PASB/WHO

Rafael Miranda Franco	Sanitary Engineer Advisor
Luis González del Solar	Consultant in Administration

U.S.A.I.D./Brazil

Arthur V. Regnier, Jr.	Senior Malaria Advisor
Richard P. Loomis	Administrative Advisor
Jacob H. Landes, M.D.	Epidemiologist
K. H. Jones	Transportation Advisor
Hugo V. Chirieleison	Supply Advisor

Tuesday
29 September

Team called on U.S.A.I.D./Brazil Deputy Director William Ellis, accompanied by Messrs. Regnier and Loomis.

Same group, accompanied by Engineer Miranda Franco, called on Acting Representative of PASB Zone V, Dr. Donald F. Damude.

Same group, later joined by PASB Transportation Advisor Rodrigo Donoso, continued discussions.

Wednesday
30 September

Team called on Superintendent of Campaign of Control and Eradication of Malaria (C.E.M.) Dr. Mario de Oliveira Ferreira, accompanied by PASB Advisors Miranda Franco and González del Solar

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together with U.S.A.I.D./Brazil Advisors Regnier and Loomis.

The Superintendent presented these members of his staff participating, as listed:

Dr. Djalma Almeida	Chief, Technical Audit
Dr. José Aluis B. de Fonseca	Epidemiology Chief
Eng. Fernando José Brasileiro de Melo	Chief, Insecticide Operations
Dr. Sebastião Ferreira Pinto	Health Ed. & Training Chief
Eng. Osmar Ribeiro de Paulo	Asst. Chief, Insecticide Oprns.
Dr. Carlos Eugenio Porto	Technical Advisor

Team later divided and visited various Sections together with Chiefs.

Thursday
1 October

Team continued visits with Section Chiefs and included in addition to those listed:

Sr. Jayme Esteves	Transportation Chief
Sr. Werner de Andrade	Supply Chief

Friday
2 October

Team starts to accumulate necessary data, review, and consolidate notes. Team called on Minister of Health, Dr. Raymundo de Britto, recently from the United States of America, accompanied by PASB's Dr. Damude and Miranda Franco and U.S.A.I.D.'s Regnier.

Saturday
3 October

Team continued review of data.

Sunday
4 October

Team leaves Rio de Janeiro to begin visits to various programs in States of São Paulo, Paraná, Santa Catarina, and Mato Grosso, in accordance with plan originally outlined in TOAID A-63 Airgram dated 17 July 1964. The Team was accompanied from Rio de Janeiro by PASB's Miranda Franco and U.S.A.I.D.'s Loomis.

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Monday
5 October

Team, together with those accompanying them from Rio, reviewed State of São Paulo program at its headquarters, where they met with and received data from:

Dr. Antonio de Padua Ribeiro	State Director
Dr. Aldino Schiavi	Deputy Director
Dr. Pedro José de Carvalho	Epidemiology Chief
Dr. Renato de Roberto Correa	Entomology Chief
Dr. Decio Rodrigues Camargo	Protozoology Chief
Dr. Odilon Ferreira Guarita	Zone I Medical Chief
Sra. Angelina de Salvo	Health Education Chief

PASB's Luis Silvetti Pena, Engineer Consultant, was present and accompanied the Team in making its visits.

Tuesday
6 October

Team visited São Vicente, Hq. for Zone I of the State of São Paulo program, with the Medical Chief, Dr. Odilon, Dr. Pedro de Carvalho, Epidemiology Chief, and Sra. Rachel Godoy Moreira, Health Education Chief.

Wednesday
7 October

Team visited Campinas, Hq. for Zone II of the State of São Paulo program, with Chief, Dr. Anisio Ribeiro de Lima, and Health Educators Srtas. Ivanise Ferndandes de Menezes and Mariana Irae Monice Mendes.

Thursday
8 October

Team reviewed program and data of Parana SECTOR, having been joined by the Superintendent's representative, Dr. José Aluisi B. da Fonseca. They met and recevied data from:

Dr. Joaquim de Castro Filho	Sector Chief
Dr. Joaquim Rodrigues Cavalcante	Chief, Epidemiology Sect
Eng. Gildardo Tomich	Chief, Insecticide Operat Section
Eng. Oydil Maciel	Asst. Chief, Insecticide
Dr. Luis Marogliano	CEM Hq. Epidemiology Sec
Dr. Firmino de Oliveira Lima	CEM Hq. Epidemiology Sec

The Team also met U.S.A.I.D. Dr. Landes in Curitiba and revie epidemiology data collected for certain districts of this sect

Friday
9 October

Team visited and reviewed program and data of Paranagua DISTRICT of the Paraná SECTOR having been accompanied on their visit throughout the sector by Dr. Fonseca, Dr. Joaquim, and Eng. Tomich.

Sr. Pedro Stareprovo was the district chief interviewed.

Team visited Guratuba LOCALITY of Paranagua DISTRICT of Paraná SECTOR.

Saturday
10 October

Team visited and reviewed program and data of Joinville DISTRICT of the Santa Catarina SECTOR with:

Dr. José Tasso Ayres de Alencar	Sector Chief
Sr. Hugo	District Chief
Eng. Manuel Cabral	Chief, Insecticide Oprns.

Sunday
11 October

Team left Paraná sector for São Paulo enroute to Mato Grosso sector.

Monday
12 October

Team initiated two day review of Mato Grosso SECTOR program, having been joined by the Superintendent's representatives, Eng. Osmar Ribeiro de Paulo and Auditor Hector Dancuart, receiving data from:

Dr. Benedicto Figueiredo	Sector Chief
Eng. José Trouy de Oliveira	Chief, Insecticide Oprns.
Sr. Edir Pedroso Daubian	Asst. Chief., Insecticide Oprns.
Sr. Antonio Cruz	

Tuesday
13 October

Team continued the above described sector program review in considerable detail.

Wednesday
14 October

Team completed Mato Grosso review in Campo Grande and proceeded to Río de Janeiro.

Thursday
15 October

Team obtained data that had been requested prior to their departure from Rio de Janeiro and prepared during their absence.

Friday
16 October

Team members Villalobos and Barreda visited the Rio de Janeiro SECTOR in Niteroi accompanied by Supt.'s representative Eng. Fernando José Brasileiro de Melo, receiving data from:

Dr. Ivan Mendes Correa	Sector Chief
Dr. Manfred Busch	Chief, Epidemiology Section

Team members Villalobos and Miller called on Dr. Mario Ferreira Supt., accompanied by PASB's Miranda Franco and U.S.A.I.D.'s Regnier and Loomis. Dr. Parigot, technical advisor to the Supt. was present. The Supt. requested U.S.A.I.D. and PASB advisors to review the draft of the proposed law reorganizing the national malaria service, obtaining the Team's help.

Saturday
17 October

In compliance with above request of the Supt., the Team met wi U.S.A.I.D.'s Regnier, PASB's Gonzalez del Solar, and the Supt.' representative Parigot.

Sunday
18 October

Team left Rio de Janeiro for review of COORDINATION III inclu three sectors: namely, Salvador SECTOR (with Valença DISTRIC Juazeiro SECTOR (with Barra DISTRICT), and Ilheus SECTOR (with Ilheus DISTRICT).

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Team, accompanied by the Supt.'s representative Fonseca, PASB's Miranda Franco, and U.S.A.I.D.'s Landes, met and received data from:

Dr. José Moniz Barreto de Aragão	Coordinator
Dr. Hamilton Machado de Carvalho	Sector Chief of Espirito Santo, and Supt.'s Hq. representative
Dr. José Teixeira de Franca Silva	Coord. Epidemiology Chief
Eng. Anisio de Castro Filho	Coord. Insecticide Chief
Dr. Antonio Carlos Rodopiano de Oliveira	Sector Chief, Salvador
Eng. Everaldo de Araujo Medeiros	Insecticide Chief, Salvador
Sta. Gleide Gomes	Health Education Assistant

PASB's sanitarian José Moquillaza was present throughout the meetings and accompanied one Team member in visiting different sections.

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ctober

Team continued the above described Coordination, as well as Sectors, program review in detail.

esday
ctober

Team, accompanied by the same representative of the three organizations listed, proceeded to Aracajú for review of the Sergipe SECTOR program and data, receiving data from:

Dr. José Leite Primo	Sector Chief

U.S.A.I.D. Malaria Division's João Carlos Rovigatti arrived to assist the Team.

sday
ctober

Team continued the above described review.

y
ctober

Team left Aracajú for review of Coordination II (Northeast Program) including eight sectors: of these, three are visited, namely, Sergipe SECTOR (with Hq. in Aracajú), Pernambuco SECTOR (with Hq. in Recife), and Ceará SECTOR (with Hq. in Fortaleza).

Saturday
24 October

Team, accompanied by the same representatives of the three organizations listed, met and received data from:

Dr. Francisco de Oliveira Ferro	Coordinator and Acting Chie Pernambuco Sector
Dr. Antonio Alves Pereira da Silva	Coord. Epidemiology Chief
Eng. Augusto M. Pereira	Coord. Insecticide Chief
Dr. Cleomadson Nunes Ferraz	Sector Physician
Dr. Carlos Alberto Meira	Sector Physician
Eng. Wilson Rui Dias da Silva	Sector Insecticide Chief

PASB's Engineer Lamberto González was present throughout the meetings.

Team met in Recife with Minister of Health, Dr. Manuel Ferreira, Director of DNERu, and other advisors of the Minister.

Sunday
25 October

Team reviewed criteria as applied to various sectors visited to d

Monday
26 October

Team visited the Regional Coordination Hq. and received explanati of program.

Tuesday
27 October

Team visited the Sector Pernambuco Hq. and received data. Spray operations in the area were also visited.

Wednesday
28 October

Team left Recife and arrived Fortaleza for review of SECTOR prog

Thursday
29 October

Team met and received data from:

Dr. Edvaldo Eloy Guides	Sector Chief
Eng. Ernani Wilson B. Carneiro	Chief, Insecticide Oprns.
Dr. Tacito Mendes Muniz	Chief, Epidemiology Sectio
Eng. Armando Roriz Burlamaqui	Asst. Chief, Insecticide O
Sr. Otavio Ferreira Bezerra	Entomology Supervisor

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[illegible] October — Team visited sector activities, including spraying operations, and also other Community health resources.

Saturday 31 October — Team reviewed observations to-date and consolidated notes for draft of report.

Sunday 1 November — Religious holiday.

Monday November — Team left Fortaleza and arrived Belém for review of COORDINATION I's program including 6 sectors: of these three were visited, namely, Pará SECTOR (with Hq. in Belém), Amazonas SECTOR (with Hq. in Manaus), and Roraima SECTOR (with Hq. in Boa Vista).

Tuesday November — Team, accompanied by CEM Supt.'s representative, Dr. Djalma Almeida (and Supt.'s Chief Administrative Auditor Antonio P. Gonçalves da Silva, present only for the Belém part of the visit), PASB's Miranda Franco, and U.S.A.I.D.'s Arthur Regnier, met and received data from:

Dr. Albanyr Leal	Coordinator
Sr. Cristovão da Silva Maciel	Coord. Entomology Supv.
Dr. Salomão Pontes Athias	Sector Director
Dr. Antonio de Deus de Oliveira Mello	Epidemiology Chief
Eng. Roberto Uchoa Rodrigues da Silva	Insecticide Chief
Sra. Suzana Nascimento	Health Education Asst.

PASB's Dr. Silvio Palacios and Eng. Osvaldo Pareja were present throughout the meetings.

U.S.A.I.D.'s Malaria Division M. Cohen arrived to assist one of the members of the Team.

Wednesday 4 November	Team visited the Coordination Hq. and received data. Also met with the Governor and later, with representatives of various medical organizations.
Thursday 5 November	Team visited Sector Hq. and received data. Also visited other community health resources.
Friday 6 November	Following review of data, Team left Belém and arrived Manaus.
Saturday 7 November	Team, accompanied from Belém by those listed above and PASB Coordination Advisors Palacios and Pareja, as well as the Coordinator Dr. Albanyr Leal, met and received data in Manaus on the Amazon program from:

Dr. Agostinho da Cruz Marques	Chief Sector
Dr. Heitor Veiro Dourado	Epidemiology Chief
Eng. Elomyr Duclerk Ramalho	Insecticide Chief
Sra. Maria Bessa Barroso	Health Education Asst.

Sunday 8 November	Team visiting and reviewing various aspects of program in and around Manaus.
Monday 9 November	Team, accompanied by the same group, proceeded to the Boa Vista Hqs. of the Roraima SECTOR, where they were joined by Dr. Ros Pletsch, U.S.A.I.D. Consultant to the Team. The Sector Director Dr. Durval de Araujo Gonçalves, received the group and furnished sector data. The Team also met with the Governor.
Tuesday 10 November	Team continued review of Roraima program.

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dnesday
November

Team, and those accompanying now including Dr. Pletsch, returned to Manaus where they received data previously requested and discussed problems.

ursday
November

Team left Manaus and arrived Brasilia.

iday
November

Team, and those accompanying, after meeting Ministry of Health's Chief of Cabinet, Dr. Matias Gama e Silva, proceeded to Goiana for review of the Goias SECTOR program. They met and received data from:

Dr. José Paulo Filgueiras	Sector Chief
Sr. Elso de Azevedo Coutinho	Chief Administration
Dr. Osvaldo Garcia Sandia	Chief Epidemiology
Eng. Benedito Antonio dos Santos	Chief Insecticide
Eng. Luis Alberto Olmos Molina	Asst. Chief Insecticide

PASB's Hernán Albi de la Fuente was present throughout the meetings.

urday
November

Team completed review of Goias sector program.

day
November

Team returned via Brasilia to Rio de Janeiro

day
November

Team started in Rio de Janeiro to consolidate findings and preparing draft of report.

sday
November

Team members Villalobos, Barreda, Miller, together with Consultant Pletsch --- accompanied by CEM Supt. Mario Ferreira and U.S.A.I.D's Regnier --- at the invitation of the Minister of Health, Dr. Raymundo de Britto, met with him in order to discuss the draft (previously prepared by CEM) proposals for legislation required to reorganize

degree of independence essential for the implementation of an effective program that will insure the expeditious eradication of malaria from Brazil. See appendix for copy of suggestions handed the Minister , for use in preparing the proposed legisla

Wednesday
18 November

Team in Rio de Janeiro consolidating field data obtained and prepared draft of report, until

Monday
30 November

Drs. Oswaldo da Silva and Lee Howard representing PASB/WHO and AID/W respectively arrived in Rio de Janeiro. Review of draft of Evaluation Team's draft report proceed until

Monday
7 December

Evaluation presented Washington representatives first draft of its report in English, with the major part translated into Portuguese but requiring further corrections and editing.

