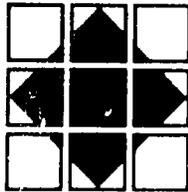


REVIEW OF SURVEILLANCE ACTIVITIES
NATIONAL MALARIA CONTROL PROGRAM

February 13, 1987

by: Edgar A. Smith
Vector-borne Disease Consultant

INCREASED PRODUCTIVITY THROUGH BETTER HEALTH
Contract No. LAC-0018-C-6005-00
Project No. 505-0018
Belize, Central America



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I. OBJECTIVES OF THE CONSULTANCY

STATEMENT OF WORK OF THE CONSULTANT
FOR REVIEWING THE SURVEILLANCE ACTIVITIES
MALARIA PROGRAM, BELIZE C.A.

A. OBJECTIVE:

The Consultant shall review, evaluate, recommend, train and assist with improvements of the surveillance activities of the Malaria Program of Belize.

B. SCOPE OF WORK:

1. Review and advise in all the planning and organization of the surveillance activities including but not limited to passive case detection and active case detection.
2. Review and advise on the surveillance activities on time and space.
3. Review and advise on the Epidemiology activities such as case reporting, case treatment, case investigation, and case follow up.
4. Review and advise on personnel and equipment needs for the surveillance program.
5. Review and advise on the case classification system.
6. Review and advise on supervisory activities in the surveillance program.
7. Do field work necessary to accomplish the above stated tasks.
8. Review and advise on training activities.

II. EXECUTIVE SUMMARY

Visits were made to all six districts and NMCP supervisors, evaluators and supernumeraries were interviewed. Visits were also made to a representative sample of households, voluntary collaborators, community health workers, health centers, clinics and hospitals in each district.

An annotated listing of findings is presented for each district and the headquarters operation. A summary list is provided of problems identified in the operation of the program. Most of the problems interfering with more effective conduct of the surveillance program appear to involve administrative management and supervision.

Recommendations are made for the improvement of all aspects of the surveillance program. The most important of these are as follows:

1. A series of changes in the organizational pattern to provide for more efficient administrative management and supervision.
2. The implementation of geographical reconnaissance and stratification.
3. A series of changes in the surveillance system decreasing the emphasis on Active Case Detection and increasing the emphasis on Passive Case Detection.
4. The establishment of entomological services.

In view of the fact that there are no technical problems as yet, that all of the management and supervisory problems can be corrected, and that the Belize NMCP has a good organizational base with capable people, the prospects for regaining good control and even virtual eradication of indigenous malaria in Belize would appear to be excellent.

However, if there are extended delays in implementing corrective action, technical problems may well develop. With the history of vector resistance to DDT elsewhere in Central America, it is likely that such resistance will eventually develop in Belize. When and if this happens, the cost of controlling malaria will rise substantially. Any alternative insecticide will cost 3 to 5 times as much as DDT. Also operational costs may double as an alternative insecticide may have to be applied as much as 4 times per year.

III. BRIEF HISTORICAL REVIEW

The Belize Malaria Eradication Program started in 1957 and through residual spraying of DDT successfully reduced the annual incidence of malaria from over 1,000 cases per year to only 17 in 1963. However, by 1965 the number of cases increased 12 fold and in 1966 increased another 2 1/2 times. In 1968 the cases were brought down again and for the next 8 years stayed below 100 cases per year. The number of reported cases increased steadily from 199 in 1976 to a peak of 4,595 in 1983. The number of cases has continued to drop from 4,117 in 1984, 2,818 in 1985 and 2,780 in 1986. In January of 1987 there were 192 cases* compared to 200 cases in January of 1986.

The entire country went from attack phase to consolidation phase in 1963, back to attack phase in 1965, largely to consolidation phase again in 1974, reverted to attack again in 1976 and is now mixed with 100,900 population in attack, 19,456 population in consolidation and 45,000 population in maintenance.

At the present time the program is ostensibly a malaria control program, but it is operating by eradication guidelines.

In spite of this patch work quilt pattern of control, the mosquito vector is still susceptible to DDT and the malaria parasite is still susceptible to anti-malaria drugs.

IV. FINDINGS

A. District Review

1. Cayo District has a total population of 25,418, of which 2,537 population is considered to be in consolidation phase and 22,881 population is under residual spray coverage and considered to be in the attack phase. Of the 114 localities, 14 are in consolidation and 100 are scheduled for spray coverage.

District Malaria Staffing is complete with a supervisor (covering two districts), 3 evaluators, and one supernumery. However, the supervisor feels that one supernumery is not sufficient to keep up with the case-treatment load.

* Slides still coming in as of February 13, 1987.

Active Case Detection

Each evaluator has 38 localities to cover on a monthly basis. Weekly itineraries are prepared to provide for an average coverage of 75 houses per day. However, this is adjusted to take into account the closeness of the houses and the difficulty of the terrain. San Jose Succotz with 260 houses was scheduled to be covered in 4 days (an average of 54 houses per day). The evaluator said that he could usually cover it in that time. However, on Tuesday of that week, the rain was so bad that no houses were covered. The evaluator stated that he catches up by covering a few additional houses each day. No forms were available for the weekly evaluation schedule, so a simple list of localities was jotted on scratch paper.

For the most part, there are house numbers only in the spray areas which means that there are no house numbers in the towns and consolidation areas. No maps are used. Geographical reconnaissance has not been carried out for many years.

