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MANAGEMENT OF MALARIA
(Project No. 521-0143)

SNEM/COH, USAID, PAHO

Report of Mid-Term Evaluation Team

August 26 - September 19, 1984

Executive Summary

The malaria situation in Haiti is worsening. The total number of cases, taking into account available partial figures, should actually be estimated at around 250 to 300,000 cases per year. On the basis of worldwide experience of P. falciparum mortality rates (1%) the number of deaths directly due to malaria should amount to some 3,000 per year. This toll is particularly heavy among young children and pregnant women. Operationally, the country could be divided in four areas:

- a) Above 500 meters; an altitude which is practically malaria free;
- b) Urban and peri-urban;
- c) Low lands with low to moderate malaria transmission;
- d) Swampy and irrigated areas with high malaria risk.

On the basis of the above and taking into account available and limited resources, the evaluation team recommends:

- a) to make single dose treatment (10mg of chloroquine per kg body weight) to any suspected case of malaria without necessarily getting microscopical confirmation of the diagnosis;
- b) to restrict full curative treatment (radical treatment) to health institutions where microscopical diagnosis and medical facilities are available;
- c) to reduce transmission by the application of measures aiming at reducing the levels of man/mosquito contact. This should be mainly achieved by the use of indoor residual insecticide applications (particularly fenitrothion) just before the peaks of transmission, i.e. November and May. These interventions should be as large as possible in order to avoid future malaria epidemics of catastrophic proportions. Other measures to reduce vector densities should be taken as complementary to the application of residual insecticides and should be utilized under special circumstances and only after appropriate testing has been conducted;
- d) in urban and peri-urban areas the implementation of land reclamation programmes and of source reduction in close cooperation with other national and international agencies dealing with these kinds of problems should be attempted in order to cope with the problem of man-made malaria.

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It is the team's view that SNEM is a unique organization in Haiti being able to reach the most peripheral communities. It is therefore thought that efforts should be concentrated on expanding its rural coverage and that the aim should be to have at least 18,000 VC posts with all the necessary supervisory and supporting services. This unique network should collaborate in the application of other priority health programs such as family planning or distribution of rehydration salts which also require total coverage in time and space.

In view of the fact that many of the recommendations contained in this report have been made previously by other evaluation teams and have not yet been implemented and in view of the deteriorating malaria situation, it is the opinion of the team that a re-organization and strengthening of the administrative management of SNEM is necessary before undertaking any other action.

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Introduction and Purpose of the Evaluation

In May 1979, a nine (9) member evaluation team made a series of recommendations for the guidance of the Government of Haiti (GOH), the U.S. Agency for International Development (USAID) and the Pan-American Health Organization (PAHO) on the future conduct and support of the Haiti Malaria Program.

In October 1981, at the request of the Director of the SNEM, another evaluation team assessed the implementation of the recommendations made in 1979. Also, it had to make recommendations for the future residual spray program based on the results of the pilot project tests and the future overall program which was being developed on a 5-year Plan of Operations.

The main objectives of this Plan of Operations, initiated in September 1982 and supported by USAID, the GOH, PAHO and the Government of Japan, were (1) to strengthen the institutional capacity of SNEM to plan and implement malaria control activities, and (2) to significantly reduce mortality and morbidity from malaria.

In August-September 1984, the GOH called for a new mid-project evaluation which had to focus its attention in the following four broad areas:

- a) to develop alternatives for malaria control activities given limited resources, including an eventual lack of insecticides;
- b) to propose improvements in the SNEM administrative and management functions;
- c) to estimate the cost and effectiveness of major anti-malaria measures needed singly or in combination;
- d) to suggest ways and means for the participation and support by non-SNEM agencies in malaria control activities.

Scope of Work

To (a) determine that project objectives and outputs are being met on schedule, to (b) identify and suggest ways in which the field operations, the SNEM management, the field research, the malaria surveillance and the community mobilization and support can be improved, and to (c) assist the SNEM and USAID to design contingency malaria control strategies which will ensure the best possible future use of available resources to reduce malaria as a health problem. In order to do this, the evaluation team members will be required to undertake the following:

1. to examine project anti-malaria activities, including:
 - a) operational research on fenitrothion dosage (PROFEM)
 - b) regular residual house spraying in selected areas,
 - c) drug distribution in selected problem localities,

- d) biological control with fish,
 - e) environmental management,
 - f) larviciding and space spraying (ULV and fogging);
2. to examine project technical support activities, including:
 - a) entomology studies (densities, bio-assays, susceptibility tests, etc.),
 - b) cholinesterase testing,
 - c) laboratories (staining, examination, recording, etc.),
 - d) case detection (active, passive, blood surveys, etc.), recording and reporting and drug protocol,
 - e) geographical reconnaissance (population, houses, maps, etc.),
 - f) management support activities including supervision, training and health education,
 - g) statistics,
 - h) stratification process,
 - i) evaluation of activities;
 3. to examine administrative support activities including:
 - a) supplies and equipment (procurement),
 - b) transport (vehicle maintenance) and replacement,
 - c) personnel management,
 - d) financial management and administration,
 - e) communications and routine management reporting,
 - f) organization,
 - g) advisory services;
 4. to review all documentation pertaining to project administrative, technical and operational activities with the SNEM central office senior staff members. This would include the following:
 - a) the 1981 evaluation report and recommendations,
 - b) the SNEM four-year Plan of Operations (FY 83-86), the USAID/Haiti Project Paper (Management of Malaria) and the USAID/COH Project Agreement,
 - c) the SNEM Plan of Action for FY 83, FY 84, FY 85,
 - d) the PROFEN protocol: a field trial to test the efficacy of 1c/m², 1.5c/m² and 2.0g/m² of fenitrothion 40% WDP and other pertinent documents;
 5. to conduct field visits to observe field activities and hold discussions with the SNEM Zone and Sector staff concerning program progress and problems;
 6. to submit findings and observations to the team leader to assist in the preparation of the team's final report and recommendations.

1.2. Team Members

The following eleven consultants participated as members of the team:

GOH/DSPP:

Dr. G. Lerebours, Division of Evaluation
Dr. S. Veillard, Division of Hygiene and Sanitation

PAHO/WHO:

Dr. A. Noguer (consultant), Team Leader
Dr. F. Lopez Antunano, Coordinator
Mr. B. Ibanez, Administrator, Tropical Medicine
Mr. M.A. May (consultant), Administrator
Inc. J. Curzio, Administrator
Dr. H.M. Latiri, Administrator

USAID:

Dr. G. Jeffery (consultant), Epidemiologist/Researcher
Dr. J. Hobbs (consultant), Entomologist/Researcher
Mr. E. Smith (consultant), Malariologist/Operations

II. Program Implementation and the Malaria Situation

2.1. General Evaluation of the Malaria Situation and of the Activities

The malaria situation in Haiti seems to be deteriorating very quickly. Although there are no reliable data on the amount of malaria among the population, it appears that the number of cases is on the increase. In 1982 and 1983, out of 309,962 and 309,582 blood slides collected by an incomplete network of some 6,658 Voluntary Collaborators, 67,121 and 54,102 were found respectively positive each of those two years. If we consider that these VCs were actually not covering the same localities and that less than half the total localities in the country provided epidemiological information at irregular intervals, it could be assumed that the number of cases in Haiti during these two years should be close to 250,000 to 300,000 cases per year. There is also no information about malaria mortality but considering the lack of immunity to P. falciparum infections in the age group 3 months to 4 years old, and in the view of experience in other countries facing similar conditions, it should be assumed that malaria in that age group (and on a minor scale in older groups) should be a main cause of mortality particularly when associated with diarrheal diseases and caloric/protein deficiency.

The team notes with satisfaction that some of the recommendations made by the 1981 evaluation group have been carried out adequately. A Plan of Operations was prepared, the tests with three different dosages (1g/sq.m., 1.5g/sq.m. and 2g/sq.m.) of technical grade fenitrothion has been adequately implemented and evaluated.

The country's epidemiological stratification has also been carried out and several larvivorous fishes have been tested on a preliminary basis.

However, the application of some additional measures such as source reduction, larviciding, etc. were in most cases reduced for lack of adequate resources.

In regards to the coordination with the primary health care system, much remains still to be done. However, taking into account the organizational ability of the SNEM, and its unique experience in reaching the rural population, the team believes that it may play an important role as the spear-head for the development of some of primary health care activities among rural communities.

2.2. Anti-Malaria Operations

Passive case detection represents the main tool for the epidemiological surveillance of malaria. Surveillance is carried out mainly by Voluntary Collaborators who are members of the community. There are 5,389 civil posts and 269 paramedical collaborator posts. This kind of surveillance does not provide the basis for important and timely decision-making.

However, it does orient the selection of areas for planning purposes.

During the years 1982-1984, the more important anti-malaria operations carried out were:

- Intradomiciliary spraying
- Larvicide application
- Mass drug distribution
- Biological control (fish)
- Space spraying
- Source reduction
- Radical and presumptive treatment of malaria cases.

2.2.1. Research on Fenitrothion Dosage (PROFEM)

SNEM had been facing great difficulties in reducing anopheline densities due to the resistance that the vector mosquito had developed against DDT. Another insecticide of the organo-phosphorous group, Sumithion, also known as Fenitrothion, was tested in the South Peninsula at a concentration of $2\text{g}/\text{m}^2$, a dosage which proved to be effective. The results showed a reduction in the anopheline density and a decrease in rate of malaria prevalence. But SNEM, confronted by financial difficulties and having its stock of fenitrothion reduced to 400 metric tons donated by the Government of Japan and 50 tons purchased by USAID, decided in July 1982, as recommended by the 1981 evaluation team, to give priority to a experimental spraying project called PROFEM.

2.2.1.1. Brief Description of the Trial

This project consists of the intradomiciliary spraying with fenitrothion at dosages of 1g, 1.5g, and $2\text{g}/\text{m}^2$ in 824 localities selected on the basis of high malaria endemicity. For control purposes, 320 localities were selected using the same criteria of high endemicity. The project is being carried out simultaneously in areas of Zone I, III and IV. Of the six spraying cycles planned, four have already been carried out.

2.2.1.2. Comparative Analysis of Results

Two malariometric surveys have been completed in the trial and control areas. The first one being called the initial pre-spraying survey covering 90 localities completed in September 1983. The other which covered 115 localities was completed in April 1984. These surveys are intended to measure the impact of fenitrothion when applied at different dosages and to determine which one of the three is the most effective taking into consideration the toxicity and cost of the insecticide.

The tables that follow show the results for each trial and control area where the malariometric surveys were carried out in the three Zones.

Results of the Malarionetric Surveys^{*}

Initial Survey: Sept. '83 - 1st Post Spraying Survey: April '84

Zone I

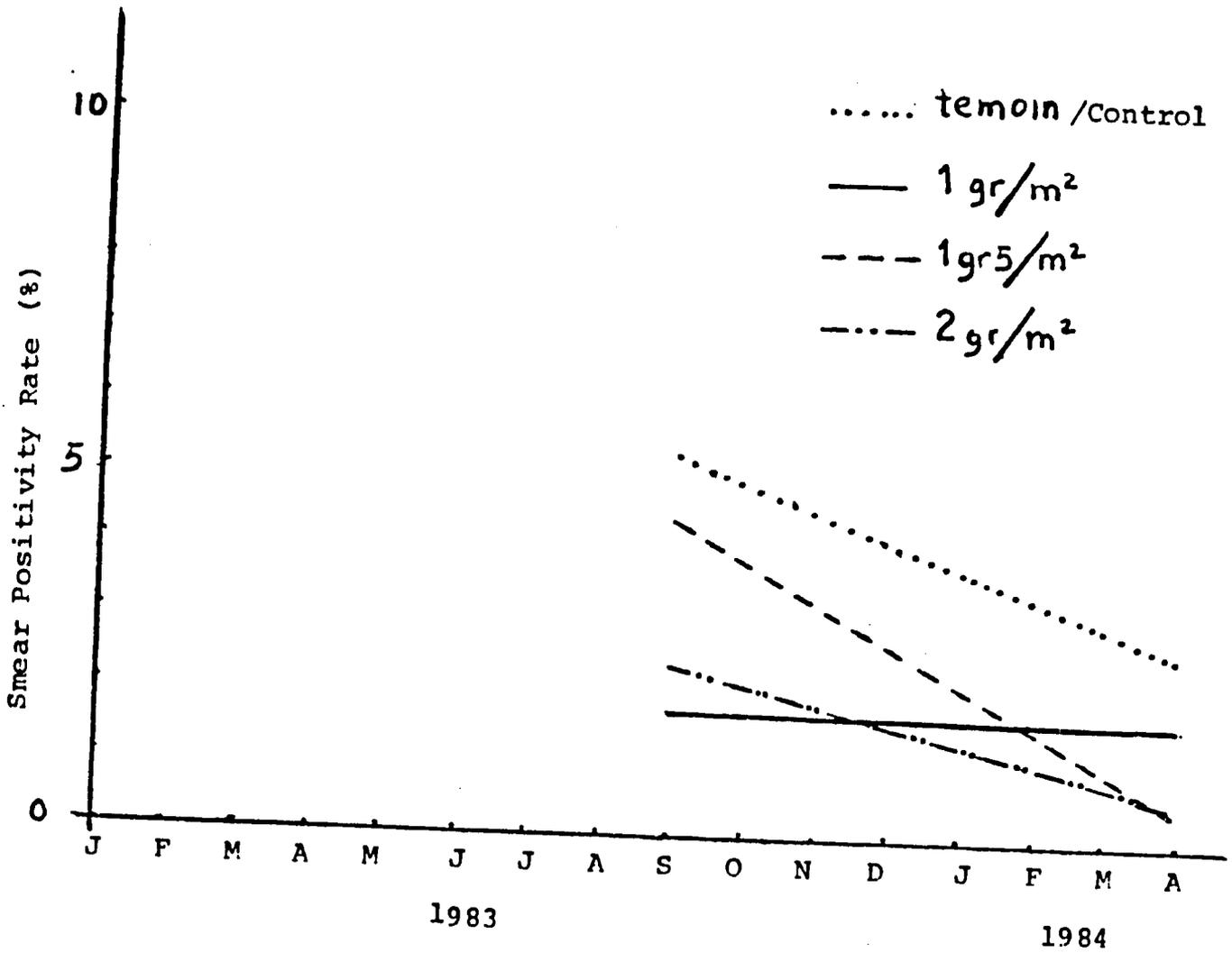
Fenitrothion Dosage	September 1983				April 1984				Percentage of Decrease of the SFR
	Loc.	Slides	Cases	SFR	Loc.	Slides	Cases	SFR	
1g/m ²	7	1,325	23	1.7	11	4,612	73	1.6	5.9
1.5g/m ²	5	1,320	78	4.3	7	4,536	20	0.4	90.7
2g/m ²	6	1,886	44	2.3	10	2,795	16	0.5	78.3
Control	5	1,324	58	4.2	7	2,184	52	2.7	35.7
Total	23	6,425	203	3.2	35	14,332	163	1.2	62.5

* See corresponding curve.