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. HISTORICAL BACKGROUND

Brazil has a long history of anti-malaria work. Brilliant results were tained in the eradication of A. gambiae, which had been imported from Africa. brief summanry follows:

In 1931 an outbreak of malaria caused by the A. gambiae occurred in the city Natal in Rio Grande do Norte. An organized campaign against the mosquito resulted n the eradication of A. gambiae from Natal. But 7 years later in 1938, A. gambiae eached the Assú and Apodí Valleys in Rio Grande do Norte and the Jaguaribe Valley n Ceará. Entire families were obliterated and industry and agricultural pursuits vere practically paralyzed. Local stocks of quinine were exhausted. "Illness, poverty, hunger, starvation, and death were close associates in this fulminat epidemic of Northern Brazil" (Soper and Wilson).

It was estimated that in 1939 about 50,000 cases and over 5,000 deaths occurred in Rio Grande do Norte out of a population of some 243,000, an incidence rate of 20 per cent, and a specific case mortality rate of 10 per cent. In the Jaguaribe Valley in Ceará about 63,000 cases were recorded and estimated deaths numbered 8,000.

The first organized campaign against the A. gambiae in 1931 resulted in the eradication of the mosquito from Natal. With the reappearance of malaria in the Assú, Apodí, and Jaguaribe Valleys, the government organized the Anti-Malaria Service in 1938, which was soon converted into the Malaria Service of the Northeast, a cooperative service organized to combat the A. gambiae. These were supported by the Ministry of Health of Brazil and the International Health Division of the Rockefeller Foundation. An intense attack was soon begun with Paris Green and pyrethrum against both larval and adult forms concentrating, at first, on the peripheral and frontier zones. In less than 2 years A. gambiae was eradicated from Brazil.

Prior to World War II there were some isolated malaria control activities. Although reliable statistics are not available, it was estimated that in 1940, there were approximately 6 million cases of malaria. The only known death rates from malaria are those from Manaus, where a mortality rate of 290 per 100,000 population was reported in 1931, increasing to 504 per 100,000 population in 1935.

In 1941 the National Malaria Service was created to undertake malaria control activities in a more extensive geographical area. The Special Public Health Servic (SESP), was given the responsibility in 1943 for the malaria control program in the Amazon state and the Rio Doce Valley. These control activities were continued through 1955. The reorganization of the Ministry of Public Health in 1956 resulted in a marked reduction in the malaria budget. During this year and in the subsequent years there was a reduction in the residual insecticide house spraying operation which had started in 1947.

The entomological studies related to malaria transmission has been investiga in Brazil brilliantly, giving valuable systematic and biologic data on the princip vector species. These documents served as the basis used to successfully guide th control campaigns with the introduction of, and generalized use in the country of chloride insecticides, during 1947-48. Consequently entomology lost a great deal of its practical value and the specialists dedicated their attention to other types of investigations. From that time on data obtained was greatly reduced and was limited to susceptibility tests, obtaining isolated data of geographic distributio of anopheles, and, although collection in other areas was considered difficult, Kerteszia and A.darlingi transmission observations, were made about these vectors behavior. Exception to this rule was the State of São Paulo where the routine st of anophelines were continued.

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In December 1957 the State of São Paulo organized its own malaria eradication program which also included control of Chagas Diseases. On June 24, 1958 the Ministry of Health signed an agreement with the State of São Paulo for joint participation in the Campaign. This agreement made it possible for the State of São Paulo to receive commodity support from AID (then called USOM), through the Ministry of Health.

The agreement was subsequently approved by São Paulo State Law No. 5,395, of June 26, 1959. This Law was amended on May 29, 1961, Law No. 6,070. The amendment provided that material and equipment purchased with AID funds destined for São Paulo was for the exclusive use of the campaign until its termination when they would be considered the property of the Malaria Prophylaxis Service of the Public Health Department.

Prior to the activities in the State of São Paulo described in the two preceding paragraphs were taking place, a bi-lateral agreement was signed on Febuuary 4, 1958 between the Governments of Brazil and the United States (Point IV) whereby a national cooperative program leading to the eradication of malaria was provided for. It was estimated at that time that the malarious areas throughout Brazil were inhabited by approximately 30 million people, living in areas that extended over more than 7 million sq. kms. In accordance with the terms of the above described agreement the campaign was to have been carried out initially in the State of São Paulo and the other states included in the Northeast and Amazon River Valley. (Included in the Appendix of this report are résumés on the activities of the malaria eradication campaign in these regions).

On the memorable day of February 4, 1958, Presidential Decree No. 43,174 was also issued, (later amended on September 23, 1958 by Decree No. 44,494), which created the Malaria Eradication Campaign as part of the Departamento Nacional de Endemias Rurais (DNERu). This decree provided for the establishment of a "Grupo de Trabalho"

which was to plan the eradication program. Under the aforementioned bi-lateral agreement the Ministry of Health of Brazil was to administer the program and provide all the local costs, install offices, shops and storage facilities. The U.S. Mission (Point IV), was to provide insecticides, solvents and emulsifying agents, vehicles, spray cans, spare parts, and technical assistance.

During the year 1958 the Government of Brazil also signed an agreement with the Pan American Sanitary Bureau (PASB), which was to provide technical assistance, training grants and anti-malarial drugs.

The Brazilian Government's national program for the eradication of malaria was to consist of three phases, progressing by areas, and which was to be conducted over a 10 year period:

1) The preparatory phase was to last for one year, followed by

2) The attack phase of four years duration, and

3) A consolidation phase of a minimum of three years.

By 1960 CEM's program had been curtailed due to a steady decline in the financial support of the Brazilian Government. On July 7, 1961, Decree No. 50925 was issued providing for the appointment of a Superintendent and the above mentioned planning body called "Grupo de Trabalho". A plan was then formulated to divide the country into two distinctly different categories:

One, with eight states, was to be under the attack phase - these included the States of Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe, Rio de Janeiro and Paraná, which states had finished, or were about to complete the preparatory phase activities including geographical reconnaissance;

The other states were to be under a phase called "emergency", which combined the preparatory and the attack phases. This "emergency" phase was to have lasted for two years.

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By the decision of the Ministry of Health in 1961, according to the note June 21 of the Minister of Health to the Director of USAID/Brazil (Point IV), ough draft of a plan of operations established that the eradication program luded a plan of emergency operations for 1961 and 1962, and that the total erage should begin in 1963. For various reasons, the emergency phase continued ing 1963 and 1964, and probably will continue during 1965;

The year 1963 is termed the "black year" by malaria personnel due to budget- difficulties and the personnel problems that interrupted CEM's ability to carry t most of the campaign that had been previously planned. This interruption to the rvices was due to political and financial upheavels which took place throughout azil during the year.

At the end of the 1964 current year, CEM continues with the dual program:

The attack phase, now in nine states, and

The "emergency" phase activities in the other states. See table that follows.

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BASIC DATA PERTAINING TO THE NATIONAL MALARIA ERADICATION AND CONTROL PROGRAM OF THE UNITED STATES OF BRAZIL, PRESENTED TO THE US AID - PASB/WHO EVALUATION TEAM DURING OCTOBER & NOVEMBER 1964 AND VISITS MADE BY THE TEAM INDICATING LOCATION OF OBSERVATIONS NOTED IN THE ANNEXES

	PHASE		Number of Current Spraying Cycle (thru 1964) of Sector in Attack Phase	Number of Districts in Sector
	Partial = Par	Attack = A		
4-S-NATIONAL C.E.M. HQ.				
S-COORDINATION I (Hq.: Belém, Pará)				
6 Sectors:				
Rondônia	par			
Acre	par			
S +Amazonas	par			
S R +Roraima		A	2	1
S +Pará	par			
Amapá	par			
S-COORDINATION II (Hq.: Recife, Pernambuco)				
8 Sectors:				
Maranhão	par			
Piauí	par			
S R +Ceará		A	10	3
Rio Grande do Norte		A	10	2
S +Paraíba		A	10	3
S R +Pernambuco		A	6	7
Alagoas		A	8	3
S R +Sergipe		A	8	3
COORDINATION III SR(Hq.: Salvador, Bahia)				
3 Sectors:				
+Salvador	par			
Juazeiro	par			
Ilheus	par			
COORDINATION IV (Hq.: Rio de Janeiro, Guanabara)				
4 Sectors:				
S +Goiás	par			
Minas Gerais	par			
Espírito Santo	par			
R +Rio de Janeiro (Guanabara)	-	A	6	6
COORDINATION V (Hq.: São Paulo, S.Paulo)				
3 Sectors:				
S +Mato Grosso	par			
S +Paraná		A	6	5
S +Santa Catarina (Rio Grande do Sul)	par			
24 Sectors Sub-Totals for CEM	15	9	-	33 Districts in 9 Attack Sectors
3-S R + S. Paulo State Program	-	A	10	8 (zones)
GRAND TOTALS FOR ENTIRE COUNTRY	15	10	-	41 Districts in 10 Attack Sectors

\+ Indicates 13 Sectors (in some instances Districts and Sub-Districts) visited during October & November 1964 by the Evaluation Team of a total of 25 including the State of São Paulo Program.

R-Indicates Resumé of Sector visit included in Appendix on Technical Content of Program.

S-Indicates Summaries of Observations, in Coordinations (Regions), Sectors, and a few Districts visited in Appendix on Administration of Transportation and Supply activities of Program.

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ENERAL DATA ON BRAZIL

Brazil is located in the eastern-central portion of South America, bordering almost all the countries of the continent, with the exception of Chile and cuador. It has an area of 8,513,844 sq. kms., and is one of the largest countries the world. Its population, according to the 1960 census was 70,969,185 inhabitants estimated approximately at 80,000,000 for 1964 by the Brazilian Institute of Geo-raphy and Statistics - IBGE).

Brazil is divided into five distinct regions, as follows:

. North Region - Corresponds to the Amazon and comprises the States of Amazonas, Acre, Pará, and the Territories of Amapá, Rondônia, and Roraima. This region has an area of 3,591,180 sq. kms., and a population of 2,601,519 inhabitants, that has a density rate of 0.7 inhabitants per sq. km.

. Northeast Region - Comprises the State of Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco and Alagoas, with an area of 265,652 sq. km., and a population of 15,577,995 (16.2 inhabitants per sq. km.).

. Eastern Region - Comprises the states of Sergipe, Bahia, Minas Gerais, Espirito Santo, Rio de Janeiro, and Guanabara, with an area of 1,260,057 sq. km. and a population of 24,832,611 inhabitants (19.7 inhabitants per sq. km,).

. Southern Region - Comprises the states of São Paulo, Santa Catarina, Paraná and Rio Grande do Sul, with an area of 825,621 sq. km. and a population of 24,818,194 (30.1 inhabitants per sq. km.).

. Central-Western-Region - Comprises the states of Goiás, Mato Grosso, and the Distrito Federal, with an area of 1,879,455 sq. kms. and a population of 3,006,866 inhabitants (1.59 inhabitants per sq. km.).

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The regions with more inhabitants and most developed are those in the East and South, where the great industrial area of the country is located. Although the major part of the population is rural, similar to other Latin American countries, there is a tendency to migrate to the great urban centers.

There are few mountainsin Brazil. Along the Atlantic coast, there is a mountain range which separates the coastal lowlands from the center plateau. The highest point in the country is located in this mountain range and is called "Pico da Bandeira", situated between the States of Minas Gerais and Espirito Santo with an altitude of 2,890 meters above sea level. In the North portion of the country there are extensive lowlands formed by the basin of the Amazon River. On the borders of Venezuela and British Guiana there is another mountain range which divides the basins of both Amazon and Orinoco rivers. 97% of this territory does not exceed in altitude 900 meters above sea level.

The Amazon river valley basin has an area of 4,778,000 sq. kms. Other important rivers in Brazil are the São Francisco, Paraguay, and Paraná.

Due to its vast area, Brazil's climate is varied. Generally, there are three main types: a) equatorial - in the Amazonic Region, with high temperatures and a high degree of humidity; b) tropical - also hot, but presenting variations in the humidity, and c) sub-tropical - in the Southern regions, and also in the hilly regions where lower temperatures are found. Rainfall also varies: there are areas with high percentage of rainfall such as the Amazon and the southern states interior. In contrast there are other areas such as the Northeast where occasional rains and subsequent drought are responsible for large scale migration of population to the south.

The Eastern and Southern Regions have better transportation means, either by air or by land. In recent years, greater importance has been given to the development of the Central and Northern regions of the country where networks of highways

systems are being developed to connect ultimately with the rest of the country. A significant example is the Belèm-Brasilia Highway extending over a distance of approximately 2,000 kms., which is routed through a portion of the Amazon-Jungle. Many regions of the country depend almost exclusively on river and air transportation. In areas where commercial airlines do not provide access, the Brazilian Air Force, on occasion, collaborates by providing air trasnport.

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IV. CURRENT STATUS

A. LEGISLATION, ORGANIZATION AND ADMINISTRATION

Legally the Malaria Eradication Campaign (CEM), is a part of the National Department of Rural Epidemics (DNERu), and is rigidly established by the following decrees:

No. 43.174	-	dated February 4, 1958;
No. 44.494	-	dated September 23, 1958; and
No. 50.925	-	dated July 7, 1961.

In conformance with these decrees CEM is a part of the Ministry of Health and is administered by a superintendent (known for his technical competence and of the career staff of the Ministry), appointed by the Minister of Health.

The "Grupo de Trabalho" (Planning Board), was established by decree No. 43.16 which originally was presided over by the Director-General of DNERu, and which is now presided over by the Minister of Health, following the application of decree No. 44.494. The "Planning Board" in reality has no function but instead, the Minister of Health and the CEM Superintendent have been responsible for planning. It is interesting to note that in accordance with Par. No. 1, Article 3, of decre No. 50.925, the representatives of both A.I.D. and PASB/WHO could have participat in the meeting of the "Planning Board" whenever it was so determined by the Minis of Health.