Passive Case Detection is carried out by Voluntary Collaborators (VCs), Hospitals, Clinics, and Health Centers. There are currently 60 VCs actively taking blood smears in 32 localities. There are 4 hospitals at Belmopan, San Ignacio, Santa Elena (Loma Luz - 7th Day Adventist) and Benque Viejo; 2 clinics at San Jose Succotz and the Valley of Peace refugee area, and 8 Health Centers.

Slides from all of these passive surveillance posts are supposed to be picked up once every week. The supervisor assigns a different evaluator the duty of picking up the slides each week so presumably this takes one day every three weeks out of his regular schedule. In actual fact, it may take more time or he may have to skip some posts.

The slides are sent into the laboratory in Belize City at least once a week and more often when convenient. Since the supervisor also covers Belize District, it is often convenient for him to take the slides himself. Other health workers go to Belize City regularly and can take the slides. The slides can also be sent by ambulance or by bus.

Notification and Treatment

The laboratory notifies the statistician of positive cases. The statistician notifies the

supervisor or the evaluator in the District by telephone. There is no confirmation given in writing. The passive surveillance posts are not routinely given a written report of results from the slides they take. They learn of positive cases from the supernumerary or other malaria workers in connection with treatment.

The treatment given by the supernumeraries is the standard 5 day radical cure using chloroquine and primaquine adjusted for age and/or weight. The supernumerary is expected to visit the home and personally administer the pills to the patient each day for the 5 days.

The Chen report of 1980 recommended the 14 day treatment, but this was abandoned as being impractical. Some supervisors have reported a few cases where they felt that the 5 day treatment was not effective. Such cases should be investigated and comparative trials carried out if so indicated.

Summary of Surveillance Activities

In Cayo there were 820 cases of malaria reported in 1986 from 51 of the 114 localities. There was an average of 67 cases per month with a low of 37 cases in February and a peak of more than 100 cases per month for 3 months; June-105, July-130, and August-128. Given the size of the area, the number of different localities involved, the distances between localities and the nature of the terrain, it would appear to be impossible for one man to keep up with this work-load.

The District Malaria Office consists of two small rooms in the San Ignacio Hospital. There is no adequate safe storage space for supplies, forms and equipment. There is a small closet which is partially safe only because it is awkward to get at. A bed has to be moved first.

There are no records kept in the office - all are sent to Belize City. There are no file cabinets and no adequate desk drawer space in which to keep records.

The supervisor has, however, taken the initiative to develop charts and graphs showing positive malaria cases by locality, monthly incidence of malaria and age distribution of malaria cases. Although maps are not currently used in the program, the supervisor has recently obtained maps of an adequate scale which can be traced and used for planning both spraying and case detection activities.

2. Belize District has a total population of 57,171, of which 55,890 population is considered to be in the consolidation phase and 1,281 population is under residual spray coverage. Of the 48 localities, 1 is considered to be in the maintenance phase, 39 in consolidation and 8 under spray coverage.

District Malaria Staffing consists of a supervisor who is presumably half-time since he also covers Cayo and lives in that district; 1 evaluator and 2 supernumeries. However, the evaluator was assigned temporarily to Corozal district during the peak malaria transmission season leaving the Belize District without an evaluator for several months.

Active Case Detection operated under a handicap in 1986 with only one evaluator who was gone during the peak season of the year. One of the supernumeries has been doing the work of an evaluator, but for some time there have been only 2 motorbikes for the three workers.

Another factor interfering with coverage in space and time for the Belize District was the washing away of the ferry across the Belize River at Bermudian Landing in April, 1986. The ferry was not repaired until early December. This apparently prevented any active case detection for the six localities west of the river for nine months. House card records verified this. In Double Head Cabbage there were no visits by malaria personnel between April 2, 1986 and January 23, 1987 (the date of the consultant's visit). In Bermudian Landing, the householder in the most easily accessible house on the road near the ferry, said that she had not seen a malaria worker for more than a year....since long before the ferry went out. In spite of the ferry being out, one malaria case was reported from Bermudian Landing in September so presumably some slides came in from passive case detection posts.

In Maskall, one house card showed fever case survey visits only in May and October in 1986 and in January 1987. In Burrell Boom a householder stated that she had not seen a malaria worker in 6 months.

Passive Case Detection in Belize District involves 1 government hospital, 1 private hospital, 2 health centers and 16 private physicians all in Belize City (Maintenance area), and in Belize District (rural) 4 clinics, 2 health centers, 17 voluntary collaborators in the consolidation area and 6 voluntary collaborators in the spray area. Health Centers are located in San Pedro and Caye Caulker. Clinics are located at

Maskall, Double Head Cabbage, Crooked Tree and Hattievville.

Also there are community health workers in Ladyville, Burrell Boom, Rockstone Pond and Boston. They are volunteers whose principal duty is prevention and management of diarrhea, but they have been trained to take blood smears for malaria.

The community Health Worker at Burrell Boom was found at home. She covers a population of 876. She travels 4 miles each way on foot or by bicycle. Her house visits are in connection with the diarrhea program. She takes malaria slides at home. She had not seen a malaria evaluator or supernumery for 6 months. She takes her slides into Belize City herself. She appeared to be a very enthusiastic and dedicated worker.