Results of the Malarionetric Surveys - PROFEN

Initial Survey: Sept. '83, 1st Post-Spray Survey: April '84

ZONE I



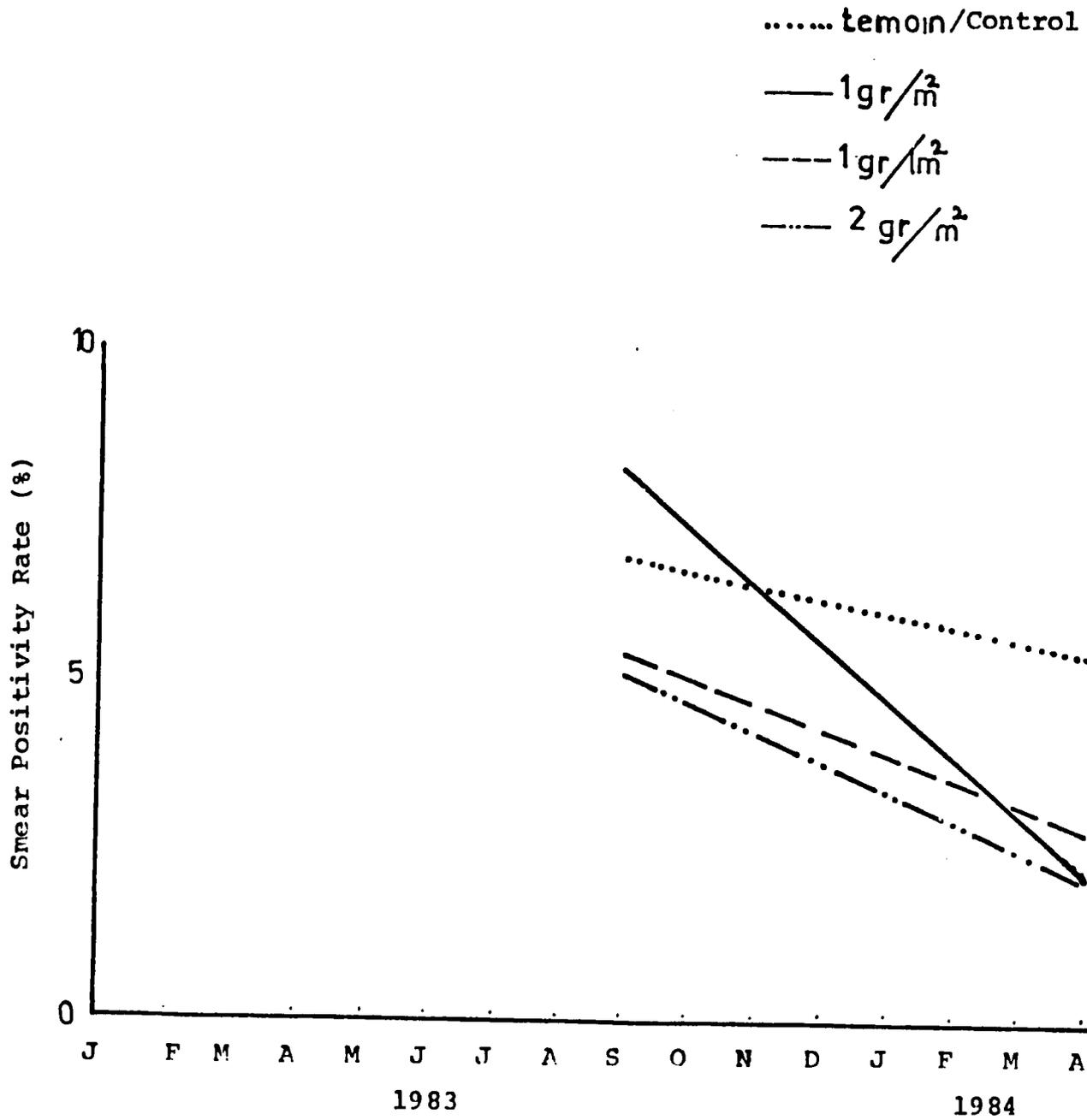
Results of the Malariometric Surveys*

Initial Survey: Sept. '83 - 1st Post Spraying Survey: April '84

Zone III

Fenitrothion Dosage	September 1983				April 1984				Percentage of Decrease of the SPP
	Loc.	Slides	Cases	SPP	Loc.	Slides	Cases	SPP	
1g/m ²	2	1,014	84	8.3	9	1,857	43	2.3	72.3
1.5g/m ²	11	848	47	5.5	14	1,260	38	2.9	47.3
2g/m ²	7	887	49	5.2	10	1,416	31	2.2	57.7
Control	11	1,982	76	7.0	12	1,237	68	5.6	20.0
Total	37	3,831	156	6.7	45	5,679	180	3.2	52.3

* See corresponding curve.

Results of the Malarimetric Surveys - PROFENInitial Survey: Sept. '83, 1st Post-Spray Survey: April '84ZONE III

Results of the Malariometric Surveys*

Initial Survey: Sept. '83 - 1st Post Spraying Survey: April '84

Zone IV

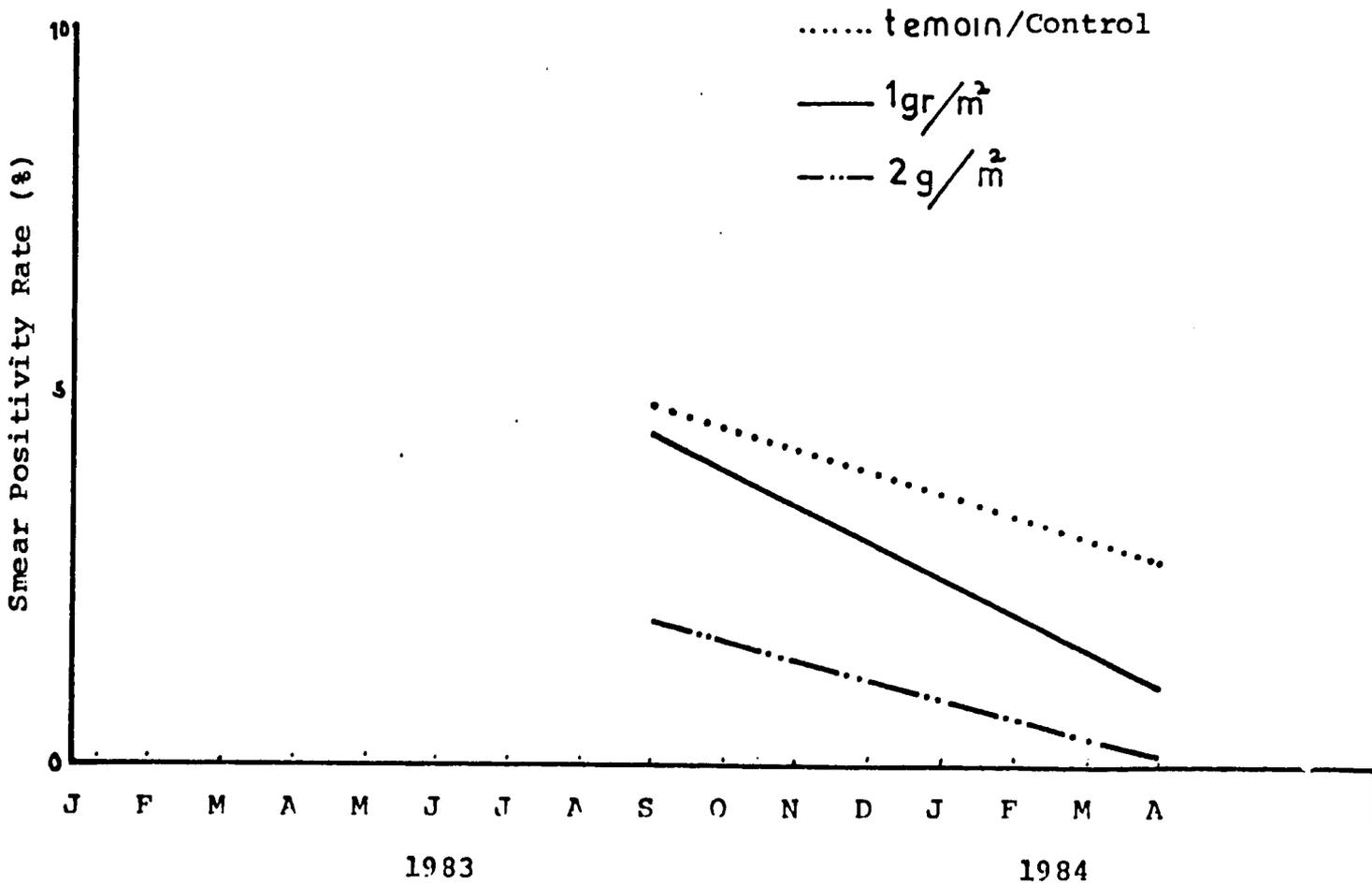
Fenitrothion Dosage	September 1983				April 1984				Percentage of Decrease of the SPR
	Loc.	Slides	Cases	SPR	Loc.	Slides	Cases	SPR	
1g/m ²	14	1,563	71	4.5	17	3,804	42	1.1	75.6
1.5g/m ²	-	-	-	-	-	-	-	-	-
2g/m ²	12	1,722	34	2.0	13	2,493	4	0.2	90.0
Control	4	732	36	4.0	5	1,110	33	2.9	40.6
Total	30	4,017	141	3.5	35	7,407	79	1.1	68.6

* See corresponding curve.

Results of the Malarimetric Surveys - PROFEN

Initial Survey: Sept. '83, 1st Post-Spray Survey: April '84

ZONE IV



According to these results, it can be said that the ideal dosage in relation to toxicity and cost varies with respect to the trial areas. In Zone I, the dosage of 1.5 g/m² appears to be the best one, whereas in Zone III and IV, the dosage of 1g/m² appears to be very effective. However, it is still too early to arrive at a conclusion on the basis of these two surveys alone. It will be necessary to wait for the results of the planned September 1984 malariometric survey since the prevalence of malaria is reported to be higher in September than it is in April.

2.2.1.3. Recommendations

It is highly desirable and recommended that steps be taken to carry out the survey in September-October 1984 as planned, in order to compare its results before deciding on the selection of one of the trial dosages to be applied twice a year before the peaks of high transmission.

2.3. Regular House Spraying in Problem Areas

On the basis of field trials, the program elected to apply only fenitrothion as a residual house spray insecticide in Haiti. The spray program for the first year (1982) included a comparative study of the use of fenitrothion at three levels of application in four zones and the operational application of fenitrothion at 2g/m² in highly endemic foci considered to be problem areas. Delimitation of these areas was to be done according to analysis of annual parasite incidence, as well as known entomological and ecological parameters. Master lists of positive localities and problem localities during the years 1980-81-82 were prepared for each rural section. Problem localities were then plotted on maps to determine foci requiring operational spraying.

Although January 15, 1983 was targeted as the starting date of the first operational spray cycle, it was necessary to delay this until April 1983.

2.3.1. Implementation and Analysis

A summary of the results of the first cycle of operational spraying is given in tabular form as follows:

Summary Results of First Cycle Operational Spraying

April 19 - June 18, 1963

Zone	Localities	Existing Houses	Sprayed	%	Population Protected
I	232	20,457	20,350	99.5	55,070
II	214	18,122	17,881	98.7	70,570
III	469	48,010	47,704	98.4	175,505
Total	915	86,589	85,942	99.2	311,142

These reported results of spraying operations in the first cycle represent a high percentage of coverage of programmed houses, and serve to indicate that the SNEM is capable of carrying out an acceptable operation of house spraying.

The second cycle of spraying started on August 9, 1983, and completed on October 5, 1983, also produced an equally high percentage of coverage in all three zones. A third cycle scheduled for January-April 1984 was cancelled due to the lack of funds. An April-June 1984 spray cycle was applied in different malaria foci of the 4 Zones.