The decree No. 50.925 reorganizad the "Planning Board" placing it under the chairmanship of the Minister of Health and maintaining its functions of planning and governing the administration of the eradication and control of malaria throug Brazil; that is to say, responsible for all functions attributable to CEM. Since the "Planning Board" has never functioned, neither of the two international agen

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A.I.D. or PASB/WHO have had the opportunity to regularly participate and so contribute to the development of the Malaria Eradication Campaign. This is a fact that should remain clear because the presence of the A.I.D. and PASB/WHO representatives would be a constructive and delimiting factor contributing to CEM policy formation as well as the administration of the operations connected with Malaria Eradication.

Until the present time both agencies (A.I.D./PASB), have given financial assitance to CEM (from 1958 thru 1963), A.I.D. contributing more than $14 million and PASB nearly $1 million).

The experience of many countries carrying out malaria eradication has demonstrated conclusively that PASB/WHO and A.I.D. representatives are always of benefit to such eradication service.

1. In order to eradicate malaria within a reasonably given period of time throughout Brazil, certain specific measures should be taken to change and so improve the existing <u>organization</u>. This will facilitate the accomplishment of the following objectives:

   a) The formation of malaria eradication broad policies and planning so that there is conformance with internationally accepted techniques and procedures:

   b) The structure of the malaria eradication <u>S E R V I C E</u> organization so that it will have sufficient authority and concomitant responsibility to carry out the policies and plans. In addition the proposed organization should be able to resist pressures insisting on technically ineffective, sporadic and premature spraying (prior to Geographical reconnaissance, preparatory phase, epidemiological study), which in the past, has resulted in the waste of time, money and effort;

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c) the establishment of a malaria eradication service administration so that it will be able to provide and manage on a national basis, -- men, money, materials, and physical facilities. At the same time, this new administration should be D E C E N T R A L I Z E D in order to give sufficient direction to the 5 regional offices (Coordinations) in this vast country with such difficult terrain, delayed communications, and limited access-of-transport problems. Through these five regional offices there should be further delegation of authority to the sector offices (synonymous with states in Brazil). The present problems basically affecting the administration are:

(1) The present administration's greatest problem is the lack of a sufficient number of personnel, trained and experienced at the various supervisory and intermediate levels. The Brazilian Government's rigid, across-the-board job classification and salary ceiling (based primarily on the existing situation where most government professional personnel are in fact part-time and are not able to travel or willing to be transferred), makes it impossible to attract and hold -- with adequate salary, fringe benefits, as well as job security (including pension rights) ---- the quantity and quality of personnel needed for malaria eradication. (See recently released newspaper article about DASP on this subject in the Appendix and substantiating data on turnover and attrition given under "IV. CURRENT STATUS - F. TRAINING" elsewhere in this report).

(2) The next problem of the present administration is "material", including supply, transport, communications, and the provision-maintenance of physical facilities. Again, freedom from government

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restrictions in this area would enable the management of procurement, storage, distribution, and transportation to be improved so that it could meet the needs of not only the present, but the projected programs' expanded requirements as well.

(3) The availability of sufficient "money" from Brazilian and other sources continues to be a significant part of the problem even under the present favorably disposed government.

By referring to the Appendix of this Report, the budget data, (as related to many factors such as the number of positions authorized and those actually filled, for example), may be seen showing:-

(a) The actual expenditures for the calendar fiscal years 1958 through 1963;

(b) The closely estimated expenditures for 1964 current year nearly ended; and

(c) The proposed budgets for 1965, both minimal & optimum, but not maximum. Funds are requested from Brazilian Government sources in order to reach the set targets in GR, number of houses sprayed, etc. A ceiling of about 13,000 positions was approved together with the budget, and increase of 4,700 positions over 1963. Roughly 4,000 of the 13,000 positions have not been filled during 1964 --- for reasons see (1) above. It will be further noted that although 4,000 approved position slots remain vacant, the 1965 budget proposal is to increase the ceiling from 13,000 as it is now, to 13,500.

2. The Commission accepts the definition of "Regional Coordinations" mentioned on page [illegible] of the Pocos de Caldas July 1964 Blue Book, which states:

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"Regional Coordinations have the following objectives:

a) to guide and supervise the execution of works under the responsibility of the Sectors;

b) to control technical and administrative activities of the Sectors;

c) to coordinate the work, seeking uniformity of technical and administrative procedures".

It is strongly felt, however, that for the purpose mentioned, adequate budget responsibilities should also be given so that after the Annual Coordination Budget has been submitted, the Chief of each Regional Coordination will have sufficient opportunity to defend before the Superintendency the Annual Budget of his Coordination. After the Superintendent's approval has been obtained, each Coordinator will have full responsibility for handling all funds allocated.

This would give each Coordinator the necessary autonomy (responsibility and the corresponding authority), to carry out all operations of the policies established by the Superintendency.

In order to better serve its Sectors, each Regional Coordination should have in its table of organization the same Sections of those of the Superintendency thus repeating, at a Regional level, the same organization the Superintendency has at a National level, as shown on the functional chart of organization found in the Appendix. There should be sufficient technical personnel in order to assure an efficient carrying out of the previously approved program.

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In order that all the Regional Coordinations may better carry out the tasks for which they have been organized, the team suggests that International Agencies associated with the National Government for the development of the Malaria Eradication Program, create new positions for Advisors in addition to those already existing. These new Advisors would also live in those cities where the Coordinations headquarters are located. The International Agencies should maintain them there for sufficient periods, that is, at least until the consolidation phase of the Program is reached, at a Regional level. These advisors will work in direct, and permanent contact with, coordination local personnel. These local personnel should be provided with adequate funds for frequent and necessary travel within the Coordination area, and they will also work closely with the assigned International Advisors.

In order to enable the Superintendent to carry out overall technical and administrative functions required by the National Eradication Program, 3 Assistant Superintendent Positions could be added to the staff:

(1) Assistant Superintendent for Technical Affairs.

(2) Assistant Superintendent for Administration.

(3) Assistant Superintendent for Training and Health education.

Each Section now under the Superintendent could be directly responsible to only one of the 3 proposed Assistant Superintendents.

All the functions of the various levels of the Superintendency could be studied by a especially created Commission which would establish job qualifications and job specifications for each type of position, including defining and separating both administrative and technical responsibilities.

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The functions and duties of existing personnel, following the Commissions findings, could be redistributed, based on background of experience and demonstrated ability, every effort being made to maintain the personnel in their residential area (preference being given to the place of origin), but having also in mind the needs of the Service.

All vacancies, present and future, should be filled by carefully selected competent personnel, based on the aforementioned specifications. Both new and existing personnel should receive training in the various activities of the program:

a) They should receive on-the-job training at various levels and be guided in performing their responsibilities (regarding their responsibilities to their supervisors and subordinates);

b) They should be visited frequently with the objective of observing them, in order to provide the incentives necessary to maintain good morale; and

c) As far as promotion is concerned, preference should be given to existing personnel, when they have met their job requirements.

4. Salaries of personnel which have been authorized by the proposed new law should be adjusted according to the job classifications established by the study mentioned above, adding the usual fringe benefits such as medical care, vacations, sick and maternity leaves, retirement, etc.

Considering that CEM is an agency of limited duration, the personnel presently working in malaria eradication activities, should be given preference for transfer to the Ministry of Health or other government agencies keeping in mind the importance of maintaining continuous government service with its attendent benefits.

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This Evaluation Team considers that its suggestions are logically developed, in order to provide the Superintendent with sound organizations, both at the National and Regional levels (Coordinations). Sectors should be well integrated within the Coordination making possible the malaria eradication operations performance at local levels (districts, sub-districts, etc.) in geographic areas with similar conditions; this is in line with accepted international standards.

Supply and Transportation

The supply and transportation operations for the malaria eradication campaign (CEM) were reorganized in 1961. Dr. Fonseca was appointed Superintendent. Prior to Dr. Fonceca's appointment malaria program operations had been conducted in various parts of the country. When deactivated, the operations left certain materials and vehicles in storage. These items were later brought within the control of the supply and transport operations under the reorganized malaria eradication program.

The supply and transport activities have been continually expanding since that time.

a) Major supply management activities

The term "supply management", as used is the means of obtaining the most economical use of supplies and equipment through the establishment of operating and management controls, reflecting custodial and fiscal responsibilities; commodity accountability records for the receipt, inspection, protection, storage, maintenance, movement, issuance, utilization and disposition through survey of unserviceable surplus or excess items by sale.

b) Organization

The supply management section of CEM consists of:

1) Planning Unit

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2) Purchasing Unit

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3) Central Warehouse Unit,

4), 5) & 6) Subsidiary warehousing units,

7) Dispatch Unit,

The functioning responsibilites of these units are as follows:

(1) Planning Unit - plans, through a system of schedules based on campaign needs including schedules of stock replacement items, for purchase and distribution of supplies and equipment to the various points of use.

(2) Purchasing Unit - develops a descriptive catalogue of common use items with their specifications standards and characteristics. Purchasing operations for both local and offshore items, in accordance with specifications. This action may involve competitive bidding, letters of credit, ocean transportation, insurance, etc., all to be in accordance with the laws, policies, and procedures in force. Develops a register of acceptable firms qualified to supply the items desired and maintain complete records of purchase transactions.

(3) Central Warehouse Unit - Rio de Janeiro

(a) Develops specific standards to cover requirements determination and use of formulae for computing replacements.

(b) Receives, inspects, protects, stores, transfers, and issues for use - items in its custody.

(c) Performs all necessary activities related to items arriving at the ports of entry, involving customs clearances, stevedore services, the issuance of reports for shortage and damage and the removal of cargo to storage.

(d) Maintains a continuous system of records reflecting the receipt, storage, and disposition of items in custody.

(e) Maintains facilities for the renovation of office furniture.

(4) In addition to the central warehouse, there are regional warehouses located at Belém, Recife, Salvador, São Paulo and Paranaguá. The main function of these facilities is to receive cargo arriving at the ports of entry and act as a base of supply, chiefly for DDT, until distributed to the sectors within the regional geographic area.

(5) The sector office is the administrative and operations head-quarters for the state. The sector warehouse facility is the base of supply for those items required for the program in the state.

(6) The district offices are in effect branches of the sector office. District offices are responsible for program operations in their designated portion of the state. The warehouse facility at the district office is the base of supply for those items required for the program in the district area. In certain districts local supply depositories have been established to store small quantities of supplies as a service facility for remote or isolated areas.

(7) Dispatch Unit - Transportation - provides for the movement of the supply and equipment requirements at all levels within the organizational structure of the program. The movement of these supplies and equipment is performed for the most part by automotive vehicles of varying types. However, in certain areas water transportation is used, and in certain other remote and isolated areas, mules are used for transport purposes.

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Facilities for performing major overhaul and servicing operations for transport units are located at sector and many district installations.

c) Discussion of supply and transportation activities

(1) The Team recognizes that the CEM has developed a substantial system dealing with supply and transportation. The Team also recognizes that varied problems arise wherever large quantities of supplies and equipment must be purchased, stored, and distributed under existing conditions, such as the difficulty of estimating requirements, need for adequate storage and transport repair facilities, need for maintaining a continuing system of records of commodity accountability and lack of trained personnel in the techniques of handling supplies and equipment and operating transportation repair and servicing facilities. The cumulative effect of the following basic conditions on supply and transportation problems, deserve the careful attention of top management. Any substantial improvement will contribute in no small measure to the welfare of the overall malaria program. These basic conditions as found are:

(a) Unsatisfactory warehousing operations.

(b) Unsatisfactory transportation repair and servicing facilities.

(c) Excessive inventories, unutilized supplies and equipment.

(d) Deterioration and damage to supplies.

(e) Inadequate organization.

Discussion of the above listed conditions:

(a) Unsatisfactory warehousing operations - there is an apparent lack of appreciation regarding the role of warehousing activities as an important segment of supply management operations in terms

of the problems for improving the utilization of supplies and equipment. As for example, the development of specific standards to cover requirements determinations; the use of formula for computing the replacement quantity delivery schedules; controlling stock records and inventories as a continuing activity; performing maintenance and repair operations to items of equipment, storage, protection, and preservation of items; the development and implementation of procedural standards; and the development of an efficient warehousing organization.

(b) Unsatisfactory repair and servicing facilities for transportation equipment - there is an apparent lack of appreciation regarding the importance for providing adequate facilities for repair and servicing requirements to the various types of transportation equipment. As for example, the development of specific standards for determining the implements and equipment installations at the sector and district offices; the use of formula for computing replacement parts, quantity, and delivery schedules; controlling stock equipment records and operating cost and equipment inventories as a continuing activity; the development of procedural standards for the management for transport repair and servicing operations; and the development of an efficient transportation servicing organization.

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(c) Excessive inventories, unutilized supplies and equipment - there are items of supplies still packed in the original containers in which they arrived in Brazil. These items which have never been unpacked, inspected or described on records of inventory, are, in effect, not officially received. There are quantities of DDT which have remained in storage in excess of twelve months. There are items stored in certain locations for excessive periods for which only a limited use can be expected. There are items of equipment in need of repair for which little effort is being made for their return to usable service. There are also quantities of unserviceable and scrap items requiring disposition through survey action. The principal causes for these conditions may be attributed to:

(1) The uncoordinated control of inventories;

(2) The task of controlling inventories is complicated by the fact that commodities are stored in many distant places.

(3) The available inventory and requirements data are unreliable and incomplete.

(4) The process of declaring and disposing of surplus or excess items is such that no direct incentive to take positive action exists.

(d) Deterioration and damage to supplies - items of supplies have been damaged due to unsatisfactory storage conditions, rough and careless handling.

(e) Inadequate organization - most of the problems of supply management and transportation can be traced ultimately to problems

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of organization. The organization requires strengthening before other basic improvements are feasible. While central controls are not completely lacking, there is no "nerve-center" for a supply management and transportation system as a whole.

The principal weaknesses may be described as:

(1) An overall control of supply and transport is lacking within the CEM.