The Maskall Health Clinic has one nurse. She maintains a chronological register of all of her work in one bound volume. She enters the date of taking a blood smear and when notified indicated if it is positive but does not give the date of notification or give any information on treatment. In effect the nurse makes a symptomatic diagnosis and takes blood smears only for those fever cases suspected of being malaria.

Summary of Surveillance Activities

In 1986 case detection activities resulted in the finding of 151 malaria cases in 23 of the 48 localities in the district. Of these, 36 were in consolidation areas, 54 in spray areas (42 in a single locality), and 61 in the only maintenance area (Belize City).

In view of the poor coverage in space and time due to the shortage of manpower during the peak transmission season, the lack of sufficient transport and the cut-off of travel to 6 localities west of the Belize River for nine months, the actual number of malaria cases in the district for 1986 was probably somewhat higher.

District Malaria Office

There is no malaria office for the Belize District and consequently no district records. When the supervisor is in Belize, he has the use of a desk in the main office, but no place for safekeeping of his forms or supplies.

2. Corozal District has a total population of 29,663, with 47 localities, all of which are considered to be under attack with residual spray coverage.

Malaria staffing is not complete. There are 2 evaluators but no supernumery. The position has not been filled for the past 2 years. The supervisor lives in Corozal, but also covers Orange Walk District. An evaluator was borrowed from Belize District during the peak malaria season.

Active Case Detection

Since there is no supernumery, both evaluators are required to give treatment and cannot keep up with their fever case survey schedules. Another factor militating against maintenance of their schedules is lack of transport. One of the two motorbikes has been out of service for nearly four months awaiting repairs. Spare parts are said to be available in Chetumal, but have not yet been purchased. Under these circumstances, surveillance coverage in space and time must be considerably less than planned.

Passive Case Detection in Corozal District is carried out by one hospital, 3 clinics (2 government and 1 private), 3 health centers and 46 voluntary collaborators. However, only 29 of the 46 VCs are currently active in taking slides.

Notification and Treatment

Slides are brought to the laboratory in Belize City by Malaria or other Health personnel, or are sent by ambulance or bus. The evaluator stated that since the bus driver was a friend, he did not have to pay anything.

Analysis of the positive case register for the month of December 1986 showed the following time-lag between taking of slides and start of treatment:

- The number of days between the taking of the slides and examination ranged from 4 to 23 days with an average of 10.9 days.
- The number of days between examination to notification of the District office ranged from 1 to 5 with an average of 3.2 days.
- The number of days between notification and start of treatment ranged from 1 to 22 with an average of 7.9 days.

- The total time lag between the taking of the slide and start of treatment ranged from 9 to 44 with an average time-lag of 21.8 days.

Summary of Surveillance Activities

In 1986, case detection activities resulted in the finding of 985 malaria cases in 38 of the 47 localities. Although 8 localities showed no malaria cases in 1986, this may be due to the inadequacies of both the active and the passive surveillance systems as indicated above. Positive cases in the other 38 localities ranged from 1 to 112 with an average of 25 cases per locality. 17 localities had 25 or more malaria cases and of these 5 had 50 or more cases.

In view of the shortages of ACD staff, the transport difficulties and the fact that there are only 29 voluntary collaborators to cover 46 localities, it would appear that the actual number of malaria cases must be considerably more than reported.

The District Malaria Office is a single room in the public health clinic in Corozal Town shared with the Aedes aegypti program. There is inadequate safe storage space for forms and supplies and no provision for filing of reports, records and completed forms. The Supervisor does keep some records in charts on the wall of the office including month by month positives for all 47 localities.

4. Orange Walk District has a total population of 19,000 with 59 localities all of which are in the attack phase and are scheduled for residual spray coverage.

District malaria staffing consists of one supervisor presumably half-time since he also covers Corozal District, 1 evaluator and 1 supernumery. An additional evaluator was hired, but reportedly quit after 3 months because no transport was available. The position has been vacant since June of 1986.

Active Case Detection is handicapped because of the vacant positions. also because one motorbike has been inoperable part of the time waiting for spare parts.

Many houses in this district do not have house numbers thus making follow-up for case investigation and treatment difficult. The reason given is that they ran out of paint.

Passive Case Detection is carried out by 1 hospital, 2 health centers (Blue Creek and San Felipe), one private clinic and 24 voluntary collaborators. There are 43 VCs listed, but only 24 are currently active.

The San Felipe Health Center has a caretaker but no nurse. The caretaker takes blood smears. The caretaker could not remember the last visit from NMCP though the evaluator said he had been there in November. A house card for a near-by house in San Felipe showed treatment visits for March and April of 1986 and no further visits for the rest of the year.

Four VCs were visited in mid-morning with the following results:

- Yo Creek - No one home. Wife gone to Belize. Husband is a farmer working in his fields.
- San Lazaro - No one home. Farmer working in fields.
- Trinidad - Husband working in Belize - comes home every two weeks. Wife takes slides. Using old forms. No house number - no house card.
- August Pine Ridge - VC is a teacher and was at school. Slide kit was at home. He stated that he could not keep it at school as children would get at it. If fever case comes to school he has to take him to his home. He says that very few come to his home in the evening as they do not want to be out after dark.

Notification and treatment is similar and has the same problems as other districts. The evaluator stated that he had to pay the bus driver a half dollar or a dollar to take the slides to Belize City.