All of the operational spraying scheduled for the second half of 1984 had to be terminated at the end of the first cycle in June until a physical inventory of the insecticide could be completed because the 400 tons of fenitrothion anticipated from Japan was not granted. Only sufficient stock was found to be on hand to complete the experimental project for determination of optional fenitrothion dosage applications.

2.3.2. Impact on Malaria Indices

It is clear that the experimental application of fenitrothion at $2g/m^2$ in the pilot projects of 1978-1982, and in the continuing dosage study, has brought about a satisfactory decline of malaria cases in these study areas. It is less clear that the operational applications of 1983 and 1984 have achieved successful results. This is because the epidemiological assessment of spraying can only be done by analysis of data collected through the Voluntary Collaborator system. At present, this system does not provide the information required to evaluate success or failure of operational application of fenitrothion. It is quite likely that application of fenitrothion has had a favorable impact on malaria indices in many localities, but this cannot be proven by the available surveillance data.

2.3.3. Recommendations

It is difficult, if not impossible, to make recommendations for the operational use of fenitrothion in view of the non-availability of this insecticide for the rest of this year, and doubts about its availability to the program in the future.

A general recommendation could be that if any residual house spray insecticide is applied to high transmission localities or problem areas in the future, adequate epidemiological and entomological assessment should be made of the efficacy of the spraying.

2.4. Drug Distribution

2.4.1. Presumptive Treatment consists of the administration without cost of a single dose of 10mg/kg of chloroquine (adjusted by age) to each person attending a Voluntary Collaborator post with presumed malaria symptoms. Theoretically, the posts should be distributed so as to be within reach of every person living in a malaria

endemic area. There are more than 6,000 such posts in Haiti. Although a blood film is taken from each person as a surveillance measure, there seems to be little doubt that the most, if not the only, important function of the post is the reduction of mortality and morbidity (time of suffering) through the timely treatment of a malaria attack. In order for the VC post to operate satisfactorily, there is a continuing need to provide supplies and supervision on a regular, frequent and timely basis, and to provide the VC with appropriate training, retraining and supervision. There appear to be short falls in the provision of these functions which should be rectified.

2.4.2. Radical Treatment consists of treating of certain cases "diagnosed" as positive by blood examination with a curative dose of chloroquine (presumably 25mg/kg) in multiple doses. Subjects selected for this treatment include children 6 months to 5 years of age, pregnant women, and gametocyte carriers. Because these same subjects have already received a presumptive (and probably curative) treatment, and the retreatment is usually delayed for a long time after the blood slide was made (sometimes as long as 4 or 5 months), there seems to be no valid scientific basis for this type of radical treatment.

2.4.3. Mass Drug Administration consists of treating all persons contacted in a defined area with a single dose of chloroquine (500mg/kg), the selection of the area based on epidemiologic evidence of high malaria transmission. In some programs, the chloroquine has been combined with a gametocytocidal dose of primaquine (45mg adult dose). Information was provided relating to two periods where mass drug administration was used:

- 1) 3 cycles at 15-day intervals between November 1982 and January 1983, and
- 2) 2 cycles at 10-day intervals in September and October 1983.

The first period covered 1,200 localities (6% of the malarious localities of the country), including a population of 386,662. The second period covered 740 localities and included 167,382 and 170,072 persons in the 1st and 2nd cycle, respectively. During these two cycles, the proportion of people in the areas actually treated, ranged from 60.4% to 86.7% with an average of 80.1% to 82.1%. No parasitologic or epidemiologic evaluation of the mass treatment was provided.

The report of the 1981 program evaluation discussed in some detail the usefulness of mass drug administration, noting that in the areas where this method was used, there seemed to be little evidence that case numbers had decreased in subsequent months. It is therefore strongly advisable to use mass drug treatment on limited groups of population in areas of high risk and also for limited periods of time (two consecutive rounds being advocated as the optimum).

2.4.4. Comparative Effectiveness of Different Regimens

In vivo testing of chloroquine in Haiti has shown that the single dosage of 10mg/kg body weight is still highly effective in producing a cure. There are undoubtedly some cases in non-immunes (infants) and immune-compromised persons (pregnant women) which may recrudescence, but as a rule the single dose appears to be highly effective. Thus the presumptive treatment should be a highly effective measure, providing there are minimal problems of underdosage or non-absorption.

Radical treatment, with the higher total dosage of chloroquine (25mg/kg), is effective even in non-immune infants and in immune-compromised cases (e.g. pregnant women), but its use should be restricted to hospitals and clinics.

The inclusion of gametocytocidal doses of primaquine is undoubtedly effective in eliminating infective gametocytes, and may have a usefulness in mass drug administration and in presumptive treatment. At these low single doses (30-45mg), there is apparently no problem of irreversible toxicity in Haitian populations. The questions of ease of administration (i.e. exclusion of multiple tablets) and cost-effectiveness are more important considerations.

Because of the emergence elsewhere of parasite resistance to chloroquine, an alert must be maintained through regular in vivo and in vitro testing to monitor parasite sensitivity.

2.4.5. Recommendations

There is little doubt that presumptive treatment through the VC system is highly important in the reduction of mortality and morbidity in Haiti. The 1982-1986 SNEM program plan proposes improvement of the VC system, but little seems to have been accomplished. The team recommends that immediate attention be given to appropriate redistribution of VC posts and to other improvements and measures which would enhance the activities and coverage of these posts for the timely treatment of suspected malaria cases.

There is enough evidence that 10mg/kg chloroquine base single dose treatment is effective enough to eliminate asexual parasitaemia of falciparum infections in Haiti. There is no immediate justification to increase cost of treatment by adding a second course of 25mg/kg chloroquine base in three days after confirmation of parasitological diagnosis.

The team therefore recommends that radical treatment in its present context as a part of the SNEM program be immediately halted.

There is little evidence of effectiveness of mass drug administration, even though on theoretical grounds it would be effective in reducing the parasite reservoir in the populations where it is applied. The method should be used in only limited situations. The team recommends that criteria for the use of mass drug administration be established with the assistance of experts in this field, and that these criteria be carefully applied in the decisions for use

of the method. Further, each use should be carefully evaluated to determine the effectiveness of the measure on malaria morbidity, mortality and transmission. The question of inclusion of priming should be determined on the basis of logistics and cost-effectiveness, given the theoretical value of the drug in the elimination of gametocytes and infectivity to the vector.

Because of the high level of chloroquine usage in Haiti and experience with drug resistance elsewhere, the possibility of the emergence of resistance in Haiti exists. The team commends the Program for its continuing efforts to monitor drug sensitivity and strongly recommends a continuation and expansion of this effort as a routine program activity. Information already developed on a suitable modified in vivo (7-day) method and on several useful in vitro methods will be useful. The in vivo method should be widely used, with frequent confirmation by a suitable in vitro method. There should be a continuing effort to develop an "early warning" system through the introduction of the modified in vivo method in widely dispersed clinics, hospitals, sector offices, etc. Reports of suspected resistance in any focal area should trigger an immediate and thorough investigation and development of measures designed for confinement and elimination. Studies should also continue on the sensitivity of Haitian parasites to alternative drugs, such as Fansidar, Mefloquine, and Quinine.

2.5. Biological Control

Previous evaluation teams in 1979 and 1981 have commented on the advantages of using natural enemies to control the mosquito vector of malaria, have identified larvivorous fish as the only feasible method of biological control readily available for field use in Haiti and recommended that field trials should be carried out in Haiti with indigenous and imported larvivorous fish.

2.5.1. Achievements and Prospects

In 1983, an ichthyology/entomology consultant (Dr. E.C. Bay) was brought in to advise SNEM on an appropriate strategy for the use of larvivorous fish for biological control of anopheline larvae in Haiti. This consultant's visit was followed in 1984 by a project sponsored by USAID to evaluate the larvivorous potential of indigenous fishes as compared to the best-known larvivorous fishes Gambusia affinis and Peocilia raticulata. The report of the project was written by Alison L. Linden of University of California at Davis. The work was done by Linden under the auspices of Volunteers in Technical Assistance (VITA) of Arlington, Virginia.

The project developed a reference collection of the available fish for use by SNEM and evaluated the effectiveness of the various species of larvivorous fish. A protocol has now been developed by Martilla of FAHO and Celestin of SNEM for a project utilizing larvivorous fish for control of malaria in Haiti.

Thus the recommendations of the 1979 and 1981 evaluation teams have been carried out. With the protocol now developed, it will be possible to determine how and to what extent the use of larvivorous fish may be incorporated into the operational program of SNEM.

The use of larvivorous fish, as with other biological control methods, should not be expected to lead to a substantial reduction of malaria by itself, but should be considered as a supplementary method to be used in conjunction with other methods such as source reductions, water management, etc.

2.5.2. Recommendations

The draft protocol should be reviewed by the two technical consultants Bay and Linden to insure that full advantage is taken of their experience and expertise.

As suggested by both consultants, the possible use of annual fish (*Nothobranchius* sp.) should be explored.

If a decision is made to implement the protocol, the work should not be started until and unless a firm commitment is made to provide the personnel, equipment, supplies, and vehicles to carry out the work, or the size of the project should be reduced to that which can be supported.

As other biological control measures become available, laboratory and field trials in Haiti should be included in future research plans. The bacterium *Bacillus thuringiensis* is a good candidate for such trials as it is being used successfully in many mosquito control programs.

2.6. Source Reduction

Source reduction is the progressive reduction or elimination of mosquito breeding places and when properly planned and carried out can reduce the risk of malaria transmission. Source reduction may involve drainage, filling, water management, weed control and other interventions; is long range in its benefits and effectiveness; and is most effective in combination with other methods such as larviciding or biological control (use of larvivorous fish).

2.6.1. Achievements and Prospects

The source reduction program in Haiti reached a peak in 1977 when 11% of the SNTM budget was set aside for source reduction. By 1981, this was reduced to 3.5% of the budget and in the present project starting in 1983, source reduction does not appear as a line item in the budget. Although some money is available for source reduction activities, it is expected that community participation will be mobilized to accomplish source reduction on a village basis.

In both the 1979 and the 1981 evaluations, the source reduction program was criticized on the basis that planning did not take into account the vector density or malarigenic potential of the individual project areas. Therefore, it has been impossible to evaluate any of the source reduction projects to determine whether or not they have contributed to the reduction of malaria or malarial mosquitoes.

It is not considered desirable for SNEM to engage in large scale public works type projects as in the past, but there are mosquito breeding areas where source reduction may well be the most cost effective method of malaria control.

2.6.2. Recommendations

Selection of source reduction projects should be based on entomological and epidemiological criteria and the results should be similarly evaluated.

Source reduction projects in urban or peri-urban areas should be given priority.

SNEM should develop a working relationship with all other organizations concerned with water in order to promote collaboration on source reduction projects of mutual benefit and in order to have an opportunity to evaluate the potential of and avoid the development of man-made malaria.

2.7. Space Spraying

Adulticiding with ultralow volume equipment (LECO-ULV) and thermal fogging equipment (Dynafoe and Swingfoe) has been carried out in Haiti for many years.

2.7.1. Achievements and Prospects

As other evaluation teams have noted, space spraying has little value in malaria control programs except in epidemic situations where it is highly desirable to eliminate the maximum number of potential vectors capable of transmitting malaria. However, even for this use the method should be thoroughly evaluated to determine how space spray adulticiding with ground equipment can best be used under epidemic conditions in Haiti.

As pointed out by previous evaluation teams, space spray adulticiding can be effective against Aedes aegypti in control of Dengue Fever. However, its use for this purpose should also be evaluated.

The use of space spray adulticiding as a public relations tool by controlling nest mosquitoes is ill-advised for a malaria program as it can be counter-productive. A flight of nest mosquitoes can easily invade houses right after a fogging or there can be an outbreak of malaria right after fogging. In either case SNEM would lose credibility.

2.7.2. Recommendations

Protocols should be developed for testing and evaluation of ULV spraying and thermal fogging under Haitian conditions.

To avoid quick development of insecticide resistance by the vector mosquito, no organo-phosphates should be used in space spray adulticiding.

In order to avoid detracting from the malaria control effort, the use of space spray adulticiding for Dengue Fever control and for Rest Mosquito control should be a separate activity with its own budget. The involvement of SNEM should be restricted to providing technical guidance.

2.8. Larviciding

Larviciding does not play a major role in most malaria control programs, but under certain circumstances, when used properly, it can contribute to a reduction of the transmission of malaria. Larviciding is most effective in the dry season when there is a limited number of larval breeding places, but can be ineffective and wasteful if used in the rainy season. Larviciding can contribute the most to the program in the urban and peri-urban areas when used in conjunction with other methods such as source reduction and water management.

2.8.1. Achievements and Prospects

Larviciding has been conducted by SNEM for a number of years with varying degrees of effectiveness. In the past, the larviciding program has suffered from inadequate planning and evaluation.

The present anti-larval program which started in May 1983 with 2 anti-larval brigades (2 in each zone), if fully supported with men, money, and materials and if carried out as planned should provide technical guidelines on how best to utilize larviciding in the Haiti malaria program.

2.8.2. Recommendations

A special consultant on mosquito control should be brought in to review the on-going anti-larval program to insure that Haiti benefits from the latest developments in modern mosquito control techniques.

Materials used for larviciding should never include any insecticide which might be used as a residual wall-spray.