(2) The various functions of supply are not related in terms of planning requirements, purchasing, receiving, transportation, storing, issuing, repairing, controlling inventories, and disposing of surplus or excess or scrap items.

(3) The staff has not had adequate training in the management of supplies and transportation.

The transportation management organization is responsible for:

Vehicles assigned to C E M National Program	1249
Vehicles assigned to SEM São Paulo Program	239
Total	1488

(See Appendix for Sector locations)

(1) The operating reports for the 6-month period - January through June 1964 show the following:

	Vehicles		Percent
(a) For the CEM National Program			
The average number of units operating	932	-	74.5%
The average number of units not operating 30 days or more	311	-	25. %
The average number of units not accounted for	6	-	.5%

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	Vehicles		Percent
(b) For SEM São Paulo Program			
The average number of units operating	211	-	89. %
The average number of units not operating for 30 days or more	28	-	11. %
Total	239	-	100.%

The total number of 1488 units include 8 different makes, of these there are 25 model types. See Appendix for complete list.

(2) In June 1962 a program of standardization was adopted. Under this program future purchases of automotive replacement units will be directed toward reducing the number to a maximum of 4 makes, all of which are produced nationally, with a total of 5 - 7 model types. This reduction in both makes and model types will assure a significant reduction in the overall parts inventories, amounting to many thousands of dollars, and is a most desirable objective.

(3) The transportation management organization is also responsible for providing, maintaining, and servicing units of equipment for inland waterway transportation. The total equipment includes the following: (see Appendix for details)

Outboard motors	161
Launches with inboard motors	21
Open boats for outboard motors	22

According to AID records a total of 153 outboard motors were purchased with AID funds, while CEM purchased 20 units or an overall total of 173 outboard motors. These records also show a total of 36 launches with inboard motors.

The launches observed were in need of general repair and repainting both to the hulls and superstructures in order to protect the original investment in this type of transport and to prevent even more serious deterioration. The smaller open boats, observed at various locations, generally lacked even the usual minimal maintenance attention required to keep them in service.

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. GEOGRAPHICAL RECONNAISSANCE

According to the Drafting Committee on Terminology, convened by WHO ie 1961, Geographical Reconnaissance is defined as "the operation which les the basis for the choice of field centers and depots, for detailed ules and itineraries of spraying and surveillance personnel, for the deployment of transport, and for the numerical control of the completness e work accomplished or reported". It includes collection of information e number, type, location and means of access to all houses and field ers, as well as on communications, health units, vehicle repair facilities, ation movements and other relevant factors.

The following are accepted concepts of Geographical Reconnaissance (G.R.): oth WHO and AID malaria authorities:

It is imperative that G.R. be completed before the start of spraying operations.

Spraying operations must begin soon after the completion of geographical reconnaissance (before data become obsolete).

G.R. should not last more than a year.

G.R. is an expensive operation requiring careful preparation and organization [illegible] undertaken until the country is ready for the activities [illegible] a malaria eradication program.

[illegible] must be kept up-to-date constantly and during each spraying cycle.

Geographical Reconnaissance was completed in eight States, now under the [illegible] phase, in anywhere from 3 to 12 months. Spraying operations started soon [illegible] the completion of Geographical Reconnaissance, which has also been kept up-to- [illegible] during each spraying cycle. In those States where the geographical area under

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attack has been increased, the increase was due to inadequate demarcation of the malarious area and not to a deficient geographical reconnaissance operation.

In all the other States (sectors), which are under the preparatory phase, this phase started on or about January 1, 1962 with the exception of two sectors which started on or about July 1, 1962. (Reference is made to the table "Sectors Under Preparatory Phase" following Chapter III "Historical Background and another detailed listing in the Appendix"). The only sector now under the attack phase which completed G.R. under "combined Geographical Reconnaissance partial spraying phase" was Roraima, population of about 35,000 persons living in an area of 230,104 sq. kms. Espirito Santo, with 122,162 houses and an approximate population of 490,000 persons residing in the malarious area (designated for total coverage), completed the numbering of houses in 1964, but will not be ready for the attack phase until January 1, 1965. As can be appreciated from the latter detailed table referred to most of the sectors still have a large quantity of houses to locate and number, even after spending approximately 30 months in the "combined preparatory attack phase". Geographical Reconnaissance has not been brought-up-to-date during each cycle in all "partial spraying" areas.

All of these sectors carrying out geographical reconnaissance simultaneously with the "partial spraying operations" do not have sufficient funds, personnel, nor vehicles to carry out the combined operations. Much remains to be done in achieving adequacy throughout the field installations including offices, supply depots, vehicle repair shops, and other facilities.

An excellent "Manual of Geographical Reconnaissance" has been prepared and is in use. Two forms are used:

"Recognized Locality Report"	-	CEM-OI-1
"Registry of Houses"	-	CEM-OI-2

Geographical Reconnaissance agents receive lower salaries than the raymen. However, the Geographical Reconnaissance agents presently employed e not of a sufficent high caliber. These agents eventually become spraymen.

Sectors use both area sketch maps and locality sketch maps. In some ctors, when localities are very small, no locality sketch maps are made for hem. The area sketch map shows the number of houses in each locality.

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C. SPRAY OPERATIONS

In Brazil, as in many other countries in the world, the method chosen for the interruption of malaria transmission is residual insecticide house spraying.

Pampana says "If based on residual spraying, the phase of attack would start when, through geographical reconnaissance, all houses of the malarious area have been numbered, their exact population counted, and the total surface area to be sprayed calculated".

In order to be effective, residual insecticide house spraying must cover all the surfaces in all the houses numbered with the correct dosage following regular cycles. These four preceding conditions must at least be met if transmission of malaria is to be interrupted.

Unlike other countries, however, Brazil is using residual insecticide house spraying, known as either "emergency spraying" or "partial spraying" to reduce the malaria incidence. This "emergency or partial spraying" is done simultaneously with geographical reconnaissance. The Evaluation Team again wishes to emphasize that this type of "mixed" or dual simultaneous operation prejudices the effectiveness of both.

Partial spraying protected approximately 5 million persons from 1 January to 1 July, 1964 in the Sectors under the preparatory phase. The following descri of the current status is related only to those sectors in the attack phase.

In the sectors which are under the attack phase, in 1960 approximately 1.5 million people were placed under spray protection. The number had increased approximately 5.5 million by June 30, 1964. These population figures include pe living in cities inside the protective spraying barrier. The percentage of hous which were visited, but were missed either due to refusals or because they were

closed, amounted to 11.9%. The number of shut houses is slightly higher than the number of refusals.

This very large percentage of "missed" houses which are visited constitute the most serious problem in the spraying operations. The number of houses which were not visited is not reported. No mop-up work is done by any special squads. Seriously prejudicing the effectiveness of the spraying is the large number of missed houses in cities where they have set up a barrier.

In most sectors, the number of non-sprayable houses was originally included in the geographical reconnaissance work. This number has been carried in the subsequent spraying cycles, thus complicating the spraying statistics.

The inside of all houses and of adjacent sheds are sprayed with DDT every six months. Spraying is performed by squads whose composition vary from 2 to 5 squad men. A fluvial squad may consist of from 2 to 4 spraymen and a squad chief. Frequently, in fluvial and horseback squads, the squad chief also sprays alongside his men. Squads which are transported on horseback usually have the same composition as the fluvial squads. Motorized vehicle squads have 4 or 5 spraymen with a squad chief. Squads on foot have 5 spraymen with a squad chief.

The following are used in the spraying of houses: Emulsion, suspension and solution. The emulsion now in use in the country is made from an 80% DDT concentrate paste ("pasta"). This paste is prepared in five factories (Rio de Janeiro, Curitiba, Salvador, Recife, and one under installation in Belém) in the following manner:

In a mechanical mixer, 35 kgms of DDT are mixed with 8 liters of "Xylol" for 5 minutes; to which are added 2 liters of kerosene and mixed for an additional 10 minutes; then 6 liters of Triton (Octagon 602) are added and mixed for 10 more minutes; the mixture then goes through a mill, from which the finished paste is

collected. The paste is then weighed and packaged into small tin cans, each one containing 625 gms. of the 80% DDT paste (to be mixed with water to make 10 liters of emulsion). It is planned to replace the tin cans with glass jars.

This paste is being used more and more throughout the country in an attempt to reduce the number of refusals. It is intended for use on impermeable surfaces which are painted or which have a good finish. However, it is also used on permeable surfaces with a good finish.

The squad chief notifies the householders of the spraying, usually a day in advance, but sometimes the notifications are made only an hour or two before the actual spraying. The squad chief also selects the type of formulation (suspension, solution, or emulsion), distributes the work amongst his men and fills out the spraying forms. The sprayman sprays houses assigned to him by the squad chiefs, fills out form CEM-OI-7, the sprayman's daily report form and signs the house visit card posted inside each dwelling.

In preparing the spray suspension, the sprayman adds 670 gms. of 75% wettable DDT (contained in a small individual plastic bag) into a bucket where he mixes it with a paddle and enough water to make 10 liters of suspension. To provide better mixing, the contents of the closed spraying can are shaken by inverting the tank several times. The 5% solution is not prepared by the sprayman who receives the prepared solution from the solution drum. The pump is stroked enough times to bring the pressure of the can to 55 p.s.i. When the sprayer does have a pressure gauge, or when the pressure gauge is defective, the pump is stroked 70 times. The sprayman then applies the fan-shaped spray of 5% DDT throughout the entire inner surface of the walls and ceilings as high as the wand can reach (3 meters) of every house. The rhythm of spraying is presumably such that an

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ivalent of 2 gms. technical DDT is deposited per 1 sq. meter of surface. under sides of furniture are also sprayed.

All spraying personnel wear CEM uniforms and a helmet. Each sprayman a flag with his identification number which he places outside the house t he is spraying.

The squad chiefs have the itinerary and/or the planning record (CEM-OI-4) the area or locality sketch maps.

Overseeing the spray squads are the spraying operations inspectors who expected to verify, help and supervise the operations. They usually have from o 5 squads under their responsibility. These inspectors are also used as pay-ters and for other administrative duties. The inspectors are in turn responsible the district chief, whose function is much more administrative than technical. sector engineer is responsible for all spraying operations within his sector. addition to this responsibility which includes supervision, the sector engineer pares the spraying operations plan, which is forwarded to the Superintendency dquarters. He is assisted by the Coordination Engineer in the training of sonnel. The Coordination Engineer supervises the work in all the sectors under jurisdiction: also compiles and analyzes data.

The Superintendency Engineering Section has two basic functions; analysis planning. The field plans are analyzed and revised; standards and norms are blish; instruction guides and operational manuals and records are prepared; istical data are compiled and analyzed; and supervision is made of Coordination Sector operations.

See Appendix for information regarding the requirements and related problems ecruiting engineers.

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Manuals have been prepared for and are being used by the spraymen, squad chiefs and inspectors. The manuals "Technique of Spraying", "Hudson Sprayers X-Pert 710 S/148" have also been prepared.

The following records are used:

CEM-OI-6	- House Visit Card	- By Sprayman
CEM-OI-7	- Sprayman's Daily Report	- By Sprayman
CEM-OI-8	- Squad Chief's Weekly Report	- By Squad Chief
CEM-OI-10	- Guide for Inspection of Brigade Chief's Work	- By Inspector
CEM-OI-11	- Guide for Inspection of Sprayman's Work	- By Inspector
CEM-OI-3	- Locality Kardex Card	- By Sector Engineer
CEM-OI-4	- Planning of Spraying Operations	- By Sector Engineer
CEM-OI-5	- Itinerary for Squad	- By Sector Engineer

Many sectors were using their own prepared records in addition to the above. There are no records for "pending houses" or for "localities terminated".

The number of houses sprayed per man day is calculated using the number of days the men worked and not the number of days for which the spraymen were paid. Days spent on travel, and spraycan repairs or lost through vehicle breakdowns or unusual weather, etc. are not considered in computing the yield per sprayman.

Several items that were observed in some places:

1) a great deal of time was spent by the personnel and/or the householder in preparing the house for spraying;

2) when pressure gauges were not working, excessive pressures were used in spraying. This, coupled with a distance of the tip further than 45 cms. from the wall, produced a swath wider than 75 cms.;

3) in many instances the sprayman did not overlap the swath.

4) the absence of flaslights by squads and sector chief and by other supervisory personnel;

5) an area on the wall approximately 25 cms from the floor is not sprayed;
6) sprayman do not agitate the can often enough while spraying with suspension;
7) spraying is <u>not</u> done on the following external surfaces: under eaves and upper part of walls protected by same when walls do not reach slanting roof.

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D. ENTOMOLOGY

When the Malaria Eradication Program began its operations, there was substantial and useful entomological information available, though it was regarded as somewhat obsolete in view of the changes which have taken place in the country in the past 20 years, brought about by population increase and occupancy of areas which hitherto were unsettled, devastation of large forests, construction of large and small dams, expansion of irrigation etc., which factors were capable of radically changing the physical appearance of vast areas, thus causing profound alterations in the composition and density of the anopheles vector population.

According to certain observers, the repeated utilization, cycle after cycle, of house spraying with DDT seems to have caused anopheles mosquitoes to change their behaviour in the presence of DDT in some places, which led to the much publicized belief among technicians, that in these areas DDT had ceased to be useful in the fight against malaria, since it did not succeed in stopping transmission of the disease. As more typical examples thereof one could mention the following: the suspicion that the species Kerteszia cruzii and bellator of some areas did not enter DDT-sprayed houses, and only transmitted malaria outdoors while the A.darlingi species found in the Engenheiro Dolabela (Minas Gerais), area escaped contact with DDT and after feeding in the house it would go out to rest on unsprayed outer walls. Since in both cases failure of the insecticide was apparent different methods were attempted. In the Kerteszia-infested area, manual removal of bromeliads and destruction of those plants was carried out by means of airplane or hand spraying of calcium arsenate and copper sulfate. Chloroquine salt was also used and a careful search for malaria-infected people and their radical cure were attempted, but results were far from encouraging owing to the vastness of the

ffected areas and the physical impossibility to effectively use these procedures throughout the area against A.darlingi at Dolabela. Chloroquine-salt was used for a time successfully at first but with less success later since transmission continued.