Summary of Surveillance Activities

In 1986, case detection resulted in the finding of 364 malaria cases in 32 of the 59 localities. Although 26 localities reported no malaria cases in 1986, all are in the attack phase.

Coverage in time and space is inadequate to determine if all of these 27 localities still require spraying. With the inadequacies of the ACD system (lack of manpower and transport) and the small number of VCs - 24 currently active in 58 localities, it may well be that all 58 localities should still be sprayed. a complete stratification of all localities based on the past 3 years of epidemiological records and current entomological studies would be necessary to satisfactorily answer that question.

The District Malaria Office is a single room in the Orange Walk Hospital. As in other malaria district offices, there is no adequate provision for safe storage of forms, supplies and equipment. No past records are kept in the office and there are no file cabinets or drawers to keep such records. A single sheet is on the wall showing malaria cases by month and locality.

5. Stann Creek District has a total population of 22,513 of which 16,200 population is in consolidation phase and 6,313 is under spray protection. Of the 41 localities, 15 are under consolidation phase and 26 under Attack phase.

District Malaria Staffing consists of a supervisor (half-time since he also covers Toledo District) who has been without a vehicle for six weeks, 1 evaluator (currently on leave) and 1 supernumery. The second evaluators' position has been vacant for 18 months.

Active Case Detection

With only 2 workers to visit 2,196 houses on a monthly schedule, treat 290 cases and service 35 passive case detection posts it would appear that they cannot do justice to any of these duties. Coverage in space and time would have to be very erratic.

A house card in Hopkins (where there were 32 P.falciparum cases in Jan-Feb of 1986) showed the house sprayed on June 8th and Fever Case Survey visits on 12 June, 21 October and none since. The householder stated that the malaria man came but did not sign the house card.

Passive Case Detection is carried out by 1 hospital in Dangriga, 7 health centers, 3 private physicians and 27 VCs in 23 localities. The health centers are located in Dangriga, Sittee River, Saine Bight, Gales Point, Pomona, Independence and Hopkins.

Notification and Treatment is similar to and has no problems different from other districts.

Summary of Surveillance Activities

In 1986 case detection activities resulted in the finding of 319 malaria cases in 24 of the 41 localities. Thus 17 localities had no positive cases reported in 1986. In view of the inadequate coverage in space and time due to the shortage of manpower, a heavy case treatment work-load and the sparse coverage of localities by VCs (only 23 out of 41), considerable

doubt is cast on the appropriateness of the phasing. Again, stratification is the solution.

52 of the 290 reported cases for 1986 were P.falciparum. Under these circumstances, adequate case investigation becomes very important in order to determine the origin of the infection. The supervisor stated that although he was not required to do case investigations, he has been doing so. However, without adequate filing space for records, he was unable to locate any of the completed forms.

The District Malaria Office is a single room in the Health Center shared with the Aedes aegypti program and the Public Health Inspector. Desks are inadequate and there is no provision for filing records. There is a storage room, but it is not organized with shelves and cabinets for safe storage of supplies and equipment.

6. Toledo District has a total population of 11,970, with 35 localities all of which are under attack phase except the central part of Punta Gorda.

District Malaria Staffing is complete with a supervisor (1/2 time), 2 evaluators and one supernumery.

Active Case Detection

Nine localities (850 population) in what is called Toledo South can only be reached by boat or horseback. There has been no boat available for the whole year so no ACD has been carried out there in 1986. Apparently a boat was hired for the spray crew and slides for PCD were sent out though usually late.

The supernumery was without transport for 6 months and had to ride with an evaluator thus slowing down both ACD and treatment.

Passive Case Detection is carried out by 1 hospital, 5 Health Centers located at Colombia (no nurse), San Antonio (also a mobile clinic), Monkey River (Health Talents), Crique Sarco, and Barranco; and by 28 VCs 23 of whom are Community Health Workers (CHWs) with multiple other duties. In view of these multiple other duties, the willingness and actual performance of these CHWs in taking malaria slides should be carefully analyzed and additional malaria VCs recruited and trained when, where and if deemed necessary. The CHWs are receiving a monthly stipend of \$50.00 at present, but it was said that this will eventually be phased

out. 28 VCs to cover 55 localities is certainly not enough so additional malaria VCs or CHWs will be needed.

The Community Health Workers were trained as part of a primary health care project conducted by Project Concern International. Their duties include health education, first aid, compiling of health statistics, prevention and management of diarrhea as well as taking blood smears from fever cases. Slides are given to the rural health nurse who delivers them to the Public Health Nurse or directly to NMCP.

Notification and Treatment

Slides are sent to Belize City by plane 1 or 2 times a week. Notification of positives is by telephone with no confirmation in writing.

A random sampling of cases in the months of June, July and August showed time lag as follows:

- Between taking of slide and reading it - a range of 1 day to 160 days with an average delay of 44.4 days.
- Between reading of slides and notifying district - a range of 2 days to 12 days with an average of 6.8 days
- Between notification and start of treatment - a range of 1 to 6 days. An average would be meaningless since 18 3/4 percent were marked as treated but no dates were given.

The total time lag (excluding the 37.5 percent not treated or no date) ranged from 9 days to 30 days with an average delay of 19.4 days. For the other 37.5 percent the range (excluding the time from notification to treatment) was from 78 days to 169 with an average of 120.5 days. It would appear that the extremely long time lag was directly responsible for non treatment.