The present anti-larval program should be fully supported or reduced to a scale which can be supported.

As new materials for larviciding become available, they should be included in the research program for field testing under Haitian conditions. This could include insect growth regulators (IGRs) such as Altocid, bacteria such as Bacillus thuringiensis israelensis (BTI) and the mono-molecular layer larvicide.

III. Technical Support Activities

3.1. Epidemiological Surveillance

This system aims at monitoring epidemiological situations among well defined groups of the population and/or measuring and detecting changes resulting from the application of remedial measures or resulting from variations among parameters which influence the epidemiological situation.

In Haiti actually, besides the assessment made on changes due to the application of the fenitrothion at different dosages trial of which has provided quite reliable information, there is no way to know with a certain limit of confidence the actual status of the disease in different age groups. Nor is it possible to determine with any exactitude the geographical distribution of the disease according to different levels of endemicity and the seasonal variations of transmission.

Neither levels of morbidity nor mortality are being measured. The evaluation team strongly recommends the complete termination of the surveillance system as it now exists. In its place should be organized a system which collects simple indices, in those areas where remedial measures are being applied, and is related to the operational capacities of the program.

3.1.1. Case Detection Activities

The control program is still using old malaria eradication terminology such as Passive Case Detection (PCD), Active Case Detection (ACD), Annual Blood Examination Rates (ABER), Annual Morbidity Rates (AMR), etc. which were part of a system aiming at the total coverage of the population in time and space and to the exhaustive search of residual malaria foci.

Under the present circumstances, all these activities and terminology are no longer pertinent and may mislead the epidemiologist and the malaria control planner.

There is no sense in collecting thousand of slides which are examined several months later if these slides do not reflect an amount of endemicity among a well defined population.

Epidemiological evaluation data should be directly related to the expected goals derived from the applications of remedial measures.

If the remedial measure would be to make chloroquine available to all who may suffer from malaria, the expected results would be a reduction of mortality rates and of the time of suffering of the ill (17th Expert Committee on Malaria Report, 1st Tactical Variant). If in other areas in which may be contemplated the application of a certain amount of residual insecticide, the malariologist would expect a reduction of the prevalence levels; therefore measuring the variations of the Parasite Rates (PR's), before and after the

application of the insecticide among the most sensitive groups of population (i.e. 2-9 year old children) would provide very reliable evaluation parameters.

In some instances, hospital and health institution records may become a good source of information.

The variations of the daily rate of malaria of attending patients (even if not microscopically diagnosed) to the total number of out-patients may provide some amount of information about the rank of malaria among other health problems in the area. Also an increase in the rate of malaria admissions provides information on the increased severity of the disease.

Last but not least, hospital mortality records may become the main source of information regarding malaria mortality among different age groups and its relationship (direct or indirect) with other pathologic processes.

Infant surveys provide the best source of information regarding intensity and timing of transmission. However, taking into account the recommendations made in this report regarding future anti-malaria interventions, infant surveys should be carried out only in areas where residual insecticide has been applied to reduce the intensity of malaria transmission.

Supposing that fenitrothion would be applied once a year in limited areas just before the main peak of transmission, i.e. November, infant surveys could be carried out six months later to check the amount of transmission and again sometime in August of the following year to assess the length of time of the reduced transmission.

Pregnant women are particularly sensitive to P. falciparum infections. Abortion rates and low weight at birth increases due to the disease. It is therefore recommended to assess these two indices among expectant mothers and new born babies while protecting the mother with a prophylactic malaria treatment (300mg chloroquine base per week) from the third month of pregnancy and until delivery.

3.1.1.1. Laboratory Operations

The laboratories dedicated to the examinations of blood films are much the same as they have been in the past, and most of the comments made in previous program reviews are still valid. The major laboratories are in the zone offices, but there has been some decentralization to a few sectors. Laboratories were visited in three zones (including the Bureau Central laboratory) and were observed in several sectors. The microscopist output in the zone laboratories was stated as 60-70 slides per day. In these laboratories, the preparation of reagents, slide making and staining are done by auxiliary personnel. In the sectors where the microscopist does all of the making, staining and examining, the output was stated as 50-60 slides per day. Slide examination is still not being done on a timely schedule, there appearing to be at least a 2-3 month backlog of slides in the

zone offices visited. For example, the team was informed in Zone I that there were 11,000 slides awaiting staining and examination. In Zone IV, the number given was 7,000. From all information available, it appears that there are at this time over 25,000 slides awaiting staining and examination.

The quality of the slides produced in the VC system appeared generally to range from poor to useless. It seems unlikely that this will improve. In 1963, the laboratories adopted the Field staining method after having used the Giemsa stain from 1970 to 1963. The Field staining method had been used prior to 1970. The reasons for this change are obscure, particularly in view of the wide acceptance of and usually excellent results obtainable with the Giemsa staining method. The slides stained by the Field method were almost totally blue in color with few of the attributes which would lead to accurate diagnosis of parasites. Reversion to the Giemsa method should be reconsidered, the reagents acquired, the technologists retrained, and the use of this superior method reinstated.

The microscopists presumably are well trained, and on-the-job trainees were present in some of the laboratories. However, in some recent studies, it was found that in one series of slides examined in both a zone laboratory and the Headquarters laboratory, the zone microscopists reported twice the number of positives found at Headquarters. This suggests that there may be deficiencies in capability, training and supervision which should be remedied without delay. One should not overlook the fact that the slides are so poorly made and poorly stained that even the most expert microscopist would have difficulty in accurate diagnosis. There is supposed to be a quality check on the diagnostic examinations with all positives and 10% of the negatives examined. This is done only "if time permits;" obviously, with a backlog of 25,000 slides, there is not time for this activity.

It was notable that the microscopist receives only the slide for diagnosis without the accompanying form. Thus, there is no opportunity to complete the part of the form which is intended for comments on the quality of the slide. It appeared, on scanning slides awaiting examination, not more than half could be expected to yield valid results and even these suffered from poor quality of the Field stain.

The microscopes appeared to be adequate, although the flask-type lighting is archaic and extremely variable in color. In Zone IV, some of the microscopists faced a very bright window background which must have made eye adjustment to the darker field of the microscope very difficult. In Zone II (Bureau Central), the facilities appeared to be much better, the microscopists having the advantage of a semi-darkened room.

There is little doubt that under present conditions, the results of laboratory examinations are virtually useless to the program in relation to timely response, to needs for program activities or to accurately reflect malaria incidence or distribution. If this is to be rectified to any significant degree, there will have to be a complete reorganization of the management of this resource.

Recommendations made in the past, and even as recently as April 1977 for reorganization and equitable reassignment of laboratory personnel has not been productive of improvements. Among the recommendations which should now be considered, would be the reconsideration of the maintenance of the sector laboratories which are probably the least efficient and accurate. The possibility of centralizing all of the laboratories in the Bureau Central should not be beyond consideration. Under present circumstances, there appears to be no benefit in having laboratories outside of the Bureau Central.

3.1.1.2. Entomology Studies

The entomological evaluation of the fenitrothion dosage trials (EPOFEN) continues to be a priority activity of the Entomology Section of SNEM. Entomological assessment of the impact of the different dosage levels is being conducted by the measurement of biting and resting vector densities, susceptibility tests, bio-assay tests and window trap studies. An entomology team is based in each of the study areas. A team is made up of 4-6 field assistants supervised by a team leader. General supervision of all the teams and preparation of work itineraries is done by the Entomology Section Chief.

The entomological component of the EPOFEN trial seems to be well designed and the observations are being correctly made and recorded. An analysis of these findings to date is premature, since the trials are still in progress. When completed, however, these studies will provide essential information for determining the optimal dosage for fenitrothion under Haitian conditions.

In July 1984, a training course was held for entomological field assistants so that the zone entomology teams could be brought up to full strength. It is now possible to have a five-man entomology team in each of the four operational zones. Zone entomology teams will be used to perform routine observations as well as insecticide susceptibility testing when necessary.

The information gathered by these teams can be of great value in filling in the gaps in our knowledge of seasonal changes in vector densities, as well as a better understanding of the behavior of Anopheles albimanus and its contact with man.

The current entomological program of SNEM seems to be well designed and managed. In planning for the future, it would be advantageous for SNEM to have a Haitian professional entomologist on their permanent staff. Any anti-malaria measure involving vector control or environmental management will require entomological study and evaluation.

3.1.1.3. Fenitrothion Toxicity

Reports of previous evaluation teams (i.e. 1979, 1981) have noted the necessity for precautionary measures to protect

personnel involved in house-spraying operations with the organophosphorous insecticides, particularly with fenitrothion. Such precautions have been introduced and are apparently reasonably well followed at present in both the experimental areas and in those where fenitrothion is in operational use. These include protective clothing, face masks, and gloves, as well as instructions for frequent washing and bathing at the close of the work day.

To ensure that these measures are being carried out and are effective, each member of the spray squad, the insecticide weighers and packagers, and supervising personnel who may come in contact with the insecticide are tested weekly for blood cholinesterase (ChE) levels. The team reviewed the records of these tests and observed their application in the field. Those who conducted the tests appeared to be well trained and were performing satisfactorily. The policy of SNEH is to discharge any employee who attains a level equal to or less than 50% ChE activity and to replace them with a new employee. The known seriousness of the effects of excessive overexposure to fenitrothion suggests that this policy is not overly severe.

Records provided the team indicated that in the three completed cycles of the PPOFEN project, 57 spraymen achieved ChE levels of 50% or lower. In three operational cycles (OP-1 and OP-2), an additional 146 tests were also at these levels. The data provided, along with discussions with SNEH staff and review of data in zone offices, yielded some interesting considerations.

- The number of depressed ChE levels tended to decrease in later cycles over that seen initially.
- Higher numbers of depressed levels were rather consistently seen in some squads as compared to others.
- There was an apparent bias in the testing results toward the 37.5% and 62.5% levels, at the expense of the 50% levels (e.g. 25 @ 25%, 11 @ 37.5% and 6 @ 50%).
- The number of depressed levels in the PPOFEN areas applying 2g/m² were substantially higher than in the areas using 1 or 1.5g/m² (1g = 9, 1.5g = 4, 2g = 31).
- In the PPOFEN project, 1,220 tests were done on inhabitants of the sprayed houses; none showed abnormal ChE activity.

From these observations it can be tentatively concluded that:

- supervision and compliance with precautions became better after the first cycle, perhaps because spraymen who became overexposed lost their employment;
- supervision was faulty in some squads;
- the reason for the skewing away from 50% is not readily apparent. It might be speculated that the technician conducting the test tended to be a little lenient in differentiating between 50% and 62.5%, knowing that

selection of the former would result in loss of work. It should be noted that the colorimetric determination can be slightly subjective in differentiating between adjacent levels;

- the higher dosage used apparently **was** responsible for excessive exposure to the insecticide;
- none of the inhabitants of the sprayed houses was adversely affected by the fenitrothion.

It if is planned (and possible) to continue using fenitrothion in house spraying, there must be no relaxation of effort to avoid excessive exposure of spraymen. The fact that in the PROFEM project alone, 14 spraymen reached the dangerous level of 25% ChE activity with an additional 11 such levels in OF-1 and OF-2 spraymen, suggests the need for better supervision and inspection with frequent review of the results by Zone and Headquarters management. Those supervising spray squads with a poor record might also be replaced after suitable warning. There should also be continuous training, retraining and supervision of the technicians conducting the ChE tests, and frequent checking of the equipment, reagents and methods used.

There is a suggestion that a simplified, cheaper and perhaps more sensitive method for measuring ChE levels is under development. If such a test becomes available, it should be thoroughly field-tested and its adoption considered.

3.1.1.4. Geographic Reconnaissance

The mechanism for the up-dating of geographical reconnaissance exists and it is especially important to continue to do this in problem areas that may be candidates for residual house spraying. Another need for the future is the accurate mapping of anopheline breeding places, especially in those areas where larvicides will be used or fish introduced for biological control.

3.1.1.5. Statistics

Statistics plays a rather important role in SNEP activities. However, the system, as actually operating, was designed for eradication purposes. Twenty two (22) staff are full-time devoted to statistical work: 5 at Central Headquarters, 3 at Zone I, 7 at Zone II, 4 at Zone III and 3 at Zone IV.

The data collected and compiled by the statistics section are basically related either to the epidemiology of the disease or to the control operations which have been carried out.

The flow of data is slow and much of the processed data are irrelevant to the goals of the program. On September 7, 1964, at Central Headquarter Section, there are complete processed epidemiological records only of data up to April 1964, and up to June 1964 for operational returns. Therefore, evaluation and management decisions are often mainly based on inadequate, incomplete and somewhat subjective information and not on the actual situation.

Recommendations

There is an immediate need for simplifying the reporting system using key indicators for facilitating the decision-making process.

SNEM has to urgently review the substantial amounts of data and information which must be gathered and processed rapidly in order to:

- constantly monitor high malaria risk areas or groups of population on a timely bases;
- obtain early warning of epidemiological changes in lower risk areas;
- develop an ability to rapidly and effectively respond to emerging situations before they reach crisis levels as defined by predetermined criteria.

3.1.1.6. Epidemiological and Operational Stratification

Following the 1981 evaluation, SNEM proceeded to do an eco-epidemiological stratification of the country taking as criteria different values of the Annual Morbidity Rates (AMR's) as estimated from the blood slides collected by the VCs and related to total groups of population (sectors, zones, etc.).