Malaria Vectors

Of the 53 species and sub-species of anopheles found in Brazil, the most important malaria vectors belong to Nyssorhunchus and Kerteszia sub-genera and may be divided into two categories according to their known degree of risk:

PRIMARY VECTORS

A.(N.) darlingi
A.(N.) aquasalis
A.(N.) albitarsis
A.(K.) cruzii
A.(K.) bellator

SECONDARY, LOCAL OR CASUAL VECTORS

A.(N.) strodei
A.(N.) noroestensis
A.(N.) brasiliensis
A.(K.) homunculus (?)

A.(N.) Nuneztovari should be added to the above group since it is a species whose value as a vector is still unknown in Brazil, but which is to be found all over the Amazon region, and is frequently captured with human bait.

The two sub-genera mentioned above had fields of activity which can be schematically divided by taking as a limit the parallel 25°.S which crosses the south of the State of São Paulo. From there towards the North, Nyssorhunchus species are responsible for endemic malaria, A.aquasalis on the coastal strip and A.darlingi in the hinterland, especially of large rivers and their tributaries. South of the parallel referred to, in the area of bromelid-covered woods, adjacent to the

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Atlantic Ocean, the vector is the Kerteszia. But in the inland areas, on the basin of the Paraná and Paraguay Rivers, there are malaria outbreaks from time to time caused by A.darlingi and which are kept up for some time by A.albitarsis and some other secondary vector.

Of the three species of Nyssorhunchus referred to, A.darlingi is the most dangerous vector because of its pronounced anthropophilic characteristic, great domesticity and extensive geographic dispersion, and it is considered responsible for most malaria transmission in Brazil. The distribution of A.aquasalis, the second vector, is limited to the coastal strip, owing to its requirement for breeding places with slightly briny water; nevertheless, it has been found in localities about 150 to 200 kilometers from the coast in the Northeast area. On the other hand, A.albitarsis is the commonest and most widely disseminated anopheline in the country, though it has a smaller vector capacity because it is more zoophilic. It is dangerous only in localities where it is abundant, where there are few cattle and where particularly domestic strains are found.

The Kerteszia sub-genus is found on the Atlantic coast of 11 States, from Paraiba as far down as Rio Grande do Sul, but the actual area of transmission of the sub-genus extends down the coastal strip of the States of São Paulo (only in the extreme South), Paraná and Santa Catarina, which has not precluded the appearance of malaria outbreaks north of that area, caused by K.cruzii. The most important vectors are K.cruzii and K.bellator, K.homunculus being less dangerous.

1. Biological Bases for a Malaria Eradication Program

The success of a malaria eradication program based principally on house spraying with DDT depends on the degree of domesticity of the vectors, of their anthropophilic character, of their habit of remaining inside houses, and of their susceptibility.

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Knowledge of the biology of the major vector species in Brazil was sufficient during the execution of control programs, when the only concern was to try to minimize the incidence of malaria by combating the disease in its most active foci. The most important anopheles vectors (A.darlingi, A.aquasalis, A. albitarsis, K. cruzii and K. bellator) have characteristics which make the use of DDT in houses a biologically effective method of control.

a) They were intra-domiciliary species, especially A.darlingi, which was held responsible for most cases of malaria. But there were some regional variations in the degree of domesticity; thus for example A. aquasalis was found more frequently in houses in the Northeast than in other areas, whereas A.albitarsis, which generally is less domestic, included certain strains with definite indoor habits.

b) They were sufficiently anthropophylic, particularly A.darlingi, and attacked men indoors. But here too there were variations, and even this species in Central Brazil presented a greater degree of zoophily.

c) They rested in houses for a variable length of time, which, usually, was sufficiently long to be affected by the insecticide. On the other hand, it was known that Kerteszia was characterized by its wilder behavior, feeding indoors and leaving soon, with a shorter resting inside buildings.

d) Malaria was largely transmitted indoors, although it was assumed that a certain percentage took place in the vicinity of the houses or at a greater distance therefrom, especially in the Kerteszia region.

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e) The vector anopheles were susceptible to DDT action, with the exception of certain groups of A.strodei of the State of São Paulo, which in some localties showed some physiological resistance, the same being true of A.aquasalis of the city of Belém, State of Pará. In both cases the degree of resistance was low and did not prevent an effective action of the insecticide.

All in all, these conditions were sufficient to justify the indoor utilization of DDT to fight malaria, especially considering that the major enemy to be destroyed was A.darlingi, the species presenting more favorable features in this connection. Results obtained served to confirm this forecast and even surpassed it in the areas where transmission takes place by species known to be only slightly domestic (K.cruzii, and K.bellator). But, although general benefits came up to expectations, there are certain areas in which apparently DDT failed to curtail malaria incidence (Engenheiro Dolabela, with transmission by A.darlingi and places with transmission by Kerteszia).

Disregarding all possible flaws in protecting households with insecticide (large percentages of non-sprayed houses, ill-sprayed houses, washed, painted or renovated walls, absorbing wall clay, etc., which are very common factors in a country of the size of Brazil, with so many varied geographic and climatic aspects, with so many different types of dwellings and personal habits of the people and of the anopheline species (some of which, being normally secondary casual vectors, may under favorable circumstances turn into major local vectors) it is only natural to predict that, when the activities of the Malaria Eradication Program are intensified, there is a likelihood that, in some places, the successive cycles of DDT will fail to eliminate the transmission of malaria.

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will be the time when entomological-epidemiological investigations should be expanded to find out why transmission persists. But until such a phase is arrived at, the Commission is of opinion that the use of DDT indoors in the entire malarious area of Brazil is fully justified, as the major and most effective means of control of the Eradication Program.

2. Present entomological activities

a) Personnel

When the Malaria Eradication Program attempted to bring up-to-date the available information on vectors, it stumbled on the sericus inconvenience caused by lack of adequately trained personnel, which compelled it to re-train its entomologists and to train successive groups of Entomology Assistants to fill the vacancies. But part of these new technicians, upon reaching the field, failed in their jobs for various reasons and had to be replaced. These are the conditions prevalent in November 1964, with nearly 50% of available positions unfilled (See Chart in Appendix).

The Entomology personnel now rendering services to CEM are distributed as shown on the chart referred to above.

In the Central Office (Rio de Janeiro), there is an Entomology Chief, who is assisted by three Supervising Entomologists. Acting in close collaboration with the Epidemiology Section of the Central Office, they guide the investigations in the Sectors and supervise the work both in the laboratory and in the field, also taking an active part in special studies in the "difficult" areas. Altogether, this is a job which is next to impossible to do with such scant personnel, mainly because the work in the central office absorbs a good deal of their time. At the Central Office level there is also an International Advisor of the Pan American Sanitary Bureau, a

Malaria Eradication Consultant who has been working in this country since 1962.

The Supervising Entomologists of the Regional Coordinations (Regional Offices), total 5, but they are inadequately distributed because in Region V there are three. In Region III and IV these positions are not included in the staffing pattern.

As to Entomology Assistants, there are only 24 filled positions for the 44 positions vacancies provided for. Of these, 3 were trained in 1958, 10 in 1962, 9 in 1963 and 2 are being trained in Belém. Therefore nearly all personnel are unskilled and require continuous supervision and orientation, which are hard to provide under present circumstances. Furthermore, several of these Assistants will leave their jobs shortly to take up other activities and several of the remaining ones perform jobs alien to their specialty.

Each Entomology Assistant should be assisted by 1 to 2 helpers with a driver with 1 jeep for his "exclusive use" (in order to prevent it from being contaminated by insecticide), but in several sectors this requirement fails to be met owing to the lack of vehicles in sufficient quantity. And the same takes place on sites intended for Entomology laboratories, most of which, when available, are not equipped with the least conditions to permit the conduct of a regular job.

Summing up: the Entomology personnel is scant at all levels; training and orientation of Entomology Assistants is generally deficient; its facilities helpers, vehicles, laboratories, means of work insufficient or inadequate, except in a few sectors. Under such conditions, Assistants are only able to perform simple routine jobs, and it is impossible for higher level personnel

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to supervise them as frequently as desirable.

b) Studies carried out

Owing to the lack of adequately trained personnel and the other causes already specified above, the entomology jobs performed by CEM are of poor quality in most of the sectors. Too much emphasis continues to be placed in field studies on larvae investigations and captures with animal baits are frequently used. On the other hand, no adequate observations are being made on the behaviour of vectors. To delimit the malarious area, there were taken as a basis the data gathered during the control phase, and it was only sought to update the geographic distribution of anopheles in certain areas, to conduct susceptibility tests and to make isolated observations on the behaviour of certain species. Also, the correct laying out of the protection barriers of cities constitutes a difficult problem, with quite different aspects in each. The former control program activities (drainage, cleaning of canals, anti-larval control, etc.) were discontinued several years ago, but the present barriers of most cities are based on entomological information of that time. These are old data, because the large growth of practically all those cities, with new districts occupying vast suburban areas, may have changed the natural environment favorable to mosquitoes, with consequent changes on the anopheles population. Few are the cities in which there were recently conducted adequate simultaneous entomologic epidemiologic studies so as to make certain that the definition of barrier boundaries is the most efficient and economic possible or that the data gathered thereon would permit a more suitable determination of where the barrier should be located. Furthermore,

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in most of the cities, the percentage of non-sprayed houses within the [illegible] is very high, which reduces a good deal of its protective value.

Regional Coordination I, covering the Amazon region, functioned more methodically during 1963/1964, succeeded in gathering fairly specific information. Though it does not completely meet Program requirements, this is at least a good beginning. In this connection, the Sectors of Pará, Amapá and Roraima were the most active ones. In the rest of Brazil the data obtained are irregular in their distribution and have a very uneven value.

1. The A.darlingi of Engeheiro Dolabela

The presumed change in the behaviour of A.darlingi is such a widely disseminated fact that this area has become a typical example cited by many authors, and for this reason no further comment is made on the subject.

Engenheiro Dolabela, State of Minas Gerais, constitutes the central hub of a large cattle ranch which includes a sugar mill. Its steady population is about 7,000 people scattered over a score of localities, but its population increases considerably during the sugar harvest with workers coming in from other States. This is a region which always had a very high malaria incidence and therefore it was one of the first localities in Brazil to be sprayed with DDT. Bi-yearly DDT applications in houses were started back in 1946 and subsequently they were continued at cycles of every 4 months. As a result, malaria incidence declined but, in spite of all efforts, the disease persisted. This led to a number of investigations to establish the causes of such persistence in transmission, those performed by Bustamante and his collaborators in 1951/1952 standing out in importance.

In summing up his findings in 1957, this author noticed that the always abundant A.darlingi, in Dolabela did not behave the way it did before the use of DDT when large quantities of them were found resting inside the houses. Now, these mosquitoes continue to enter DDT-sprayed houses to feed but do not remain inside rather leave soon after to rest on outer walls. From this observation he inferred that the pressure of the insecticide kept up over several years had brought about a change in the behaviour of the species which had developed an immunity to the insecticide and consequently the DDT did not succeed in interrupting transmission, and malaria thus persisted. Therefore, other means were required in order to continue the eradication campaign.

Subsequently, Dolabela has been considered a "difficult" malarious area and was given the status of an experimental area. The last DDT application was made in April 1957 and soon chloroquine salt began to be distributed regularly. At inception, the salt proved effective, but it never succeeded in eliminating the disease, which had increased in the last few years, especially when salt distribution was discontinued in February 1964 owing to stock depletion.

In May 1964 the PASB entomologist advisor visited Dolabela and made a number of observations around the area, its inhabitants, the behaviour of A.darlingi and on the various possible causes of the failure of DDT and chloroquine salt.

Inasmuch as A.darlingi continues to be normally susceptible to DDT, it was suggested as a first measure that the whole area be sprayed with DDT and entomologic-epidemiologic studies were planned including investigations on the behaviour of the vector and on the area of origin of the malaria patients observed.

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Observations took place in experimental huts, one of them treated with DDT (2 grams per square meter) and the other without any insecticide. While studies are continuing, the first results enable us to reveal that the behaviour of A.darlingi is that which we consider as normal for this species: the first specimens enter the house at dusk, resting on the wall or otherwise, feeding on the human bait, rest again and, after a variable length of time, which sometimes will last for hours, they go out of the house. After the first wave enters at nightfall, the specimens which come in later usually rest before going in, either on the neighboring vegetation or on the outer walls. On the other hand, engorged females coming out of the houses will seldom rest on outer walls. This is true both in houses without DDT and in the DDT-treated houses, with the exception that, in the latter, the length of stay of the anopheles is much shorter. It is without doubt DDT affects them and induces them to leave though this does not prevent specimens falling on the floor intoxicated whether full or empty. It is possible that this group will show an irritability higher than that deemed as normal for the species, but this still remains to be proved.

Finally, if the Dolabela "problem" is to be put into proportion: a small area with excellent roads, a steady population made up of employees and workers of an important industrial plant grouped in a small location and therefore easy to control. It is not understood why the elimination of this malaria focus cannot be accomplished using necessary combined methods such as DDT and radical cure. Summing up: on the basis of this analysis, the evaluation team does not consider Dolabela as a "problem" area.

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4.

Kerteszia's area of transmission

The regular Kerteszia's transmission area includes the humid bromeliad-forests, situated near the Atlantic Ocean, in the States of Paraná, Santa Catarina, and in the extreme south of São Paulo.

This region is very uneven and includes a coastal plan bound by steep hills and ranges with numerous valleys. The population is either grouped in important and industrialized cities or scattered over the whole territory and engaging in small scale farming and cattle raising, fishing, etc. There are many beaches with seaside resorts patronized by throngs of summer vacationers.

The whole region is covered with woods, which man has been felling in the flat lands and valleys, but there remain the ranges and hills with a primitive vegetation which included bromeliads, the breeding places of Kerteszia. Small and medium-size communities in these places are usually located along narrow valleys surrounded by forested hills. The same is true of the farming families who occupy sites yet more isolated and wild sites. Man usually builds his home on lower sites clear from vegetation, and the houses is thus surrounded by neighboring hills, sources of Kerteszia, from which they come out in search of man. Furthermore, because pasture land is generally scarce in this type of land, the quantity of cattle is negligible and fails to constitute an effective biological barrier to protect man.