Some of the time lag may be attributed to the inaccessibility of the areas of South Toledo where a boat is required. However, there was one case in Punta Gorda where there was a delay of 128 days. Apparently the slide was misplaced.

The longest time lags of 168 and 169 days may be a case of faulty recording of information. Apparently the Canadian nurse volunteer community health worker posted in South Toledo reads her own slides and started treatment immediately for all positives. The slides were eventually sent in to NMCP for cross-checking and should be recorded as such.

Summary of Surveillance Activities

In 1986 case detection resulted in the finding of 140 malaria cases in 26 of the 55 localities. 29 localities reported no cases for 1986. In the 26 localities reporting malaria cases the range is from 1 to a high of 28 cases in the town of Punta Gorda. Probably most if not all of the cases in Punta Gorda were infected in other localities, districts, or even other countries. Without case investigation report forms properly filled out, it is only speculation. Excluding Punta Gorda, the average number of cases per positive locality for 1986 was 4.1.

This relatively low rate together with the fact that 28 localities reported no malaria cases in 1986 might lead to speculation as to the need to spray the entire district. However, the coverage in space and time is not adequate to make such a determination. 28 VCs to cover 55 localities leaves too many blank spots.

Stratification involving epidemiology and entomology together with case investigation should be considered a prerequisite to changing the phasing.

The District Malaria Office is a single room in the Punta Gorda Hospital. Desk space is inadequate. There is no provision for filing of records and no secure storage for supplies, equipment and forms.

B. Headquarters Review

1. Organization of the National Malaria Control Program (NMCP) is substantially as recommended by PAHO consultant Dr. Wan I. Chen in his Final Report of the Consultant to the Ministry of Home Affairs and Health of Belize in the Malaria Eradication Program (21st July - 18th August 1980). The single exception is the deletion of the Flying Squad Leader and 2 Flying Squad Members from the Table of Organization. Since this Flying Squad was supposed to carry out entomological investigations and trials, this has effectively prevented the implementation of Dr. Chen's recommendation on the urgent need for entomological studies.

The Headquarters Organization consists of a Director, Errol Vanzie, M.P., M.P.H., who is also Director of Health Services. As Director of Health Services, Dr. Vanzie is also responsible for all other communicable disease control programs, environmental health, epidemiology, maternal and child health, primary health care, the public health laboratory and

all other health programs. It is apparent that with this multiplicity of duties, Dr. Vanzie cannot be expected to devote more than a fraction of his time to the National Malaria Control Program.

Also in Headquarters there are the following full-time positions:

- Chief of Operations, (Mr. Rafael Guerra) who is responsible to the Director. Mr. Guerra has broad responsibilities for supervision, conduct and coordination of the entire field and laboratory program.
- Administrator (Mr. Frank Westby) is responsible for personnel management, financial matters, logistics including procurement and timely distribution of supplies and equipment, provision of transportation, and maintenance and repair of equipment and vehicles.

The responsibilities of the Headquarters personnel are delineated in their job descriptions, but without a full-time director the lines of responsibility and particularly of authority are somewhat hazy and confused.

2. Planning appears to be imposed from the top down without participation by the field personnel. There is no long range planning and short range planning is not based on current epidemiological, entomological and operational information. Instead, planning appears to be based on a continuation of the eradication phasing suggested 6 1/2 years ago in the PAHO Consultant Report of Dr. Wan I. Chen.

Long Range planning should provide for the eventual merger of Malaria Control and Aedes aegypti Control as a single Vector-borne Disease Control Division. Entomological and epidemiological services could be shared in the near future. However, operational control techniques are quite different in each program. As long as substantial field operations are required in both programs, both programs would have to be operated separately. The long range plan should provide phasing-in of the merger over a period of time with epidemiological and entomological criteria established to govern the timing of merger.

The long range plan should also pave the way for eventual integration of both programs into the regular health services. The Alma Ata Declaration states that in any country with a serious endemic disease problem, primary health care should include an effective endemic disease control program. When the Aedes aegypti

problem is reduced to one of vigilance and when Malaria Control activities are primarily case detection and treatment and only focal spraying is required, then the pace of integration can be increased. The training of laboratory technicians to read malaria slides and the training of community health workers to take malaria blood smears could be considered the beginning of integration of malaria and health services. When malaria is under better control than it is now, an additional step towards integration could be the training of malaria surveillance workers as multi-purpose health workers. This should be kept in mind in the future in recruiting replacement surveillance workers.

In view of the constant danger of importation of malaria and Aedes aegypti from neighboring countries, an effective vector-borne-disease control unit with epidemiological and entomological know-how as well as a quick-reacting mobile control crew will be required even after malaria and Aedes aegypti are under good control.

3. Statistics

The statistician (Ms. Elida Castellanos) is new to the position (2 1/2 months) and the position was vacant for 8 months before that. Although there are 14 duties listed for her position, so far her efforts have been largely confined to catching up by filing 1986 forms, maintaining the positive case register and notifying district supervisors of positive cases. She needs more orientation and training.

Since there are no file cabinets available the forms with laboratory results are stacked in a jumble on a shelf next to her desk. When she has recorded them and placed them in file folders, there is no place to put the file folders, so they are piled up on her desk or on another shelf. It is not surprising that obtaining information on current or prior years activities is a time-consuming matter. Very little prior year information beyond 1 or 2 years appears to be available at all.