Although very biased, the method has helped in the planning of malaria remedial measures in spite of the fact that areas with high transmission have probably been overlooked while others with not so much transmission but with high indices of positivity have been identified (the high positivity indices of Limbe town, due to the numerous positive slides reported from the Bon Samaritain Hospital, is a good example).

It is therefore believed that the SNEM should proceed a step forward. Taking into consideration, the levels of endemicity of different areas of the country which should be well known by now, as well as the possible ways of action against the disease and other factors such as size, accessibility, house concentration, regular gatherings of people (market, church, meetings, etc.), an operational structuring of the country should be made in order to easily determine areas where different remedial measures could be applied, i.e. areas where insecticide should or could be applied once or twice a year; areas where only case treatment would be carried out; areas where larvivorous fish or larvicide may be of utility.

1. Treatment of Cases

2. Operational Possibilities

Objective

Taking into consideration the epidemiology of malaria in Haiti, the efficacy of the technological control methods and the

current financial capacity of the country, the program should focus on the reduction of and prevention of mortality due to malaria.

Goals

To select the immediate goals of the program, the following factors have been considered:

- high malaria prevalence;
- severity of P. falciparum infections;
- low socio-economic level of most of the population;
- previous experience related to the administration of the program for efficient prevention of control of the disease.

Activities

Discussions led to the conclusion that in order to achieve the general objective, wide anti-parasite measures should be applied by means of a well organized network of antimalarial drug distribution.

Since financial and human resources are not readily available to the SNEM, utilization of all possible and existing resources from health and other developing sectors is indispensable including community participation.

The general health services (DSBU) and SNEM have the responsibility for the efficient distribution of anti-malarial drugs. All community centers, military and civil organizations, as well as educational, agricultural and industrial enterprises should also play an extremely important role in making available the timely malaria treatment to all people at risk.

Organization of the Network for Anti-Malarial Drug Distribution

The already existing network of approximately 6,000 VC currently administering anti-malarial drugs should be expanded to approximately 10,000 VC, each one having an average of 325 inhabitants to attend.

Depending upon the localization and distance from the VC at the worst of the hypothesis, 10% of the inhabitants will be seeking anti-malarial treatment every month. If a single dose of 10mg/kg base of chloroquine is administered per patient, 100 tablets of 150mg base of chloroquine are needed per VC per month. The estimated number of tablets per year is 21,600,000 (including contingency figures). Current price is US\$ 15.00/box of 1,000 tablets, so the cost for one year's supply is US\$ 324,000.00.

For the training, supervision, monitoring and drug supply of the VCs, 300 SNEM field agents (FA) would be needed (50 VC per FA per month). Since every 4 FA's will be supervised and supported

by one chief of brigade (CB), 20 CB's would be needed. To ensure the efficiency of the activities, 20 group chiefs (GC) will coordinate the operation of 20 CB's (5 CB per each GC). Field agents will promote the awareness of the population about malaria, update geographical reconnaissance and other information related to population census.

The estimated cost in salaries of the needed personnel would be as follows:

<u>Number</u>	<u>Category</u>	<u>Salary per Year</u>	<u>Total</u>
360	Field Agent	US\$ 1,430.00	US\$ 514,800.00
20	Chief of Brigade	US\$ 1,760.00	US\$ 150,120.00
20	Group Chief	US\$ 2,405.00	US\$ 48,100.00
	<u>Total</u>		<u>US\$ 722,920.00</u>

Evaluation

Due to the absence of reliable data on mortality and morbidity, DSEP and SNEP are urged to conduct periodic mortality surveys in hospitals and health centers. This activity will allow the monitoring of the efficiency and efficacy of drug distribution.

In spite of the fact that the objective of the chloroquine distribution network is not the reduction of morbidity indices, the DSEP and SNEP should initiate morbidity studies in terms of:

- a) severity of the infections;
- b) reduction in time of the infection;
- c) distribution of the disease;
- d) frequency of parasitemias and clinical symptoms of malaria in health centers;
- e) contribution to the development of epidemiological surveillance systems;
- f) drug consumption patterns in DSEP units, pharmacies and other drug distribution systems.

3. House Spraying

Fenitrothion has proven so far to be the insecticide of choice to be used in Haiti. However, recent developments may greatly affect the wide scale use of this insecticide. It is therefore of paramount importance to use the limited amounts that may be available in 1985 in those areas where there is the greatest risk of transmission at that time of the year when the residual impact may be greatest. The team therefore recommends application of a single round of fenitrothion in September/October 1985 in those areas where the highest transmission rates are expected.

The evaluation team is unable to recommend which particular areas should be sprayed in priority but, according to some rough estimates, if some 140 tons of fenitrothion could be made available for the coming campaign, this would allow the treatment of about 100,000 houses, or the protection of some 500,000 inhabitants.

However, this figure should be slightly reduced because it would be highly advisable to keep a 10% insecticide reserve to be used in particular threatening situations, if and when necessary, during the spring months of 1965.

According to latest calculations, estimated costs of fenitrothion 2g/sq.m. (40%) would be in 1964.

Fenitrothion 750g/house	US\$ 3.75
Additional cost per house *	<u>US\$ 1.70</u>
<u>Total per house</u>	<u>US\$ 5.45</u>

Therefore

Total for 100 houses (1 round)	US\$ 545.00
Total for 100 houses (2 rounds)	<u>US\$ 1,090.00</u>

* Staff and petrol

If trials with 1g and 1.5g/sq.m. prove of value, the cost of the spraying per house would be reduced accordingly and most important the number of houses to be sprayed should increase proportionally.

Another alternative to the use of the insecticide could be to keep it in reserve and utilize it only in areas showing epidemic increases. The danger with this second possibility is that quite often the application of the insecticide would be too late, after peak transmission is over. The team therefore advocates the utilization of insecticide in areas selected beforehand and in accordance with the country's operational stratification.

3.2. Management Support Activities

3.2.1. Supervision

Mechanisms exist for both direct and indirect supervision of all the activities of SNEM. Forms have been developed for the recording of supervisory visits, defects found and remedial measures taken. It is quite obvious that great improvements could be made in compliance, especially in the operation of the laboratory services and office management of the Central Headquarters.

3.2.2. Health Education

Health education continues to be an organized activity of SNEM with a professional in charge with adequate support to carry out the traditional health education activities. These include the preparation and distribution of posters, the operation of sound trucks and the presentation of radio programs to explain SNEM activities and their purposes at the village level.

It is evident from the high percentage of coverage in operational house spraying that the general public understands and accepts this anti-malaria measure. There seem to be no major problems of refusal of house spraying. The same could be said about general knowledge concerning malaria among rural Haitians. It is essential that health education efforts continue so that the population is informed of current malaria activities and also informed of the availability of anti-malaria drugs through the VC network.

3.2.3. Training

Training and re-training at all levels in malaria control programs have been given high priority by numerous international meetings sponsored by WHO, DANU and USAID. In keeping with this priority, the 1979 evaluation team strongly urged the creation of a Training Section and the preparation of training manuals. The 1981 evaluation team confirmed that a Division of Training, Research and Health Education had been established and that a consultant, Dr. Guy Houel, had worked with SNEM on the establishment of the Division. Furthermore, job descriptions were written or revised and training plans were projected for all of the categories of workers. Manuals were prepared or revised for use in training in the following subjects: Entomology, Geographical Reconnaissance, Spray Operations, Principles of Malaria Control, Health Education, Parasitology, Epidemiology, Chemotherapy, Source Reduction and others.

Unfortunately, as a result of personnel changes, the Division of Training, Research and Health Education is no longer functional. Research is now included as a part of Epidemiology while training and Health Education are now under Field Operations. Responsibility for research and health education appears to be clear-cut, but there is no one with full-time responsibility for training. A training plan is not included in the Annual Plan of Action. Training courses are arranged as needed when requested.

a) International Training. During the first two years of the current project "Management of Malaria," 10 individuals were sent out of the country on 21 training missions. This included formal courses, seminars, meetings, observation trips and individual instruction in the United States, Mexico and Venezuela.

b) In-Country Training. Forty (40) courses have been given to 2,452 trainees during the first two years of the project.

Place of Training	Category Trained	1982-1983		1983-1984	
		No. of Courses	No. Train.	No. of Courses	No. Train.
Headquart.	Surv. Agents			1	41
	Field Agents	2		1	
	Sector Chiefs	1	37	1	13
	Entomol. Aides	2	69	1	30
	Supervisors	1			
	Health Educa.			1	11
Zone I Gonaives	Field Agents	2		1	132
	Surv. Agents			1	10
	Spraymen	1	110	2	
	Cholines. Test. Retrain. Spraym.	1	20	1	10
Zone II Port-au-Prince	Spraymen	1	250	1	
	Cholines. Test.			1	
	Retrain. Spraym.	1	205		
Zone III Les Cayes	Field Agents	1	20		
	Cholines. Test.	1	17		
	Spraymen	1	200		
	Retrain. Spraym.	1	150		
Zone IV Cap-Haitien	Spraymen			2	40+
	Drug Distrib.			1	100
	Cholines. Test.	1	5		
	Sector Chiefs + Supervisors			1	7

UCIS Seminars¹⁾

Place of Training	Category Trained	1982-1983		1983-1984	
		No. of Seminars	No. Train.	No. of Seminars	No. Train.
Zone I Transversal	Doctors, Nurses Auxilliaris and Laboratory Technicians	2	142	2	103
Zone II West	Doctors, Nurses Auxilliaris and Laboratory Technicians	2	277	2	66
Zone III South	Doctors, Nurses Auxilliaris and Laboratory Technicians	2	198		
Zone IV North	Doctors, Nurses Auxilliaris and Laboratory Technicians			1	114

1) Given by SNEM with the goal of obtaining the collaboration of the Health Service in the diagnosis and control of malaria.

c) Conclusions and Recommendations. The training program made great progress following the consultant visit of Dr. Guy Houel and the formation of the Division of Training, Health Education and Research. However, at the present time, responsibility for training is divided. There is not a single individual with full-time authority and responsibility for training activities. Training is one of the most important activities of any malarial program and should be a continuous full-time activity.

It is recommended that training be re-established as a full-time activity with one individual being given responsibility for all training activities.

A considerable amount of international training has been accomplished and much of it has been excellent. The training conducted by C.D.C. both in Haiti and the United States has been job oriented and designed to meet specific needs of the program. However, some of the international training does not appear to bear a very close relationship to the duties of the person being trained and is marginal in its value to SNEM.

It is recommended that a long range plan for international training be developed with the objective of developing self-sufficiency within SNEM so that SNEM can look forward to the time when it will not be necessary to rely on external advisors. For example, although entomology is a critical element in the control of malaria and other vector-borne diseases which are very important to Haiti, there is not a single Haitian medical entomologist in the country.

Under the terms of the Management of Malaria Project, certain commitments were made for assistance in the development of the training program by both USAID and PAHO. This included provision of short-term consultants and organization of short courses in the following subject areas: training of trainers, planning and organizing of training, epidemiology, supervision and personnel management, management training, design of research protocols and field studies and training or re-training of supervisors and field staff.

Some of these objectives have been fully met, some have been partially met and some have not been met at all.

It is recommended that short-term consultants be utilized to review the entire training program in relation to the plan developed by Dr. Houel in light of progress made so far as well as current and future needs.

3.2.1. Research

The reports of previous program evaluations have given special attention to the need for operational research in the program and have in some cases provided detailed outlines of needed research (e.g. Project Models, etc.). The USAID/SNEM project agreement and project description stipulated a number of areas of needed research. These included a broad range of

chemotherapeutic, entomologic, epidemiologic, biologic and genetic studies. It is well recognized that all of the technical information needed to assure success of a control program in Haiti is not yet available, and continual efforts and resources are needed to develop as rapidly as possible such information, particularly in view of potential operational constraints, such as severe shortages of insecticides. The program has in the past been highly motivated to conduct field studies and much progress has been made; however, much remains to be done. USAID has fostered through a Participating Agency Service Agreement (PASA), a 21 year collaboration between the CDC (DHHS) Malaria Branch and SNEH for research in malaria. This agreement will continue through 1965 and the progress appears to be eminently satisfactory. In all of these studies, as well as in other field investigations conducted during the recent past, the collaboration and mutual assistance provided by SNEH, the PAHO Advisory Team and CDC seems to be good. The several areas of study in the SNEH program can be briefly described.

3.2.4.1. Comparison of Fenitrothion Dosages (PPOFEN)

Because of the high level of effectiveness of fenitrothion in intradomiciliary spraying and its relatively high cost, several groups have recommended a field trial to determine the relative effectiveness of three application doses - 2g/m², 1.5g/m² and 1g/m². This project and its interim results have been described elsewhere in this report in detail.

3.2.4.2. Insecticide Resistance Studies

Insecticide resistance to DDT occurs widely in Haiti; a comprehensive review of the response of Anopheles albimanus to this compound has recently been prepared by the PAHO Entomology Advisor. The need for monitoring the resistance to the alternative insecticides (e.g. malathion and fenitrothion) dictates continued field testing of existing and newer methods of assay. The CDC group has developed a new biochemical field assay system for detection of vector resistance to organo-chlorine and organo-phosphorous insecticides. This method is being compared with the standard WHO method by field testing. It is anticipated that a biochemical assay kit which would be appropriate for operational use will be developed. Additional biochemical methods will be tested as they become available.