K.cruzii is the most abundant species everywhere, and reaches a certain density up to 600 meters above sea level. K.bellator prefers coastal plains and thrives well in sun-bathed bromeliads. Both species are vectors with similar habits, but one gains the impression that they become dangerous vectors only when their density is high. The two species are susceptible

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to DDT 4%, with a 100% mortality rate. According to studies made recently, these anopheles can fly a distance of over 1,000 meters from their original breeding places. They will attack men in the woods in the full light of day, either in the sun or inthe shade, but at dusk they will appear in substantially larger quantities which last for several hours. These are wild mosquitoes which do not care much about entering houses and resting therein. But they will fetch their food wherever it is, therefore, if man stays outdoors in the first hours of night, they will be bitten by Kerteszia. On the other hand, if men seek shelter inside their homes, these anopheles will go into the house to attack them. If a family is partly indoors and partly outdoors, there is no doubt that those outside of the house will suffer much more from the attack of these mosquitoes. Generallly in these humid woods regions, it cools down at nightfall and the farmers retire early. But also, if they go into the houses trying to flee from mosquitoes, the latter will penetrate the house through holes in the walls or the ceiling, over a good part of the night. This picture is different in larger places or in summer resorts whose inhabit because of different climatic and cultural tendencies usually stay out of the houses to refresh themselves. Summarizing both situations:

a) Dwellers in rural areas: While they work they are bitten in broad daylight, either in the woods or in the neighboring fields, but a relatively small number of Kerteszia. At nightfall, their intensity increases considerably. Attacks are made in or out of the house, and continue, as family members retire, with the arrival of other specimens which penetrate the houses. DDT applied in the houses should destroy a good deal of the mosquitoes which find it difficult to fly out once they are engorged. The more isolated a family in a bromiliads-covered woods, the larger the nu

of extra-domiciliary transmission.

b) Dwellers in urban areas: Rarely attacked during the day. At nightfall they are generally bitten when outdoors by a relatively small number of specimens. For this reason, DDT-spraying of the houses, though useful, has a smaller protective value.

Technicians charged with eradication in the Sectors where transmission of Kerteszia occurs believe that in several areas these anopheles do not enter DDT-sprayed houses, and have them turned into extra-domiciliary vectors exclusively. They consider therefore that DDT is no longer effective to stop transmission. This theory would explain the small success of CEM in the spraying cycles carried out in the Kerteszia area.

Data provided by insecticide operations in the Paraná and Santa Catarina Sectors, which are in the sixth spraying cycle, show very high percentages of non-sprayed houses. In large cities and seaside resorts these percentages frequently are over 50%. While houses scattered in the wooded hills are hard to reach and, above, all, to supervise, the number of existing unprotected houses is not known.

The entomology activity of both sectors was ill oriented, and only routine work with little practical objectives was performed. Their data, because of the way they were obtained, provided misleading information on what was really going on with Kerteszia in the houses. For example, in the São Francisco Island's experiment area, the outdoor capture and captures performed from time to time by helpers in the houses, provided the following results for the entire year of 1963:

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Time	CAPTURES		
	Extra-domiciliary (Human Bait)	Domiciliary (1) Inner Walls	Domiciliary (1) Outer Walls
Morning	645	26	0
Night	5,932	103	45.

(1) Including chicken coops, stables, pig sties.

According to these data, Kerteszia very seldom entered inside houses, but were abundant in their vicinity. This type of entomological information and other similar data, must have given rise to the idea widely disseminated among the CEM personnel that DDT would not affect Kerteszia, since they do not now penetrate DDT-treated houses, and which made it necessary to substitute other means of fighting for that insecticide. But in thinking this, they overlooked the high number of unprotected houses which existed in the area. Furthermore, that type of entomological information is in sheer disagreement with what the team's Entomologist observed, together with the Chief of the Entomology Section of the Central Office and the Entomologists of the Paraná and Santa Catarina Sectors in the two experimental areas of Guaratuba and São Francisco Island which he inspected in 1964. As a result of his observations, he believes that changes attributed to the behaviour of Kerteszia's have not been observed in the field.

In both areas it was observed that they enter the DDT protected houses at night, in a rapidly increasing number, and most of them will attack human beings, while other will rest some minutes on the walls or on the ceiling.

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Upon feeding, they fill themselves up with so much blood that many of them practically fall to the ground, the number of those which succeed in flying away in the first attempt is being small. Already engorged, they try to leave the house immediately or after resting some minutes. To this end they will either walk or take short flights towards doors and windows. Many rest on the walls, while others, engorged or empty, rest on the ceiling. The time they take to go out is variable some specimens taking more than 10 minutes before departing. On the floor of houses there were found intoxicated fallen females, filled or empty. The intensive light seemed to attract these anopheles to the houses, a factor which may prove favorable in localities which electric lighting, where protected by DDT. The foregoing constitutes preliminary observations which will be followed by careful studies on the behaviour of these species in the presence of the insecticide.

It should be noted that in the area of Kerteszia, malaria transmission by other types of anopheles is practically negligible. During winter time, transmission rate declines or becomes steady, according to the location, because low temperatures prevent development of plasmodia. However, Kerteszias though with a lower density, continue attacking man when the climate is mild.

There is an example of the effective action of DDT in Cananéia, in the South of the State of São Paulo. Since 1960, that area has been sprayed with DDT, but only partially, since only part of the houses were covered, and malaria persisted. In 1962, as adequate river teams became available, the far-removed localities could be reached and all the houses were DDT-sprayed and the work been continued in subsequent cycles. Since then,

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transmission has ceased in that area, and only the radical cure of a few patients in the more affected regions has been necessary.

Another more obvious case took place in the State of Santa Catarina. In the townships of Gravataí and Armazen, which for 15 years did not have any malaria cases, there was an outbreak at the end of 1962 which exceeded 250 cases. No measure was adopted until the second half of 1963, when all houses were sprayed with DDT, spraying having been repeated in the first half of 1964. Malaria incidence has dropped vertically without the need to resort to any supplementary measures.

The problem posed by Malaria Eradication in Kerteszia transmission regions is quite complex because it presents distinct features in each one of the areas. The situation is different if one observes a rural zone, or in a larger locality extending over a narrow valley, in an important city, or in a seaside resort.

The team believes that the use of DDT correctly applied in the houses of this malarious area should stop transmission by Kerteszia's being thus the basic weapon to utilize. But certain locations well defined by entomological and epidemiological studies, after careful observations in which it is confirmed that DDT will not suffice, may require other supplementary means. Furthermore, in the Commission's opinion it would be useless to insist upon spraying certain localities with DDT, which because of location and environmental factors possess a low Kerteszia density, since the possibility of transmission therein is neglegible. Generally, these conditions are present in cities and seaside resorts, which usually have a large number of non-sprayed houses. It is believed that only those houses which are permanently occupied should be sprayed; houses

which are generally situated on the outskirts of the urban areas. In the other parts of the city systematic case finding should be carried out immediately, followed by the initiation of radical treatment.

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E. EPIDEMIOLOGY

The epidemiological activites of the Malaria Eradication Program (CEM), were initiated early in 1962 at the beginning of the preparatory phase of the program. The following is a description of the two categories of the Section into which the country was divided in order to conform with the eradication program.

1. In circular CEM-13/61 of November 21, 1961 the objectives of the program were outlined as follows:

   a) Plan, execute and evaluate the program with eradication as the goal.

   b) Continue the eradication program in the following Sectors of Ceará, Rio Grande do Norte, Paraíba, Alagoas and Sergipe.

   c) Initiate total coverage in the Sectors of Pernambuco, Rio de Janeiro, and Paraná.

   d) Initiate total coverage in the remaining Sectors but only in specific malarious areas. These operations will comply with eradication techniques except that geographic reconnaissance will be done simultaneously with spraying.

   e) Beginning with the second semester of 1962 an epidemiological program will be initiated in the entire country bearing in mind the fundamental importance of establishing a chain of Notification Posts in all the presumably malarious areas during 1962. These posts are to meet the following needs:

      (1) Recognize the present malarious areas and the characteristics of the disease,

      (2) Provide anti-malarious drugs to the population before spraying is initiated,

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(3) Train Personnel necessary for the 1962 program and for future activities.

Malarious Areas - The following concept of the malarious areas was adopted by CEM:

Delimitation of Malarious Areas

The Eradication Campaign was initiated in the Northeastern Region. The existing malarious area of that Region were delimitated on the basis set forth by the Control Program. In order to delimitate the malarious areas the following measures were adopted: a) discontinuance of the activities of the Antimalaria Drug Distribution Units (UDAS) existing in the region; b) Elimination of the spraying cycles and utilization of the available personnel in active case detection; c) with the assistance of health centers, private physicians and para-medical personnel data were collected at the beginning of the campaign on the incidence of malaria during the previous three years; d) survey of existing data since the first control operations.

The previous malarious areas in the Northeast, where for several years no malarious cases had occurred, were considered as vigilance areas. In spite of the judicious criterion for the delimitation of these areas, these vigilance areas subsequently presented evidence of transmission. The operation of epidemiologic activities in the Sector, Regional Coordination and Superintendency in Rio has been analyzed.

The way they are carried out may be verified in the following list of documents, whose origin and routing are included in the document: "Schematic representation of routing of forms utilized in epidemiologic [illegible] verified that there is a relation between the document

and the routing followed by each form.

We also have analyzed Circular CEM-21/62, of May 8, 1962, which contains the Regulation for the utilization of Epidemiologic forms and which corresponds with the actual facts. They are as follows:*

EP-1 Is the agreement between CEM and the Voluntary Collaborator for the operation of a N.P., and is signed by the Chief of Sector and the collaborator.

EP-2 - Card of installation of a N.P.

EP-3 - Sign for the door of a N.P.

EP-5 - Note sent by the collaborator together with the slide.

EP-21 - Reviewing bulletin of blood samples.

EP-22 - Note from the Coordinator to the Microscopist on the result of the revision of the slides.

EP-23 - Filing card of positives slides.

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* Abbreviations

EP = Epidemiology

N.P. = Notification Post

P.F. = Passive Finding

A.F. = Active Finding

Guarda EP - Evaluator

V.C. = Voluntary Collaborator

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EP-28 - Daily bulletin of active case findings, by localities.

EP-31 - Receipt for anti-malarial drugs.

EP-32 - Monthly bulletin of control of anti-malarial drugs distributed in the Sector, by localities.

EP-33 - Bulletin of distribution of anti-malarial drugs.

EP-34 - Itinerary of the epidemiological personnel for checking the N.P.

EP-35 - Weekly summary of Epidemiology guardas, Inspectors and other workers of activities in Passive and Active case findings.

EP-36 - Bulletin of control of N.P. production during the year.

EP-37 - Monthly result of the test of slides sent by each N.P.

EP-38 - Monthly summary of the work of the epidemiology Inspector, by municipios of Passive and Active case findings.

EP-39 - Monthly summary of epidemiologic activities in the Sector, signed by the Assistant malariologist and the Chief of Sector.

EP-40 - Microscopist's control card, by supervisor of a Coordination (team and technical and administrative procedures used by the microscopist).

EP-42 - Epidemiology card of the locality.

EP-43 - Epidemiology card of the municipio.

EP-44 - Investigation of a malaria case (classified by the malariologist who signed the form).

EP-45 - Analytical summary of the evaluation at District level, signed by the Chief of the District and by the Assistant Epidemiologist.

EP-46 - Summary of the epidemiology evaluation by localtiy.

EP-47 - Epidemiology card - Summary, by municipio.

Manuals and Circulars prepared by the Superintendency and its team of advisors and representatives to the Coordinators and Sectors have been analyzed; thus CEM central agency complies with its regulating and supervisory function.

4. The Sectors of operation are of two categories.

a) Nine Sectors under eradication: 1) Five in the Northeast; Ceará, Rio Grande do Norte, Paraíba, Pernambuco and Alagoas; 2) Two in the East: Sergipe and Rio de Janeiro; 3) One in the South: Paraná; 4) One in the North: Roraima. These Sectors contain 30% of the population of the total malarious areas of Brazil. (In the following explanation they are referred to as Groups and are not necessarily contiguous).

b) Under "partial and progressive coverage", or "emergency phase", are included 15 Sectors where the geographic reconnaissance and the partial coverage are simultaneously carried out: Amazonas, Pará, Acre, Rondônia, Amapá, Piauí, Maranhão, Bahia, Espirito Santo, Minas Gerais, Mato Grosso, and Santa Catarina. (The State of Bahia is divided into 3 Sectors which constitute a Regional Coordination). See table in Appendix. These 15 Sectors cover a malarious area of 6,7 million sq. km. and a population of 25,7 million.

The total malarious area in Brazil extends to an area of 7,2 million sq. km. (85% of the country's total surface) and has a population of 37,5 million (4% of the country's total population, excluding the State of São Paulo).

These 24 sectors are grouped in 5 Regional Coordinations (See Map in Appendix). Their development is delayed because CEM does not have the legal flexibility to pay adequate salaries to personnel, as is discussed elsewhere.

The epidemiological evaluation started at the same time as that of the emergency spraying in a large part of the 15 Sectors of Group II and they were initiated later than the beginning of the attack phase in the 9 Sectors under Eradication, with the exception of Roraima, where the attack phase started in 1964. The Table No. 1 entitled "Data on the Malaria Eradication Program in Brazil", contains the time schedule of the "emergency" and attack phases, and also of the epidemiological evaluation. The "emergency" phase started in the first semester of 1962, excepting the Acre Sector which started in the second semester of the same year. It is emphasized that in 8 of the 9 Sectors under the attack phase—excepting for Roraima—there are two areas, one under total coverage and one under vigilance. In the vigilance areas due to the excellent work under the control "CEM is conducting epidemiological investigations to ascertain whether or not transmission exits". (See Page 34 CEM's report to the Poços de Caldas Meeting).