4. Laboratory

A Senior Microscopist (Mr. Cruz Silva) is in charge of the laboratory and supervises the work of a microscopist and a laboratory aid in staining, examining and reporting on the blood slides collected in malaria program.

The 2 microscopists can examine up to 180 slides per day if necessary and can easily average 150. With approximately 20,000 slides examined in 1986 this averages about 77 slides per day. However, during the peak season they may well have to examine from 150 to 190 slides per day. If the number of slides increases substantially they will need help.

For the most part the time lag between taking slides and reading slides is due to delays in the field. Although there is an occasional back-log of slides in the laboratory, it is usually due to delays in obtaining supplies such as giemsa stain or immersion oil.

There are Peace Corps Volunteers reading malaria slides in 2 districts. There are laboratory technicians in all districts and NMCP has plans for providing training to prepare all of the laboratory technicians to examine malaria slides.

Utilization of this resource, for reading some of the slides, particularly during the peak transmission season, would reduce the time-lag and make it possible for the Senior Microscopist to devote more of his time to field observations and refresher training of surveillance workers in the proper technique of collecting and handling of blood slides.

Local reading of the slides would render a service to local hospitals and clinics in providing better patient care.

5. Logistics

The surveillance program is affected by logistics problems in 2 ways. The district offices often run out of forms, house cards, paint, slides, lancets, etc. for supplying the evaluators and passive case detection posts. The field blames headquarters and headquarters blames the field. It will take cooperation on both sides to solve the problem.

By this time it should be possible to anticipate the needs on a monthly or quarterly basis and schedule regular deliveries to be altered only with sufficient advance notice.

The requisition system should be designed in such a way as to provide a long enough lead time to allow timely delivery of supplies as needed.

Regular supervision and assistance from headquarters will be required to make the system work. Facilities for safe storage of forms and supplies at the district offices are needed in order to maintain better inventory control.

Transportation problems also affect the efficiency of the surveillance program. In 1986 a total of 11 1/2 man-months of vehicle time was lost causing workers to double up. The usual cause was inability to obtain spare parts. In some cases this appears to be a matter of the individual spending his motor-bike allowance on other things and not having the cash available for repairs. It would appear to be in order to review and evaluate the operation of the motor-bike revolving fund in an attempt to find a solution to this problem. One obvious need is close supervision from headquarters. For one of the makes of motor-bike in use there are apparently no spare parts in the country. This is a problem that can only be dealt with at a higher level in government.

V. PROBLEMS

Problems identified in the field from observation and through discussion with malaria field personnel, other health personnel, voluntary collaborators, community health workers and householders.

A. Active Case Detection and Treatment

1. Vacant positions
2. Lack of transport
3. Inability to cope with treatment work-load
4. Need more supernumeraries
5. Few cases investigated
6. No house number on many houses
7. No house card, but in some cases 2-3 house cards in house
8. Failure to initial house cards
9. Difficulty in getting slides to Belize City

B. Passive Case Detection

1. Not enough Voluntary Collaborators
2. Many VCs not home in the daytime
3. Lack of motivation on part of VCs
4. No safe place for VCs to keep slides, forms, etc.
5. NMCP workers failure to pick up slides on time
6. Lack of support and appreciation shown to VCs, and to institutional case detection workers

7. Unwillingness of some nurses to take slides
8. A hospital laboratory technician knows how to take the thin smears only. Needs and wants training

C. Administrative

1. Notification of positive cases sometimes delayed and no written confirmation
2. Supplies and forms not available when needed
3. Allowance sometimes 2 to 3 months late
4. No adequate maps available
5. No safe storage space at District Offices
6. No file cabinets at District Office for keeping records
7. No records at District Offices except current reports
8. Uniforms promised, but still not received
9. Helmets purchased not suitable for bike riding
10. Inadequate communications between headquarters and district offices
11. Inadequate communications between supervisor and staff in his second district
12. Unclear lines of responsibility - no real chain of command adhered to
13. Boats not delivered to the field for use months after receipt

D. Other

1. Some areas can only be reached by boat or by horse-back
2. A hospital director misunderstood the purpose of the Malaria Control Program. He thought it was a failure because he still saw mosquitoes
3. In general, the supervisors were not as familiar with their second district as they should be. They obviously are not spending anywhere near 50% of the time in their second district.

It would appear that nearly all of these are problems of administrative management and supervision, and can be corrected.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. Organization

The Belize National Malaria Control Program is organized as an "Eradication" program and is using all of the "eradication" techniques in its surveillance program except entomological studies. As required for

eradication, the NMCP is attempting to provide total house coverage with monthly Active Case Detection in both sprayed and unsprayed areas. The phasing established in 1980 along eradication lines is virtually unchanged nearly 7 years later. Criteria have not been established for spraying or not spraying.

The Passive Case Detection system involving hospitals, clinics, health centers, private physicians, community health workers, and special malaria voluntary collaborators is operating under multiple handicaps of insufficient encouragement, supervision, and support, as well as inadequate coverage in space and time. In spite of these handicaps, the PCD system is providing approximately 70% of the positive slides.

For success, an eradication program demands perfection in performance but a control program also must produce a very good performance or it is wasting money. Without full-time direction, with inadequate supervision, with many vacant positions, with serious logistics and supply problems the Belize NMCP is not currently giving a good performance.