3.2.4.3. Vector Studies

Both CDC and PAHO have been collaborating with SNEH in determining more accurately the habits and habitats of the malaria vector, An. albimanus. Initial studies have been completed on vector habits including man-biting rates, indoor resting density, seasonal changes in biting and resting, degree of anthropophily and endophagy, intervals between blood meals, age composition, longevity and sporozoite rates. Studies are underway on vector house entry and resting using window traps. It is

essential to extend and complete this investigational program to provide an information base applicable to a variety of entomologically based control interventions. It will also be essential to conduct studies on the effect of human population behavior on man-vector contact.

3.2.4.4. Biological Methods of Control

The use of fish as a biological control method has been under investigation for some years, and the USAID/SNEM project specifically this as an appropriate area of research. There has been good progress in this field, and the results and prospects are presented elsewhere in this report.

3.2.4.5. Chemotherapeutic Studies

This has perhaps been the most active research area in Haiti during the past several years. The USAID/SNEM project recognized its importance and suggested a number of studies on drug use. CDC and SNEM have collaborated in the evaluation of several methods for in vitro testing of drug sensitivity (macro, micro, 12-hour) and have conducted pilot testing for resistance to chloroquine, Fansidar and pyrimethamine, using both in vitro and in vivo methods. These groups have also proposed and are testing a simplified in vivo test for chloroquine sensitivity, using a single seventh day post-treatment parasitologic examination as the criterion for resistance or sensitivity. Successful application of this simplified test would be extremely useful for a country-wide "early warning" system for detecting drug resistance. Preliminary studies have also been done on the comparative in vivo effectiveness of the presumptive (10mg/kg single dose) and the radical (25mg/kg multiple dose) treatment regimens. No cases of failure have as yet been seen at 10mg/kg when examined 7 days after treatment.

Much remains to be done in the field of chemotherapy, including completion and extension of the above studies, evaluation of alternative drugs, evaluation of the use of primaquine as a gametocytocide, evaluation of the effectiveness of mass chemotherapy, and the careful and on-going evaluation of efficiency and acceptability of all drugs and drug regimens used currently or in the future. It is of particular importance to develop and test a reliable method for the in vitro testing of parasite sensitivity to mefloquine, one of the newer drugs which might be used in the event of chloroquine resistance development.

3.2.4.6. Epidemiologic Studies

In the USAID/SNEM project description special emphasis was placed on research in stratification methodology, development of an epidemiologic surveillance system and a study of the volunteer collaborator system. Progress toward these goals has been slow. CDC and SNEM have collaborated in studies on multi-stage cluster sampling in two areas to determine recent history of fever, confirmed malaria, drug use, and point prevalence of parasitemia.

and malaria antibodies. Analysis of information provided an indication as to the recency and intensity of malaria transmission. The studies were done in Port-au-Prince and in Zone du Nord (North Haitian). Studies were extended in the Zone du Nord to assess the effect of mass drug administration on incidence and prevalence of malaria and on antibody levels, and will continue in this area to assess levels of mortality and morbidity. A clinical study is also underway in an effort to assess the most reliable predictors of malaria in acutely febrile children.

In collaboration with PAHO, a study will be done to determine the rate of asymptomatic parasitemias in the PROFEN areas. This same group is devising and testing a form for recording the data acquired in the surveillance network.

The unmet needs for epidemiologic research include:

- Improvement of stratification methodology;
- Study of the VC system as primarily a drug distribution network;
- Determination of epidemiologic criteria for triggering mass drug distribution;
- Development of surveillance systems to enhance or replace passive case detection.

3.2.4.7. Sociologic Studies

Among the suggested subjects for research in the USAID/SNEM project are:

- Sociologic factors affecting transmission and control of malaria;
- Population knowledge, attitudes and beliefs relating to malaria and SNEM programs;
- Impact of migration and population mobility on malaria;
- Effectiveness of health education methods;
- Enhancement of impact through community mobilization.

SNEM has undertaken a study of the population's perception of and acceptance of the anti-malaria operations of SNEM, including spraying, drug distribution and source reduction; the results of the study appeared to be significant and will hopefully be applicable to operational programs.

A study protocol has been prepared for the investigation of the effect of population migration on the transmission of malaria. There is a need to pursue the needed sociologic studies. Population attitudes and participation will become even more important in the years ahead and it is essential to make substantial progress toward enlightening the beneficiaries of control programs, influencing their attitudes and assuring their participation.

3.2.4.8. Conclusions and Recommendations

- An active research program is an essential element of the SNEM and must be continued and expanded to ensure continued viability and eventual success. Consideration should be given to elevation of the research component to more visible position.
- While not strictly definable as research, evaluation must be included as a component of all operational measures undertaken by SNEM. At present, such evaluation is rarely done.
- The program must recruit, train and support entomological leaders and teams which can continue to do the essential studies on insecticide resistance and on vector bionomics.
- There should be a continuing effort to find additional species of fish which would be useful for larval control in seasonal habitats (e.g. those that survive as eggs through periods of partial drying).
- With the use of anti-malaria drugs likely to increase in future years, there must be proposed and tested the rational selection and use of drugs as cost-effective and safe for the reduction of mortality and morbidity, and, if possible, reduction of transmission. Monitoring of drug sensitivity is essential and newer operational methods should continue to be explored.
- The dilemma of identifying and classifying malaria on a more timely and accurate basis is one which will require intensive and imaginative investigation. At present, the major method of surveillance provides no current information on which current operational decisions can be made. Expert consideration of this problem should be sought and trials of alternative methods initiated.
- Pilot studies should be instituted on the utilization of the VC system solely for the purpose of distributing drugs for presumptive treatment. As a collateral study the incorporation of other health functions into the system should be considered (e.g. rehydration salts, health education materials, etc.).
- There must be a continuing effort to upgrade and expand sociologic studies as they apply to the transmission and control of malaria.

IV. Administrative Support Activities

4.1. International Organization of the Program

4.1.1. Management System. the program's highest governing body, the Executive Committee is responsible for:

- . Establishment of program policies;
- . Approval of rules and provisions;
- . Budget;
- . Program of work.

It is advisable to create a multidisciplinary lower level committee comprised of the Director of SNEM, an USAID representative and a PAHO representative. This group would reinforce the steering role of the Executive Committee by establishing a monitoring mechanism to keep track of the proper implementation of policies, rules, budget and program of work. Specifically, this multidisciplinary group would follow up on program status and reporting and prepare position papers on policy, technical and administrative matters for review, decision-making and approval by the Executive Committee. This group would report to the Executive Committee and be responsible for providing its members with technical and administrative management services and follow up on policy implementation.

Benefits derived by this will be improved efficiency and the expansion of the Executive Committee role by providing its members with:

- . Policy issues for discussion;
- . Alternative courses of action;
- . Decision support group and systems;
- . Timely information for decision-making;
- . Follow-up on policy implementation;
- . Technical and administrative management advisory services.

4.1.2. General Delegation of Authority. Examination of the organizational structure reveals the need for some improvements. It appears that decisions that could have been made locally in the zones are made in Headquarters. This centralization ignores many important local factors of problem solving and also diminishes the flexibility of the program to react on a timely fashion. However, what is most important is that no commitment is fostered at the local levels due to a lack of participation in the decision-making process. Thus, an orderly decentralization program with specific decision points and appropriate controls is suggested.

Recommendations. Implement an orderly decentralization program with specific decision points and appropriate controls.

4.1.3. Mechanisms of Coordination. Initial steps have been taken to integrate certain activities between SNEM and DSPP. Not enough data are available as to make an evaluation on the integration efforts nor the implications of such an integration. In order to prevent dislocations in on-going malaria control activities, the consolidation of administrative and operations management support systems must be carefully planned and phased.

It is anticipated that the SNEM Executive Committee, as a result of creating a decision support group (Ref. 4.1.1.), will assume a stronger leadership role in the monitoring of program progress as well as facilitating top level coordination with governmental, international and private agencies.

Evaluating result records show that the malaria situation in Haiti in 1984 is worse than it was in 1974. There is the need of an urgent re-definition of goals and objectives of the program considering alternative courses of action. Coordination is imperative to facilitate a multidisciplinary and integrated approach to help solve pressing Haitian health problems.

A coordination should take place in three major areas: operations, training at all levels and research.

Recommendations. Redefine the goals and objectives of the program considering alternative courses of action. Coordination and integration is imperative to facilitate a multidisciplinary approach to help solve pressing Haitian health problems.

4.2. Organization of the Administrative Systems

4.2.1. Structure of the Support Services. While the structural and administrative capacities are sufficiently in place to carry out the program, effective implementation will require continuing strengthening of SNEM operations. The present organization fails to provide for three vital needs of an operation as large and complex as SNEM: a planning unit (in addition to the present Planning Committee), an audit capacity independent of general administration, and a training function.

SNEM needs to decentralize some field operational decisions and planning to gain more operational flexibility in program design and execution. Restructuring, expansion and decentralization will require:

- . enhanced training and supervision of all field personnel by Headquarters and Zone staff;
- . a Headquarters normative function as opposed to routine activities with a systematic, planned and independent auditing function;
- . to provide an overall quarterly plan by region and/or zone on how to execute the program and how to expend the money;
- . implement a quarterly monitoring system to reprogram activities and/or report status as required.

Recommendations

- . A systematic, well planned and independent auditing function should be established within SNEM;
- . Quarterly plans should be implemented by region and/or zone on how to execute the program and how to expend the money;
- . A quarterly monitoring system to reprogram activities and/or report status should be established.

4.2.2. Responsibilities and Authorities. Inadequate management and supervision of field operations and two-way information flow between sector, zone and Headquarters are serious administrative weaknesses that require immediate attention. Since decision-making is highly centralized, SNEM should find mechanisms to extend supervision more effectively into the field. In conjunction with the establishment of the management systems, the responsibilities of the administration top management should undergo a re-definition.

The SNEM and DSPP program of regionalization is well conceived and a strong foundation has been laid for health service regionalization. The fundamental weakness of the regionalization policy results from a lack of decentralization and coordination. Specifically, SNEM Zone Chiefs need more resources and should have more clearly defined authority and accountability for the operations within their zones.

Recommendation. Authority, responsibility and accountability for Headquarters and field personnel should be clearly defined.

4.2.3. Administration of Resources. In order to improve support for field activities, the SNEM Central Office must be functionally organized, must possess sufficient resources and must be staffed with personnel energetically committed to field operations. On a smaller scale, the same criteria applies to zone offices in providing support to sector personnel.

Simple measures of accomplishments must be developed so that progress in the implementation of priority activities can be easily evaluated so that program activities and regions/zones can be compared. Accomplishment should be recognized at all levels, from Community Volunteer to Zone Chief to Central Office Management.

The development of simple indicators to measure program activity is critical to the SNEM's future success in implementing national or regional campaigns for priority activities.

In addition to the management problems described so far, there are a range of broader administrative constraints with which SNEM must somehow cope. During the 1960's, SNEM employees were the elite of the health corps; there is no retirement plan and over the years their comparative salary advantage has disappeared. There are some indications that in the shift from

eradication to "routine" control, SNEM personnel have lost their motivation and drive to implement the revised goal and purpose of their organization.

Redefinition of goals and objectives, a new salary scale, a retirement plan (similar to the one in DSPP) and refresher training and skill upgrading are needed to motivate and to reorient staff to the continuing importance of their functions and the timely execution of their tasks.

Recommendation: There should be established a new personnel system with a new salary scale, a retirement plan (similar to the one in DSPP) and a refresher training and skill upgrading program.

1.3. Personnel Management

The evaluation of SNEM present personnel management system indicates that:

- a) functional job descriptions exist;
- b) recruitment is done through test, selection and recommendation made by the program officers such as the General Director or Zone Director.
- c) criteria used for performance evaluation and efficiency rating are not well defined;
- d) employees recognition, incentive and rewards as well as procedures for promotions or transfers are not quite clear. Most of these decisions are taken by the Director.

The personnel of SNEM are classified in two categories: the Permanent such as the staff of the Bureau Central and Temporary such as the employees hired during spray cycles.

During fiscal year 1983, a total of 1,384 employees were planned. The actual number of employees who worked during the same period was 1,013.

The recruitment of personnel especially in the field is related to the spraying needs. For this reason the payrolled staff varies from one month to another. For instance, in January 1984, SNEM used 673 employees and in August 1984 the total of employees was 1,079.

The employees of SNEM are not paid in accordance with the DSPP norms or salary scales. In fact, SNEM's salary scales are lower than those of DSPP. On several occasions, it was requested that SNEM's salary scales be brought to the level of those of DSPP. We recommend that this request be taken into consideration. A positive solution would enhance the productivity and the moral of SNEM employees.

It was also brought to our attention that SNEM personnel do not have a retirement plan. We recommend that a retirement plan be studied. It is understood that such a plan would increase the personnel costs but it would improve the program delivery. We suggest that a study be made either to integrate SNEM personnel into the DSFP retirement program or to establish an acceptable independent retirement plan.

4.4. Financial Management

4.4.1. Projected Costs Analysis. The projected costs of the project for the implementation of malaria activities during the four-year period were estimated at US\$ 26,485 million. The following table gives a breakdown of funds and sources of funds.

Budgeted Funds and Sources of Funds
(expressed in US\$000)

Sources of Funds	1982/83	1984	1985	1986	Total	%
COF ^{a)}	1,380	2,192	2,397	2,616	8,585	33
USAID	2,000	2,400	1,900	1,700	8,000	30
PAHO	460	470	480	490	1,900	7
COJ ^{b)}	2,000	2,000	2,000	2,000	8,000	30
Total	5,840	7,062	6,777	6,806	26,485	100

^{a)} Includes Title I Funds.