Case findings is accomplished through passive and active detection.

a) Passive case findings are done through the 17,450 Notification Posts (NP) which had been installed up to December 31, 1963. It is expected that 6990 additional Notification Posts will be installed by the end of 1964. (See Table No. 2). Tables Nos. 3, 4 and 5

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show the passive case findings in the 23 Sectors, during the 1st and the 2nd semesters of 1963 and the 1st semester of 1964. Following is a summary of the contents of these 3 tables:

SUMMARY - TABLE OF PASSIVE CASE FINDINGS IN ALL SECTORS DURING 1963 AND 1964 (FIRST SEMESTER)

Information	1st Semester 1963	2nd Semester 1963	1st Semester 1964
Localities with NP	12,804	15,343	15,948
Visited Localities	9,044	8,329	9,549
Positive Localities	1,849	1,285	1,221
No. of existing NP	14,531	17,550	18,27[illegible]
No. of visited NP	10,010	9,483	10,[illegible]
No. of productive NP	6,421	5,721	6,[illegible]
% of Productivity - Year	44	32.6	[illegible]
No. of slides examined	227,620	262,293	24[illegible]
Total of positive slides	44,489	38,780	37,425
% of Positivity	20	14.8	15.1
Pos. for P. falciparum	11,888	12,017	9,809
Pos. for P. vivax	32,387	26,541	27,493
Pos. for P. malariae	12	21	12
Mixed Pos. (F+V)	193	201	111

For the 9 Sectors under eradication, tables Nos. 9, 10 and 11 include the activities of passive case findings during the two semesters of 1963 and the 1st semester of 1964. The following is the summary of these 3 tables:

SUMMARY - TABLE OF THE PASSIVE CASE FINDINGS IN THE SECTOR UNDER ERADICATION DURING 1963 AND 1964 (FIRST SEMESTER).

Information	1st Semester 1963	2nd Semester 1963	1st Semester 1964
Localities with NP	7,267	7,770	7,920
Visited Localites	5,964	4,860	6,004
Positive Localities	423	287	277
No. of existing NP	8,034	8,724	8,995
No. of visited NP	6,555	6,123	6,887
No. of Productivity NP	4,070	3,741	3,986
% of Productivity	50.6	42.9	44.3
No. of slides examined	88,929	121,196	110,997
Total of Positive Slides	4,796	4,593	7,467
% of Positivity	5.4	3.8	6.7
Pos. for P. falciparum	176	81	305
Pos. for P. vivax	4,619	4,507	7,155
Pos. for Mixed (F+V)	1	5	7

b) The active case finding of malarious cases are contained in tables Nos. 6, 7 and 8 related to the two semesters of 1963 and to the 1st semester 1964 for each reported Sector. Following is a summary of the contensts of these 3 tables:

SUMMARY - TABLE OF ACTIVE CASE FINDINGS DURING 1963/1964 (1st.SEM)

Information	1st Semester 1963	2nd Semester 1963	1st Semester 1964
Localities visited	32,136	6,627	8,314
Positive Localities	4,181	665	604
Houses visited	723,522	899,980	1,041,378
Slides from persons currently with fever	89,557	99,785	115,332
Slides from persons recently w/fever	80,733	100,693	127,749
Total of slides	170,290	200,478	243,081
Positive slides:			
Currently w/fever	11,935	8,440	8,549
Recently w/fever	3,393	2,173	1,982
Total of Positive slides	15,328	10,613	10,531
% Positive Slides	9	5.3	4.3
Positives for P. falciparum	7,622	5,273	4,704
Positives for P. vivax	7,469	5,213	5,753
Positives for P. malariae	37	19	6
Positives for Mixed (F+V)	200	108	68

The active malaria case findings in the 9 Sectors under eradication phase during the two semesters of 1963 and in the first semester of 1964 are contained in the Tables 12, 13 and 14. A summary of these tables follows:

SUMMARY - TABLE OF THE ACTIVE CASE FINDINGS IN SECTORS UNDER ERADICATION DURING 1963 and 1964 (FIRST SEMESTER)

Information	1st Semester 1963	2nd Semester 1963	1st Semester 1964
Localities visited	17,160	3,261	4,441
Positive Localities	279	274	91
No. of visited houses	396,068	436,608	492,551
Total of slides examined:	48,126	74,082	107,780
Currently s/fever	25,689	33,488	46,467
Recently w/fever	22,437	40,594	61,313
Total of Positive slides	433	449	989
Currently w/fever	331	331	850
Recently w/fever	102	118	139
% of Positive slides	0.9	0.6	0.9
Positive slides of:			
P. falciparum	13	8	133
P. vivax	418	439	855
Mixed (F+V)	2	2	1

Table No. 15 contains a "General Summary" of blood slides examined and positive slides in the eradication sectors, by active and passive case finding in the years 1961, 1962, 1963 and January-June 1964. The following Table indicates the percentages of positivity in each of the 9 Sectors:

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Sector	1959[a]	1960[a]	1961	1962	1963	1964
Ceará (1)	15.0	5.3	3.0	16.0[b]	12.1[b]	9.3
R.G.Norte (1)	10.0	2.2	5.0	0.6	0.1	0.02
Paraíba (1)	27.4	16.0	5.0	6.0	3.6	1.5
Pernambuco(1)	-	-	34.0	11.0	6.5	13.6[b]
Alagoas (2)	-	31.4	13.0	4.0	0.8	0.4
Segipe (2)	-	2.3	2.0	0.6	0.1	0.1
R.Janeiro(3)	-	-	1.0	4.0	1.5	0.9
Paraná (3)	-	-	-	10.0	3.1	3.1
Roraima (4)	-	-	-	-	30.9	22.3

(1) In June 30, 1964, in the 9th cycle sprayed.
(2) In June 30, 1964, in the 7th cycle sprayed.
(3) In June 30, 1964, in the 5th cycle sprayed.
(4) In June 30, 1964, in the 1st cycle sprayed.

(a) The indexes of 1959 and 1960, which had not been included in Table No. 6 have been added.

(b) The increase in Ceará indexes during 1962, 1963 and 1964, is related to the malaria outbreaks which occurred in this Sector in 1962 and 1963. All municipios affected by the outbreaks, have started the spraying in 1962 and were under total coverage in 1964.

Indexes in Pernambuco have increased the first half of 1964 because during October-December 1963 cases of malaria have been detected in the Northeastern region of the State, near the border with Paraíba in the coastal area. The region has been included in the coverage area in 1964.

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The infections of P. falciparum in the eradication Sectors, during the two semesters of 1963 and the first semester of 1964, are shown in the following Table, percent of the total positive slides per semester (except Roraima):

Semester	Ceará	R.G.N.	Par.	Pern.	Alag.	Serg.	R.J.	Paraná
1st - 63	1.7	9	6.7	0.7	0	0	1.0	0.6
2nd - 63	1.4	17	1.0	0.8	0	13	13.0	0.2
1st - 64	0.6	17	0.4	0.2	0	0	6.0	0.1

Attached to the present report, in the appendices are Charts which show the number of slides examined in each semester, the number of positive slides and the number of positives by parasite species, during the period 1962 up to the first semester of 1964:

9 charts of the Sector under eradication

13 charts of the Sectors under emergency phase (Bahia considered as one Sector)

1 chart of the State of São Paulo

c) The previous information of samples obtained in the whole country during the two semesters of 1963 and the first semester of 1964, by passive and active finding and the percent of passive to the total, is summarized in the following table.

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LIST OF SAMPLES OBTAINED IN THE COUNTRY - 1963 - 1964 (1ST SEMESTER)

Method	1st Semester 1963	2nd Semester 1963	1st Semester 1964
Passive finding	227,620	262,293	248,645
Active finding	170,290	200,478	243,081
Total Semester	397,910	462,771	491,726
Relation P.F./Total	56%	57%	51%

Note - The increase in the active finding with the consequent decrease of the relation P.F./Total, in the 1st Semester 1964, is related among other factors to the decrease of productivity of the Notification Posts (NP) in various areas especially in those under eradication; to the case finding in the house by epidemiology evaluators in those localities where the installation of a Notification Post (NP) is not feasible and, finally, to the samplings made during the investigation carried out due to malaria outbreaks, either in the Sectors under "emergency phase", or in the Sectors under eradication.

d) The information made available by CEM, in the tables found in the appendix makes it possible to know the number of malaria cases detected by active finding and by passive finding in each of the two Groups of Sectors; in the country as a whole and per 1,000 inhabitants in the Group of Sectors under eradication, where the evaluation covers the entire malarious area of the Sector. The cases detected by passive and active finding and the total cases in the country are shown in the following table:

CASES DETECTED BY P.F.

Sectors	1st Semester 1963	2nd Semster 1963	1st Semester 1964
1st Group	4,796	4,593	7,467
2nd Group	39,693	34,187	29,958
TOTAL P.F.	44,489	38,780	37,425

CASES DETECTED BY A.F.

Sectors	1st Semester 1963	2nd Semester 1963	1st Semester 1964
1st Group	433	449	989
2nd Group	14,895	10,164	9,542
TOTAL A.F.	15,328	10,613	10,531
Total in the country	59,817	49,393	47,956

The cases detected in each one of the Groups of Sectors are shown in the following table:

CASES DETECTED BY GROUPS OF SECTORS

	1st Semester 1963	2nd Semester 1963	1st Semester 1964
1st Group - Eradication			
P.F.	4,796	4,593	7,467
A.F.	433	449	989
Total	5,229	5,042	8,456
2nd Group - "Emergency"			
P.F.	39,693	34,187	29,958
A.F.	14,895	10,164	9,542
Total	54,588	44,351	39,500
Total Country	59,817	49,393	47,956

The cases per 1,000 inhabitants in the Sectors under eradication, during the 3 semesters are the following:

Group of Sectors Under Eradication	0.46	0.45	0.75

Note: The information given above shows an increase in the number of cases in the Sectors under eradication both by active and passive case findings. They are cases of malaria detected either in vigilance areas or in non-malarious areas of these Sectors, which have been incorporated in the areas under coverage.

Following is the summary of the total slides examined in the country during the three semesters and percent of general positivity.

Semesters	Total of Slides	Total of Cases	% of general positivity
1st semester 1963	397,910	59,817	15%
2nd semester 1963	462,771	49,393	10.7%
1st semester 1964	491,726	47,956	9.8%

e) Tables in the appendix, prepared by CEM, give data on epidemiologic activities in the Sectors under eradication and those under "emergency" during 1963 and 1964 (first semester), in localities evaluated by active and passive case findings by positive localities and by % of positivity.

The following table summarizes the localities evaluated in the Sectors under eradication:

	ACTIVE CASE FINDING			PASSIVE CASE FINDING		
Period informed	Visit	Posit.	%	Visit	Posit.	%
1st semester 1963	2,858	98	3.4	993	67	6.7
2nd semester 1963	3,675	51	1.4	6,077	302	5.0
1st semester 1964	4,442	91	2.0	6,004	277	4.6

The following Table gives the same summarized information of the Sectors under "emergency":

	ACTIVE CASE FINDING			PASSIVE CASE FINDING		
Period informed	Visit	Posit.	%	Visit	Posit.	%
1st semester 1963	2,497	651	26.1	515	242	47.0
2nd semester 1963	3,845	582	16.7	3,938	1,020	25.9
1st semester 1964	3,872	503	13.2	3,545	944	26.6

Note: Examining this aspect of CEM epidemiologic activities it may be verified that there is a parallel increase of activities both in the Sectors under eradication and in the Sectors which are not yet under eradication.

f) General Evaluation - It is evident from the analysis of the CEM provided Tables, that CEM has been striving to carry on a control program in 15 Sectors (with a population of 27 million inhabitants). The available resources were never sufficient for a well-integrated program; nevertheless, a slight reduction in the annual case rate of malaria in the Sectors under "emergency" was achieved. An eradication program in 9 Sectors of the country, with a population of 11 million people, (representing 30% of the population which live in the whole malarious area of the country) was carried out. Furthermore, in all the Sectors of the country an ever increasing volume of blood samples was obtained during each semester, with a gradual reduction in the number of positive cases. However, as yet CEM has not been provided with sufficient organization, legislation, and funds with which to conduct a comprehensive and effective Malaria Eradication Program.

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. TRAINING

The training activities of malaria personnel are the responsibility of the Health Education and Training Section of the Superintendency. Professional personnel or malariologists receive their training in Brazil or in foreign countries. The information obtained is as follows for the malariologist working in CEM: Trained in

Mexcio, Venezuela or in both countries	19
Malaria Course at São Paulo School of Public Health	57 (x)
Malaria Course at National Health Department or Federal District	7

(x) Due to the great demand that exists in Brazil for physicians and engineers, CEM found it necessary to contract with six pharmacists and two veterinarians; these eight were trained and are included in this group of physicians and engineers.

The Health Education and Training Section provides the following information on training courses carried out since the organization of CEM for all levels of personnel and for varying lengths of time as indicated:

1. Superintendency (Central Office) - Responsibility, but training area may be several and dispersed amongst various sectors.

	Courses	Graduates
a) District Chiefs - 2 months	3	49
b) Sector Administration Chiefs - In service		
c) Chief Inspector (multi-purpose for spraying and epidemiology) a new course 2 to 3 months		
d) Health Education Aides - 5 weeks	4	41
e) Entomology Aides - 2 months	3	37

2. Coordination - responsibility, but training areas may be several and dispersed amongst various sectors.

	Courses	Graduates
a) Microscopists - 5 weeks	20	180
b) Malaria Inspector (multi-purpose for spraying and epidemiology - 7 weeks)	13	116
c) Epidemiology Inspector - 7 weeks	28	312
d) Spraying Operations Inspector - 7 weeks	20	295
e) Multi-purpose Inspector - 35 days (xx)	6	54

(xx) Course given to Epidemiology or Spraying Inspectors to convert them to Multi-purpose Inspectors.

3. Sector - Responsibility, but training areas may be several and dipersed amongst various districts.

a) Squad Chiefs - 3 weeks	70	1,054
b) Epidemiological Aides (evaluator) 2 weeks	108	2,074
c) Spraymen - 1 week	231	5,277
d) Geographical Reconnaissance Agents 2 weeks	21.	554

In addition to the courses mentioned above, in-service training was given to drug distributors, statistics clerks of epidemiology, statistics clerks of spraying, operations, and to other administrative clerks.