However, in the late 1960s and early 1970s Belize conducted a program which reduced malaria to the extremely low level of less than 100 reported cases per year for an 8 year period. Since, no technical problems have developed and insecticides and drugs are still effective, most of the problems appear to be "people" problems involving administrative management and supervision.

It is recommended that the following changes in the organization be made in order to provide for more efficient management and supervision:

1. In view of the fact that the multiple duties of the Director preclude full-time attention to the Malaria Program, it is recommended that a new position of Deputy Director be established to work under the direct supervision of the Director, but with delegation of authority to the Deputy Director for supervision of all aspects of the program. This individual should be thoroughly experienced in malaria control.
2. In view of the fact that in most districts the evaluators and supernumeraries are used interchangeably and are doing much the same work, it is recommended that the 2 positions be merged and given a new title of surveillance worker with

a new job description to fit the revised surveillance program.

3. In view of the difficulty of one man providing adequate supervision to 2 districts, it is recommended that a supervisor be provided for each district. If this is not possible at present, then one senior evaluator should be designated as Assistant Supervisor with responsibility in the District where the supervisor does not live.

B. Stratification

Stratification is a basis for planning anti-malaria action. It has been defined by WHO as "the process of uniting areas, populations or situations which exhibit a relative resemblance by a set of specified relevant characteristics, thereby distinguishing them from other areas, populations or situations dissimilar through the same set of characteristics."

The AID Project Paper states that the NMCP is committed to stratification. However, little if any progress has been made in this direction as yet.

It is recommended that a special effort be made to expedite the stratification of all localities in all districts as soon as possible. Stratification must be adapted to the local situation and local needs. A preliminary stratification could be done for all localities in a relatively short time based on the currently available epidemiological records for the past 3 to 5 years, the known physiographic and ecological characteristics, demographic and socio-economic conditions, climatic and meteorological factors and the knowledge and judgement of the experienced malaria workers. Receptivity and vulnerability should be determined for homogeneous areas.

Unfortunately, there is little entomological information available. The preliminary stratification should be modified as entomological information becomes available.

Stratification should be the basis for determining which areas should be subject to residual spraying or other anti-malaria measures as well as the nature and frequency of surveillance efforts.

It may well be that some localities are being sprayed that do not need spraying and that some localities not being sprayed should be sprayed. Stratification is the best way to establish criteria.

Suggested steps for implementing stratification:

1. Compile statistics for each District, locality by locality for the past 5 years on a monthly basis.
2. Prepare maps for each District. Tracings from topographic maps or aerial photographs would be best. Maps should show streams, ponds, lakes, swamps, forests and mountains.
3. Indicate on each District map all localities, hospitals, health centers, clinics, community health workers and malaria voluntary collaborators.
4. Homogeneous groupings of localities should be established on the basis of a review of epidemiological, entomological, physiographic, climatological, socio-economic and other pertinent information.
5. Key indicator areas should be established in each District for each homogeneous grouping of localities.
6. Entomological studies should be established on a continuing basis for each key indicator area.
7. A consultant could be brought in to expedite completion of stratification for all localities. The consultant should work closely with the field personnel in each District. If the consultant is brought in after completion of the first 3 steps, it should be possible to complete a preliminary stratification in 2 to 3 months.
8. As entomological information becomes available, stratification should be reviewed and revised if so indicated.
9. Stratification should be reviewed and revised each year in light of current epidemiological and entomological information.

C. Geographical Reconnaissance

All houses in both sprayed and unsprayed areas should have house numbers and house cards. Adequate maps showing the location of all houses in every locality are essential for conduct of an efficient spray program and are equally essential for a good surveillance program involving case detection and treatment. Such maps would also be valuable for the Aedes aegypti program and all other health programs.

It is recommended that a special effort be made to conduct geographical reconnaissance to be completed as soon as possible and updated at regular intervals. Guidelines

for such geographical reconnaissance are given in PAHO consultant Wan I. Chen's report of 1980 in Annex 14 page 5 paragraph 3.1.

D. Surveillance

Surveillance in a malaria eradication program is considered to be that part of the program aimed at the discovery, investigation and elimination of continuing transmission, the prevention and cure of infection and the final substantiation of claimed eradication.

The 18th Report of the WHO Expert Committee on Malaria (TRS735) has this to say about surveillance needs in Malaria Control Programs. "Malaria surveillance as was conceived for the time-limited eradication programmes, has limited usefulness for control programmes. Some aspects of this surveillance remain relevant to control programmes, however, and may be selected to follow locally evolving epidemiological situations."

This leaves great latitude in selecting a surveillance system to meet the needs of the individual country.

The surveillance system currently in use in Belize is a classical eradication system. However, the resources available are not those of an eradication program. A prime difference between eradication and control is the budget.

In eradication, the budget is set to fit the needs of the program. In control, the program is adjusted to fit the available budget and the money is spent to do the most good for the most people.

The current system of Active Case Detection in use in Belize is wasteful of resources and not necessary in a control program.

It is recommended that the following changes be made in the surveillance program:

1. Active Case Detection should be discontinued in all spray areas and replaced with malariometric surveys in representative localities twice a year.
2. In non-spray areas ACD should be discontinued as a monthly operation and conducted twice a year to supplement the Passive Case Detection system and also in cases of local outbreaks.
3. The evaluators and supernumeraries should be reclassified as surveillance workers with a new job description to include case treatment, case investigation, household

census and updating of geographical reconnaissance. A large part of their duties should be expanding and upgrading the passive case detection system including recruiting and training more voluntary collaborators, collecting slides from all PCD posts, replenishing their supplies, and encouraging, supporting and supervising the voluntary collaborators.