^{b)} Represents contribution in kind.

During the period under evaluation which covers fiscal years 1982-83 and 1983-84, a budget of US\$ 12,002 million was allocated. Reference is made to Project Document AID/COF No. 521.0143.

The following table provides details of projected commitments of funds against all costs.

Projected Commitments for Fiscal Years 1983 and 1984
(expressed in US\$000)

Funding Agency	1982/83	1983/84	Total
COM	1,380	2,192	3,572
USAID	2,000	2,400	4,400
OPHO	460	470	930
GOJ	2,000	2,000	4,000
Total	5,840	7,062	12,902

The GOJ's financial support has been used for commodities and local costs.

The USAID commitments have been programmed to cover the following expenditure items:

Items	FY 1982	FY 1983	Total
Operational supplies and research material	\$415	\$628	\$1,043
Replacement vehicles	390	413	803
Technical assistance	356	387	743
Local cost salaries	625	662	1,287
Other local cost/training	214	310	524
Total	2,000	2,400	4,400

The Pan American Health Organization's contribution for fiscal years 1983 and 1984 which amounts to US\$ 930,000 covers the technical cooperation.

The Government of Japan's actual contribution for the first two years of this project amounts to US\$ 2,000,000 budgeted to cover the cost of the insecticides.

3.2. Actual Expenditure Analysis. A review and analysis of the financial data provided by the Administration of SIEM reveals that the budgeted funds were spent according to the programmed activities.

A total of US\$ 5,207,957 for actual expenditures were accounted for during fiscal years 1983 and 1984 (July).

The financial reports also indicate that the malaria activities continue to grow in expenditures.

An analysis of the planned and budgeted programs compared with what was actually carried out shows that there is an increase in most of the planned activities. In some areas the actual expenditures exceeded the budgeted amount. In some other areas delivery could be strengthened through better planning and supervision.

For example, a budget of US\$2,481,111 was established to carry out 4 cycles of spraying during fiscal year 1982-83. Only 2 cycles of spraying, cost US\$ 638,240, were delivered.

The financial reports also indicate that the:

- a) GOH has met most of its obligations for FY 1982-83 by providing US\$ 1,300,000. However, for FY 1983-84, the GOH provided only US\$ 1,276,000 leaving a shortfall of US\$ 816,000.
- b) USAID is funding this project through an established revolving fund. An analysis of the revolving fund reimbursement procedure is presented in a separate section.
- c) PAHO also met its commitments by providing the project with full-time epidemiologist, entomologist and three sanitarians. Additional support was given to this program by PAHO regional advisor in malaria. Headquarters administrative officers, short-term consultants, training and fellowships were among this assistance.

The following table gives an analysis of the funding situation.

Progress Report on the Implementation of Malaria Project both Planned and Achieved
(Expressed in US\$ 000's)

Source of Fund	FY 1982-1983			FY 1983-1984		
	Planned	Actual	Shortfall	Planned	Actual	Shortfall
USAID	2,000	1,800	200	2,400	2,100**	0
GOH						
Budgetary	300	300	0	1,092	276	816
Title I	1,000	1,000	0	1,100	1,100	0
PAHO (Tech. Assist. in Training)	460	460	0	470	470	0
Other Sources						
Gov. of Japan	2,000	2,000*	0	2,000	0	2,000
Total	5,860	5,560	200	7,962	4,246	2,716

* Requested late 1981, received commodities end 1982 for FY 1983 activities.

** In addition, USAID obligated US\$ 210,000 in June 1984 towards FY 1985 activities.

4.4.3. Revolving Fund. A revolving fund at a level of US\$ 300,000 has been established by USAID to meet the financial requirements of the program and insure the availability of funds. According to our review, it takes USAID 6 to 8 weeks to process the reimbursement of expenditures submitted by SNEM. These delays in reinstating the level of the revolving fund in time have created some financial shortages which we recommend should be avoided.

As we believe that such delays could jeopardize the project's success, we suggest that a study be made either to increase the level of the revolving fund or to improve the reporting procedure used to reinstate the revolving fund level. Therefore, it would be beneficial to see that the initial funding and subsequent payments are processed adequately and on a timely fashion. To reach this objective, it is recommended that the administrations of both SNEM and USAID in Haiti institute a better coordination. For instance, USAID has just requested that its funds should not be combined with other grantee-owned or controlled funds, and that its funds advanced to the project be deposited into a separate bank account, and SNEM should make all disbursements for goods and services from this account. Well, SNEM was not aware of this request before. The result is the last reimbursement request is being held until SNEM complies with this request.

4.4.4. Financial and Budgetary Control. SNEM has introduced a financial and budgetary control system which includes:

- a) Monthly cumulative analysis of expenditures against budget forecasts by line of expenditures and activities
- b) Monthly financial reporting of obligations, disbursements and financial status.

The above managerial reports are not prepared efficiently and accurately because the data used to prepare the above reports are retrieved through administrative procedures which were written in 1967. These administrative procedures have not been revised nor updated since. In addition, the accounting system which was developed ten years ago, operates with these unrevised administrative procedures. We can fairly state that the accounting system is acceptable but should be improved and strengthened.

The most important areas for improvement are:

- Internal control;
- Analysis of budget against actual expenditures;
- Inventory systems;
- Payment and reporting systems.

These administrative areas should be improved because they insure the essential structural systems of SNEM to administer the technical activities of the program.

Such improvement could be realized by the computerization of the present administrative activities.

It is recommended that a committee composed of administrators representing SNEM, USAID and PAHO would set up a framework for the changes to be introduced in the present system. A time schedule for the development, implementation and evaluation of the systems should be prepared. Adequate measures, including parallel running, as appropriate, should be taken to insure their successful implementation.

4.5. Communications

4.5.1. Information Systems. To facilitate management decision-making and to link technical planning with operational implementation, a practical management information system is essential. Thus implementation of improved administrative procedures and operational instructions will provide a solid base for future computerization of key administrative management systems, i.e. payroll, supply, accounting, personnel and transport. This will enable SNEM to "routinize" administrative tasks and projections.

Short and mid-term technical assistance will be required for system analysis, management information system development, computer software design and programming and training in computer use. Key advisory services from consultants in financial, personnel and procurement and supply management are imperative before any attempt at computerization takes place to analyze user requirements and suggest applications for computer implementation. Thus, it is strongly suggested that the necessary management system structure should exist before a computer system can be properly implemented.

Recommendations

- Provide SNEM with key advisory services in financial, personnel and procurement and supply management before any attempt at computerization takes place.
- Create the necessary management and organizational infrastructure before any implementation of computer systems.

4.5.2. Management Reporting. Management decisions are currently based on inadequate and somewhat subjective data provided by sectors and zone chiefs to Headquarters at irregular intervals. Poor information flow between sectors and zones and between zones and Headquarters is one of the fundamental impediments to field operations. There is an immediate need for simplified, standardized and regular reporting on all program activities, including vehicle maintenance. Feedback mechanisms are equally inadequate.

Functional reporting with improved mechanisms for analyzing information including costs and results should be developed. Introduction of additional modern management techniques will improve the use of operational information for decision-making and planning.

Recommendation:

- . Functional reporting should be developed with improved mechanisms for analyzing information including costs and results.

4.6. Supplies and Equipment

To any field program, especially one as technical and as far reaching as SNEM, supply acquisition, distribution and transport are vital. The central issue must be the quickest and most effective methods possible to insure that field programs are not delayed. This section examines SNEM from point of procurement to the ultimate use in the field.

4.6.1. Procurement. One of the problems faced by SNEM in the area of procurement is the lack of a coordinated purchase plan. Goods are not purchased according to a long-term plan based on life expectancy, replacement rate and delivery time, USAID, through late releasing of quarterly PIL funds adds to this problem in that insufficient funding is available to make these large purchases.

Beginning in the 1983-84 fiscal year, large USAID direct financed purchases are procured through a central agent near Washington, D.C., USA. Thus, the time-lag between the purchase order, purchase, shipment and reception by SNEM makes a coordinated purchase plan a necessity.

Although regulations require that the GOH-funded purchases of over \$150 have 3 bids, this procedure is not always followed. Shipment records indicate that much time is lost through incorrect ordering specifications and forms. Also, delays are experienced due to the "Cash in Advance" policies of most US suppliers.

Another problem affecting virtually all importation is the time-lapse between the arrival of the merchandise in Haiti until the final reception at the Bureau Central Warehouse. High prices paid for rapid air shipments are wasted due to this delay. In conjunction with this, better liaison between the Finance Ministry and SNEM is needed so that duty free SNEM importations are not delayed by customs paperwork. Improved monitoring systems would give a constant status report of the shipment as well as minimize arrival delays.

Recommendations

- . A long-range Central Purchasing Plan should be developed based on consumption data such as life expectancy, replacement rate and delivery time.
- . A procurement tracking system to monitor and update shipment status should be developed.
- . A more flexible system for the release of PIL funds from USAID and GOH to meet financial obligations should be developed.

- . Training should be improved for supervisors and personnel so that forms may be done correctly and on time.

4.6.2. Warehousing Facilities. The SNEM re-supply and storage system focuses around the Central Warehouse facility at Bureau Central and is divided between auto parts and general commodities. This distinction extends through all of the program's storage facilities. Therefore, two separate requisitions must be made by the zones depending upon category.

Due to its internal organizational procedures, the Warehouse must have strong monitoring and training procedures within the infrastructure in order to function properly. Responsibilities, such as fulfilling requisitions, dispatching material to the zones, notification of low supply and maintaining a neat and workable storage facility rests directly upon the warehouse staff. A delay or error in any of the above duties could have a deleterious effect on the program. Also, required inventory procedures must be done on time and not allowed to lapse as is the current situation. Thus, the existing monitoring and training program must be improved so that the present setup can function properly.

The zone warehouses, patterned after the Central Warehouse, function well when parts are available. However, investigation has shown a lack of stock in zone warehouses, thereby limiting their effectiveness. Another negative aspect is that due to a lack of petty cash, emergency local purchases must be made by the workers. Reimbursement delays of several months are not uncommon resulting in the parts not being bought thus exacerbating the supply problem.

Recommendations

- . A system wide program in warehouse management and stock control should be created.
- . A coordinated monitoring program in liaison with the purchasing department to monitor stock levels and re-order necessities should be established.
- . A petty cash system should be established so that emergency parts can be immediately purchased.
- . Stricter adherence should be maintained to the existing requirement to produce inventory and status reports both at Bureau Central and in the zones.

4.6.3. Internal Supply Distribution. The supply distribution system is divided into two distinct divisions, Auto Parts and General Commodities. Both divisions are maintained separately with separate warehouses, personnel and distribution. However, the disbursement of supplies to the zones is virtually the same.

The acquisition of supplies by the zones is directly contingent upon the actual stock availability in the Central Warehouse and the rapidity with which the stock is distributed to the zones. Investigation has shown that delays of up to two weeks are not uncommon between the time that the requisition form was produced at the zone until the time the requisition was "officially" received at the Central Warehouse, and thus, unable to be processed. Stricter monitoring of the Central Warehouse's reception of requisition forms and dates would expose individual delays and eliminate any "sitting" on requisitions.

It must be noted that once the order has been "officially" received by the Central Warehouse, it is processed and then goods are distributed on a weekly basis to the zones. A similar procedure is used to distribute supplies from the zones to the sectors.

Recommendations

- . There should be closer monitoring of the time required to complete the zone requisition cycle.
- . A long-range Purchasing Plan should be developed so that the system will have goods available when needed.

4.7. Transport

The criticism of the vehicle fleet in the 1979 SNEM evaluation is still valid. The fleet, consisting of 118 vehicles distributed throughout the country is plagued by a critical shortage of vital spare parts. Also, the total vehicle figure is misleading in that 23% of the vehicle fleet is 11-18 years old with an average fuel consumption of 9.5 kilometers per gallon. Although life expectancy for vehicles in Haiti is estimated at three years and UNICEF has recommended replacement of malaria vehicles every 5 years, the suggested average age replacement for SNEM, i.e. when the vehicle's repair costs are higher than their "on line" service is 8 years. Thus, the utility of these older vehicles is questionable and priority should be given for their replacement.

The Transportation Department has its own system of warehousing and distribution facilities throughout the country. SNEM officially estimates that 80% of the vehicle fleet is in service at any given period. However, this figure cannot be accurate when, at best, only a small percentage of the 23% part of the fleet between 11 and 18 years old can be serviceable. Therefore, the fleet is reduced to 77% and based upon vehicle age, road conditions and lack of spare parts, it is obvious that the remainder of the fleet will not have perfect serviceability. A recent visit to Les Cayes revealed that four late model vehicles have been inoperable for the last month due to a shortage of spare parts. Cannibalization is still a source for parts.

4.7.1. Fleet Situation. Recent vehicle acquisitions have improved the quality of the fleet. Thirty four (34) percent of the vehicles are 1-3 years old and 33% of them are 4-7 years old. According to SNEM, preventive maintenance, lubrication, changing of oil and oil filter, are all done every 2,000-6,000 kilometers. Regardless, the rough Haitian road conditions necessitate an adequate and rapid spare parts distribution.