4. Reflecting the high level of Brazilian capability in the field of malaria eradication is the fact that 19 qualified malariologists, engineers, sanitarians, entomologists, and entomology aides, are working PASB/WHO Malaria Specialists in 12 other countries of the Americas. This outflow of talent has greatly assisted the programs in other countries, but its effects have been left in the staffing

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of the national program. The foregoing evidence substantiates the Evaluation Team's firm position that in order to provide the corps of personnel essential to carry on an effective malaria eradication program, there must be improved remuneration and other working conditions.

5. Other miscellaneous data affecting personnel turnover and training requirements are as follows:

a) Based on CEM headquarters and field requirements for spraying over 4 1/4 million houses, there should be at least 45 engineers in all in order to maintain the Insecticide Operations; of the 45 required, only 27 were on duty as of 2 October 1964.

b) For epidemiology, 33 physician-malariologists required; only 21 were on duty on the above date.

c) Of all university graduates with additional specific training, both in Brazil and abroad, (a total of 138 physicians, engineers, and others); 53 are no longer serving CEM.

G. HEALTH EDUCATION

The importance of health education to the malaria eradication program is obvious because the public's cooperation is essential to permit: 1) several periodic sprayings of residual insecticide to all sprayable surfaces in all houses in the malarious areas; 2) the detection and treatment of cases. Time and again, the householder must willingly permit the malaria eradication worker to enter his house; i.e. to spray, to collect blood slides, to supervise spraying and epidemiological operations, and to do entomological work. Unlike most other public health programs, all strata of the population, even the

higher socio-economic ones, need health education. The public has to know how malaria eradication is to be achieved and the benefits which will derive from a successful program.

To be effective, health education in a malaria eradication program must be carried out by all levels of personnel engaged in the program. Professional health educators are required to train all levels of personnel in order that these members of the program can in turn educate their men and make each one of them share the work of educating the public.

During the Team's visit, the national program had no professional health educators. (The program of the State of São Paulo had professional health educators). The team interviewed health education aides in the following sectors: Paraná, Mato Grosso, Salvador, Pará, Amazonas, and Pernambuco. All of them demonstrated a spirit of dedication and a sense of responsibility. However, the need for professionally trained health educators to provide the technical guidance and supervision absolutely essential for an effective program, cannot be to greatly stressed. Two of the best qualified sector aides are currently undergoing a 30 week training program in Puerto Rico and Mexico under USAID/Brazil sponsorship. On completion of training, they will work in the Regional Coordination Offices.

The aides participated in the training of personnel, particularly in courses for squad chiefs, canvassers, spraymen, and malaria inspectors. Most of the educational methods such as group instruction, identification and use of "national" community leaders and mass information are used by the aides. The population has been motivated to accept blood sampling and drug treatment. However, due to administrative problems the aides have relied more on personal

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orientation than on mass information media. The aides also participated in staff meetings along with the Sector Chief, Epidemiologist and Engineer.

The problem of "missed houses" (either refusals or closed) has been presented to these aides, who have attempted through various means (with lack of professional guidance and funds) to help solve this problem. Unfortunately, there is no evaluation of the results of the work of the health education aide. However, the percentage of "missed houses" continues high.

In numerous areas where geographical reconnaissance is proceeding slowly or not at all, the concept, of "progressive spraying" is being defended because of pressure from public officials for continued, frequent, and expanded insecticidal protection. There is no evidence that health education techniques are being exploited to orient and convince the public or those in positions of leadership concerning the importance of geographical reconnaisance as an essential tool for more complete and effective portection of the population.

E. SPECIAL PROBLEMS

MALARIA PARASITE STRAINS RESISTANT OR TOLERANT TO DRUGS

More than 50 years ago, according to the great Brazilian sanitarian Oswaldo Cruz, malaria constituted the major obstacle in the construction of the Madeira-Mamoré railway (now the federal territory of Rondônia). *Plasmodium falciparum* infections predominated (70%); attention was called to a quinine-resistant strain which required, for prophylaxis and treatment, high dosages at or near the manageable tolerance limits of the drug.

In their early tests of chloroquine in malaria patients hospitalized in Belém and Santarém, Mein and Rosa[illegible] (1946-47) found that *P. vivax* cases responded completely; in treatment of *P. falciparum* infections, chloroquine

was only 10% effective in eliminating parasites and proguanil was 25% effective.

In October of 1960, some P. falciparum infections in highway construction workers in the federal territory of Rondônia were reported as not responding to chloroquine. Similar reports from various parts of the Amazon region stimulated studies in 1960-61 at widely separated points (federal territories of Roraima, Amapá and of Rondônia and the state of Pará). More comprehensive studies took place from July - December of 1961 under an agreement between Government and the Pan American Sanitary Bureau. The results of these studies, as extracted from the report of Ferreira and Almeida (1963) are summarized below:

Area Studied	Preliminary Survey				Detailed Study		
	Slides exam'd	Pos.	Pos. for P.falc.	P.falc. Pos. (%)	Persons complete study	Pos. within 30 days*	Relapse (%)
A. Rondônia	1,344	169	160	94.7	21	6	28.5%
B. Pará	1,426	284	281	98.9	126	19	15.1%
C. Amazon Basin	12,752	460	370	80.4%	--	--	--
Macapá (Amapá)	--	--	--	--	29	14	48.3%
São Miguel Guamá (Pará)	--	--	--	--	23	7	30.4%
Barcelos (Amazonas)	--	--	--	--	15	8	57.8%
Boa Vista (Roraima)	--	--	--	--	28	19	67.9%

*After treatment with 1.5 g chloroquine (base)

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Similar phenomena were observed and reported by Rodrigues da Silva (1961) and Box, Box and Young (1963) on P. falciparum infections acquired in the Pôrto Velho area of Rondônia in 1960 and 1961, and at other scattered points (Galvão et al, 1961/62; Rodrigues da Silva and Almeida, 1964). The latter workers extended their observations to 7 induced infections in neuro-syphlitics. Since 1963 detailed studies of four P. falciparum strains from Brazil (Rondônia, Goiânia, Boa Vista and Pará) and two strains from Colombia have been carried out at the Screeing Center established in Ribeirão Preto, São Paulo under the auspices of CEM, the Malaria Eradication Service of São Paulo, the Psychiatric Department of the São Paulo State Health Service with financial and technical support from the Pan American Health Organization. Extensive studies with sub-inoculated strains have demonstrated the complexity of the problem. Promising results have been obtained.

The gravity of the problem posed by P. falciparum strains resistant or increasingly-tolerant to chlorquine (and other synthetic antimalaria drugs), was dramatically demonstrated by the studies of the malaria outbreak in the Municiaplity of Porangatú, Goiás in early 1964 (O. Garcia Sandia, unpubl.). In this rapidly developing area along the Brasilia-Belém highway, with a population of 20,000 in towns and scattered ranches, the inhabitants fully appreciate the dangers of epidemic malaria, but medical care and hospitalization are distant and are sought and utilized only for relief from the immediate effects of clinical attacks. The examination of 3,294 slides yielded 1,515 positives (46%); of these 1,273 were P. falciparum (84%). One hundred malaria cases observed in two local hospitals included 18 in coma, 14 in "pre-coma", and 21 with infections evidently resistant or tolerant to chloroquine. Of the

observed cases, 14 died (all among the 18 comatose patients), 47 left the hospital with blood still positive for P. falciparum, 19 left with P. falciparum-negative blood, and 20 left without confirmation of blood positivity or negativity.

USE OF CHLOROQUINIZED SALT IN THE AMAZON REGION

In any comprehensive planning for the eradication of malaria from the natinal territory of Brazil, the problems posed by the Amazon Basin have loomed very large. This Northern Region, consisting of the states of Pará, Amazonas, and Acre and the federal territories of Rondônia, Roraima and Amapá, has an estimated population of 2,605,500 in an extension of 3,557,322 square kilometers (density, 0.73 persons per k^2). The logistic and demographic features complicating conventional insecticidal applications in this area stimulated the pioneer efforts of Brazilian malaria workers in developing procedures for using chloroquinized salt ("Pinotti's method", 1953) for prolonged collective drug administration. In 1959 the use of chloroquinized salt was introduced in the Amazon Basin as the basic measure of attack.

By early 1961 evidence had accumulated indicating that P. falciparum infections tolerant or resistant to chloroquine were being acquired in the region. Under an agreement between the Government of Brazil and the Pan American Sanitary Bureau, special investigations were made from July through December, 1961 in 25 municipalities scattered throughout the region to evaluate the suppressive effects of the medicated salt program and to determine the existence of any chloroquine resistant strain(s) of P. falciparum. The studies by the Special Commission revealed that:

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a) due to problems in control of salt sources (distribution, contraband activities, industrial use sources), scarcely 50% of the houses visited (2,550) were using chloroquinized salt;

b) of the 50% of the population using the medicated salt, scarcely 10% were ingesting salt with sufficient quantities of chloroquine. (30-45 mg./day), due to dietary variations or "leaching-out" of salt preparations;

c) there definitely existed in the Region a strain of P. falciaprum which did not respond to conventional regimens of chloroquine treatment (1,500 mg for adults.)

As a result of the Special Commissions findings the use of medicated salt in the Amazon Region was suspended at the end of 1961 and application of residual insecticides (DDT) was introduced as the basic attack measure.

Plans called for Sector (or State) operations according to three basic patterns:

1. continuation of attack phase efforts where already initiaed (Ceará, Rio Grande do Norte, Paraiba as of 1960; Alagoas and Sergipe as of 1961;
2. acceleration of conventional preliminary phase efforts where these were well advanced, with subsequent launching of attack phase activities (Pernambuco, Rio de Janeiro and Paraná initiated attack phase spraying in 1962);
3. execution of "emergency" or "progressive spraying" operations (concomitant and progressive accomplishment of geographic reconnaissance and residual spraying) in the remaining Sectors.

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Additionally great emphasis was given to the early development of refined epidemiological operations, with two objectives:

a) accumulation of more ample information for program planning, development and evaluation, and

b) immediate provision of drugs to the largest number of persons under the threat of malaria in unprotected areas.

Certain areas which were not currently recognized as malarious, but which were suspect for historic or epidemiologically indicative reasons, were classified as "observation" or "vigilance" areas (the frequent use of the latter term has been unfortunate because the measures used in many such area have not been characterized by the case-finding intensity associated with vigilance areas as in many other countries).

The above-mentioned strategy has been conscientiously pursued within the severe limits imposed by fiscal and personnel policies of the national government.

I. PROGRAM PLANNING

As a participant in the VIII World Health Assembly which, in Mexico in 1955 announced its goal of global malaria eradication, Brazil established a Working Group in the National Department of Rural Endemic Diseases (DNERu) in 1958, assisted technically and financially by the Pan American Sanitary Bureau/WHO and the U.S. Government. The plan envisaged by this Group called for the country's division into areas, with activities to be carried out according to eradication standards wherever resources permitted, and the remaining areas to continue as control efforts. Six states in the Northeast Region, and the State of São Paulo in the South, financed by this State

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Government, formally initiated the preliminary phase of a conventional eradication program. The use of medicated salt was begun in the Amazon Basin; other areas received partial protection through control-type spraying operations. Available resources did not permit the orderly development of these plans, and a re-vitalizing of the program was attempted through Decree No. 50,925 of July 7, 1961, which recognized the importance of the continental wide malaria eradication program and the need of protecting the Brazilian population against this disease.

As reorganized, the campaign is directed by a Superintendent, named by the Minister of Health, and acting as the executive officer of a Working Group for the Eradication of Malaria, to whose meeting the representatives of AID and PASB could attend at the discretion of the Minister of Health. The central headquarters (Superintendency), is a normative and supervisory echelon operating through Regional Coordination, Sectors (usually States), and District and sub-district divisions.

The progress observed in eight States attests to the soundness of basic planning in adhering to conventional program phasing in those areas; Ceará, Rio Grande do Norte, Paraiba, Alagoas, Sergipe, Pernambuco, Rio de Janeiro and Paraná are progressing favorably in their attack phase activities.

In contrast, sectors programmed for "emergency" or "progressive spraying" [illegible] reconnaissance activity, incomplete spraying coverage, and precocious epidemiological refinement. Each semester's activities have included spraying as many houses as possible in areas previously covered; if time and resources permit, spraying is then extended to additional areas. Occasionally one

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reconnaissance agent attached to each spraying squad to accomplish mapping, house numbering and census taking of population. Progress in the essential task of geographical reconnaissance has therefore been greatly handicapped, and initiation of attack phase spraying has suffered successive delays. In late 1961 the stated target for initiation of total coverage throughout Brazil was January, 1964. The CEM report prepared in June 1964 in Poços de Caldas, Minas Gerais, for the IV Meeting of Directors of Malaria Eradication Services in South America anticipated initiation of total coverage spraying in the second semester of 1964. The currently obtained target dates for attack phase spraying in some Sectors (States) now vary from January to "...optimistically, January 1966".

Several Sectors have apparently made recent attempts to change their strategy so as to completely or partially divorce their geographical reconnaissance and spraying operations, and progress in the former has been generally proportional to the degree of success in attaining the separation of the two activities. The geographical reconnaissance has also been handicapped by the low salaries paid to the reconnaissance agents.

The planning of activities in areas still not in the attack phase has also encouraged, or permitted an imbalance between geographical reconnaissance and epidemiological work. The essential epidemiological task in the pre-attack period are the definition of the malarious area and resolution of special problems, such as the need for, or extent of, barrier spraying in urban areas (for example, in the Amazonas Sector the houses sprayed in the outskirts of Manaus have varied from 32% to 79% of those sprayed in the entire Sector, yet no definite entomological nor epidemiological studies have yet clarified the necessity for, or extent of, such spraying).

In practice many "Emergency" phase sectors have an epidemiological organization, with refined establishement of passive and active case finding mechanisms, corresponding to the requirements for the second or third year of attack phase. This accelerated development would be highly desirable and commendable if funds were sufficient for all essential preliminary phase activities, especially geographical reconnaissance. With only limited funds available, program planning must consider the respective roles of operational and epidemiological personnel, especially in non-attack sectors, to insure the balanced financing and development of these elements.

In summary, it is evident that the "emergency" or "progressive spraying" program, planned more than 30 months ago, has not permitted the establishment of a firm target date for the initiation of total coverage.

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