4.7.2. Vehicle Maintenance. On September 10, 1984, SNEM received jurisdiction to merge the maintenance of DSPP vehicles with their own. Since the infrastructure in the field has yet to be established, it is recommended that the first few months be monitored closely to insure the correction of any merger problems. It is strongly recommended that unless SNEM becomes a division under DSPP that strict separation of parts and gasoline is necessary to insure proper accountability and distribution. The current system of emergency parts purchase either through lengthy requisitions or by the workers purchasing parts directly and waiting often for months, to be reimbursed is awkward and should be replaced by a system of petty cash.

Recommendations

- . Stocks of spare parts must be increased, maintained and distributed through the creation of a long-term procurement and distribution plan.
- . Training must be given to parts warehouse personnel so that low quantities of spare parts will be recognized and rectified before a crisis level is reached.
- . Priority must be given for the replacement of older, uneconomical vehicles.
- . A monitoring system must be created to insure that supplies and time allocations remain distinct between SNEM and DSPP.
- . A petty cash account must be created so that immediate action may be taken to obtain emergency spare parts.

V. Coordination with DSPP

5.1. SNEM and DSPP

Since 1982, the Ministry of Public Health and Population has placed its major efforts in rural health care on the six priority programs including: diarrhea, immunizable diseases, tuberculosis, malnutrition, family planning and malaria. These account for the major mortality and morbidity both amongst children and adults and in each case are amenable to intervention at low cost with good coverage throughout the rural areas of Haiti. Coverage of the health system remains limited largely due to the lack of trained manpower living and working in the rural areas of Haiti. While the effectiveness of these priority strategies has been well proven in pilot studies as well as in the areas reached by present DSPP facilities, the major challenge lying before the DSPP today is to extend the coverage of the six priority programs to the most peripheral villages and population.

For almost 20 years, the vast majority of the rural area throughout Haiti has been served by the SNEM (Voluntary Collaborators) who have provided services of presumptive treatment and passive blood smear collection to their immediate and neighboring population. Some 7,000 VC currently exist in the most isolated and underserved areas of the country. Collaborators are visited once or twice a month by field agents who carefully check their records, their procedures and resupply chloroquine and materials for the taking of blood slides.

In recent years, pilot efforts to involve VCs in extending basic health services to their immediate neighborhood have been successfully carried out. Most notable is the effort in Miragoane where after a brief five-day training, VCs carried out house to house contraceptive distribution and resupply of them in an area of some 50,000 in population. A dramatic increase in the use and continuation of modern contraceptives was demonstrated in this trial area. In other districts, the VCs have been given a supply of oral rehydration packets for resale to the public at a fixed price. Interviews with numerous VCs have demonstrated that they are frequently consulted by parents seeking assistance for children ill with diarrhea and welcome the opportunity of being able to respond to this common complaint with an effective and cheap medicine. Far from complaining of the added responsibility VCs have welcomed this extension of their capacity, feeling that it enhances their prestige in the community and their credibility in their basic work of caring for fever cases. VCs are very capable of keeping accurate records, of providing clear instructions and are stable, well recognized members of the communities in which they live. They are viewed by most as reliable health workers for at least a limited number of symptoms. The potential of the VCs in extending basic primary health care services to the country is clearly a great one.

Recommendations. In view of this experience and the extremely high coverage of rural Haiti with VCs, it is proposed to use SNEM as an executive branch for primary health care activities, mainly in the supply of oral rehydration packages and contraceptives. For this, it will be advisable:

- . that the SNEM becomes the executive branch in rural areas of programs that have the same operational characteristics and constraints as those of the malaria case treatment, i.e. total coverage in time and space throughout all the rural communities;
- . that limited trials of combined operations be carried out in 2-3 SNEM sectors with evaluation of how the integration of the new activities into the previous ones of VCs affect malaria case treatment output;
- . to describe carefully the new responsibility of the SNEM in PHC;
- . to prepare the norms and itineraries for supervision;
- . to retrain in a stepwise fashion all existing VCs and their supervising staff.

5.2. UCIS Activities

In May 1982, a new section was added to the SNEM administration: UCIS, Unit for intersectorial Coordination. The mission of this unit is to promote the coordination between SNEM and public services such as Ministry of Public Works, the Ministry of Agriculture, the Office of Tourism, the Ministry of Education, the Ministry of Social Affairs, the Office for Alphabetization and Community Action.

Since then UCIS:

1. has made an inventory of all physicians and technical laboratories working in large towns and provided training in malaria diagnosis and treatment;
2. is currently giving drugs for malaria prophylaxis in some hotels;
3. has prepared a joint US\$ 250,000 program with the Office of Tourism to be implemented after funding;
4. is working with the Ministry of Agriculture on the list of insecticides utilized in Haiti;
5. has provided information on malaria to all sectors.

As a result, the image of SNEM is improving and collaboration mainly with physicians and technical laboratories is easier. The control of malaria at this level is better. Now SNEM has to develop a methodology to evaluate the work done by this unit and take action accordingly.

VI. Main Recommendations

In Relation to Case Detection Systems

In order to stratify the different malarious areas in Malawi, data on mortality, morbidity and prevalence of the disease are essential. A simple case finding system should be adjusted for detecting changes in the malaria endemicity levels due to factors affecting transmission or as a response to control interventions.

The group recommends:

- 1) DSPP and SNEM should organize and utilize all existing hospitals, health centers and dispensaries to make available suitable (parasitological) diagnosis and determine causes for continued transmission throughout the country.
- 2) Community services (e.g. Voluntary Collaborators national network) should be able to identify and treat suspected malaria cases and health agents ("Agent de Santé") should be capable of clinical diagnosis of malaria cases and treatment.
- 3) SNEM should organize systematically parasitological and serological surveys in special groups of the population to determine prevalence, incidence and distribution of the disease in areas where vector control methods are implemented.
- 4) A special monitoring system should be organized at national level to test the response of P. falciparum to available drugs in vivo and in vitro.

Regarding Laboratory Services

Considering the current characteristics of the malaria control program, the quality of the blood samples and their processing are crucial to achieve the required standards of high sensitivity and specificity of parasitological and immunological diagnosis.

The group recommends:

- 1) The laboratory system in the country should be re-organized to secure timely and accurate malaria diagnosis at different levels and places.
 - Reference laboratories (SNEM) at the central level and zone office level.
 - Mobile SNEM laboratories in rural areas where hospitals, health centers and dispensaries do not exist and quick diagnosis is required.
 - DSPP laboratories at all levels in the country.

- 2) Responsibility should be given to a SNEM laboratory chief to make continuous supervision, establishment of techniques and quality control implementation. The Chief of Laboratory should count on the support and help of at least three senior laboratory technicians for the supervision of SNEM and DSPP laboratories.

Regarding Treatment

Taking into consideration the efficacy of the single dose, administration of 10mg/kg of chloroquine base (adjusted to age) for the treatment of Haitian falciparum malaria infections in non-immune populations.

The group recommends:

- 1) That immediate attention be given to the appropriate distribution and increase on numbers of VC posts and to other improvements and measures which would enhance the coverage of these posts for the timely treatment of febrile and suspected malaria cases with the above mentioned single dose.
- 2) That criteria for the use of mass drug administration should be carefully established and its application should follow a detailed protocol with clearcut objectives, resources, methodology, extension, duration, evaluation procedures and expected results be defined before its approval and implementation.
- 3) That chemoprophylaxis should be encouraged for individual protection of travelers coming in to or going out of the country, as well as during epidemics in rural communities. The 10mg/kg chloroquine base single dose in these cases should be followed by weekly doses of 5mg/kg chloroquine base.
- 4) Recrudescences of falciparum infections after treatment with single dose of 10mg/kg chloroquine base should be treated with 25mg/kg chloroquine base administered in 3 days (10, 10, 5), and chloroquine resistant infections should be treated with alternative treatment.
- 5) A single dose of 0.75mg/kg of primaquine base be given with chloroquine in areas where vector control measures are in operation.
- 6) Other chloroquine treatment regimens or other drug combinations are used, e.g. in case of 10mg/kg chloroquine single dose failures.

Regarding Research

Bearing in mind the limited epidemiological research done in the country, the need to build-up a health infrastructure in view of the existing constraints for the development of effective and

economic methodology for malaria prevention and control.

The group recommends

- 1) The construction of a conceptual framework for the understanding of the epidemiology of the disease and the implementation of in-depth study of the interaction of social, economic, ecological and biomedical variables affecting transmission and factors determining control are urgently needed.
- 2) The elaboration of protocols of applied field research on simple and economic methods for detecting human plasmodial antigens in the human and vector populations.
- 3) To develop operational research in the implementation of anti-malarial activities (diagnosis and treatment) within hospitals, health centers, dispensaries, community centers and voluntary collaborators.
- 4) To strengthen scientific and technical articulations with universities, health care institutions, research groups and bilateral and international agencies in Haiti in order to mobilize human and financial resources for the development of a functional health infrastructure.

In Relation to Vector Control

Although house spraying with residual insecticides continues to be the primary method of choice for malaria control, supplementary or alternative methods such as larviciding, space spray, adulticide, biological control and source reductions may be the method of choice in some situations. It is therefore recommended that all of these methods be tested in Haiti under close supervision and evaluated both entomologically and epidemiologically to determine how, when and under what circumstances each of these methods should be used in the regular operational program of SNEM.

In Regard to Training

- 1) Training should be re-established as a full-time activity with one individual having full-time responsibility for the overall training program.
- 2) A long-range plan for international training should be developed with the primary objective of achieving self sufficiency within the staff of SNEM so as to reduce and eventually eliminate dependence on expatriate advisers.

Relative to Stratification

Taking into account that the eco-epidemiological stratification provided the geographical distribution of the disease in the country it is recommended to urgently proceed to the operational stratification

of the malarious areas. This should be based not only on the level of endemicity but particularly on the feasibility of the application of different remedial measures. Such a stratification would have to take into account the accessibility, house concentration, crop cultivation, local gatherings, irrigation, watering systems, etc., besides levels and timing of transmission.

Relative to the Application of Remedial Measures

The team, taking into account the worsening malaria situation in the country and the scarcity of resources, strongly recommends as the main objective throughout the country, the reduction of mortality due to malaria and of the length of time of illness by giving a single dose of chloroquine (10mg/kg weight) to any suspected malaria case. To develop an evaluation system which would permit the assessment of such an intervention. In areas of high endemicity, besides the treatment of all suspected cases with a single dose of chloroquine, the aim should be the reduction of malaria prevalence. To achieve such a result, the only available measure for the reduction of the level of man/mosquito contact is the application of a residual insecticide, e.g. fenitrothion, at least once a year, just before the main peak of transmission and, if possible, according to the availability of the insecticide, a second time just before the Spring peak of transmission. The team emphasizes that if no insecticide is used in Haiti, the country would be subjected to catastrophic epidemics since integrated vector control programs seem not yet feasible on regular basis.

Recommendation Concerning the PROFEM Trials

It is recommended that the final 1 or 2 cycles of spraying be eliminated. With the exception of epidemiological follow-up, we now have sufficient information for the evaluation of the trials. The final decision on the optimal dosage of fenitrothion for operational use in Haiti will be made possible in November 1964 after analysis of the data of these trials.

Recommendations on Administration

In the area of Internal Organization of the Program, the team recommends creation of a multidisciplinary level committee comprised of the Director of SNEM, an USAID representative and a PAMO representative. This group would report to the Executive Committee and be responsible for providing its members with technical and administrative management services and follow-up on policy implementation. The team also recommends:

- . Implementation of an orderly decentralization program with specific decision points and appropriate controls.
- . A redefinition of the goals and objectives of the program considering alternative courses of action. Coordination between agencies is imperative to facilitate a multidisciplinary approach to help solve pressing Haitian health problems. The team believes that it is premature at this time to integrate SNEM into the Administrative Support Structure of DSPP.

On the Organization of the Administrative Services, the group recommends that:

- . a systematic, planned and independent auditing function should be established within SNEM;
- . quarterly plans should be implemented by region and/or zone on how to execute the program and how to expend the money;
- . a quarterly monitoring system to reprogram activities and/or report status should be established.

In regard to Information Systems, the team recommends that:

- . key advisory services in financial, personnel and procurement and supply management should be provided before any attempt at computerization takes place;
- . the creation of the necessary management and organizational infrastructure before any implementation of computer systems.

In the area of Procurement, the team recommends:

- . the implementation of a long term purchasing program;
- . the release of PIL and GOH funds well in advance to avoid delays in the procurement process.

In the area of Transportation, the team recommends:

- . the establishment of a transportation monitoring system to include vehicle needs, utilization, and a scheduled maintenance program.

On the Financial Management, the team recommends:

- . the development and implementation of a comprehensive computerized financial management system (Ref. 4.4.) capable of improving the following areas:
 - Budget allocation
 - Expenditure accounting
 - Inventory control
 - Financial reporting

On the Personnel Management, the team recommends that:

- . the salary scales be brought to the level of those of DSPP;
- . a retirement plan for SNEM personnel be introduced;

- . personnel assigned to administrative units be given the opportunity to upgrade their knowledge through on-the-job training, local courses and seminars and specialized training courses abroad.

The new techniques and strategies recommended by the evaluation team to improve the results of the Malaria Control Program would have little chance to succeed unless the overall administration of the Program is immediately strengthened.

It is strongly urged that SNFM, USAID and PAHO should meet as soon as possible to determine how to improve the administrative management of the Program.

VII. Acknowledgements

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