In order to improve the Passive Case Detection system, new VCs should be appointed promptly to replace those who quit or leave.

Better judgement should be exercised in choosing VCs who will be available a fair share of the time during the day and that all the villagers will be willing to go to. It may be advisable to appoint 2 VCs in the same area.

Even if a VC is not active for several months, he cannot be fired since he is a volunteer and for good relations with the village he should not be. However, a second VC can be appointed in the area and the first one dropped over a reasonable period of time.

Since records show that approximately 70% of the positive slides are coming from the PCD program now, this approach of expanding and increasing the efficiency of passive surveillance would be more cost-effective than continuing the less effective house-to-house fever case survey. Development of the passive surveillance network can also set the stage for development of the primary health care system.

E. Personnel

Personnel vacancies have hampered the work in the field. 21 man-months have been lost in 1986 alone. One position has been vacant for 18 months. Apparently there is no shortage of candidates for any vacant position. Vacancies should be filled as soon as possible. In order to avoid delay, applicants should be screened in advance of vacancies so as to establish a roll of interested and qualified candidates. The U.S. Civil Service does this routinely.

F. Entomology

Entomological services are essential for further progress in controlling malaria in Belize and it is risky to do without. Without routine entomological studies, the vector could easily become resistant to DDT without any one

being aware of it until numerous outbreaks, epidemics or even a return to high endemicity takes place.

Essential entomological studies include taxonomy, biology and ecology of the vector species, biting and resting habits of the vector, possible role of secondary vectors, susceptibility of the vector to DDT, bio-assay studies, and testing of alternative insecticides. These studies are necessary to guide the spray program, but are also required for establishing stratification and for epidemiological evaluation of the progress of the program.

It is recommended that arrangements be made to carry out this entomological work as soon as possible. In the long range, the best solution would be to select a Belizean to be sent off to get a college degree in medical entomology or if a graduate in biological sciences is available - to get an MSc in medical entomology.

This would take a minimum of 2-3 years. A temporary or stop-gap solution would be to request a Peace Corps Volunteer entomologist for a 2 year tour. Even this would take until mid-1988 providing the request is made by September 1987.

The Belize NMCP cannot afford to wait this long before commencing entomological studies and it is not necessary. Two of the supervisors have already had short course entomology training abroad (PAHO-Entomology in Panama and Vector Control at the Wedge, University of South Carolina) which included many of the techniques and procedures required. Also one of the supervisors served as a member of the Flying Squad doing entomological work during the period it was in existence.

It is recommended that one of these supervisors be appointed as an entomology technician with full-time duties in conducting the entomological studies required by the program.

G. Statistics, Records and Filing

The new computer forms are a big improvement over the old forms. As soon as field testing is accomplished and appropriate correction made, they should be put in general use.

Comments on Report Forms:

The case investigation form provides information as to the location of the infection which is not

carried over to the summary form. Instead, the malaria cases are classified as to malaria eradication phasing which may be of some academic interest, but is not as important for evaluation and planning of the program as is the origin by locality, and district or other country.

Some forms use the term autochthonous apparently interchangeably with indigenous. The term autochthonous includes both indigenous and introduced cases. The forms should be consistent. The WHO recommendations on terminology are included as Annex B.

Examination of completed case investigation forms showed that some were incorrectly filled out. Some obvious relapse cases were not so marked and others were marked relapse with insufficient evidence for justification. Also in some cases, insufficient information was recorded to justify the classification of imported.

It is recommended that continuing refresher training be given on case investigation procedures.

The statement has been made that 90 to 95 percent of the cases detected have been treated. Examination of the case treatment reports for Cayo District for September through December 1986 showed that of 100 cases, 1 could not be found and 3 refused treatment with the other 96 receiving treatment for the full 5 days.

Most malaria programs record the number receiving 1,2,3,4, or 5 days treatment with most getting from 1 to 4 days and fewer getting the full 5 days treatment. It is unreasonable to expect that 100 percent of all those receiving treatment will be available for all 5 days. It seems more likely that the pills for the 5 days treatment were left with the householder or the VC with the expectation that they would be taken. This should be checked. If the house-card system for supervision was working properly, it would be easy to check.

There are no file cabinets in Headquarters for the massive amount of information sent in. Records are in a jumble on shelves or are put in file folders stacked on a shelf. Prior year records are not readily accessible. There are no records kept at district offices.

It is recommended that file cabinets and file folders be purchased for headquarters and all district offices and that a filing system be developed to facilitate easy retrieval of prior year information as well as current information. It is further recommended that each district office retain and file duplicate copies of the pertinent information needed for proper planning.

H. Supervision

The NMCP has adopted the standard house-card system for indirect supervision. It is an excellent system, but it is not working in Belize. Many house-cards and house numbers are missing, but even when they are present, NMCP employees often fail to sign the house card when visiting a house for fever case surveys, treatment or supervision.....sometimes for many months.

It is recommended that a special effort be made to number and install house cards in the proper place in all houses and that all employees be impressed with the importance of following the instructions already given to sign the house card every time a house is visited for any purpose. Supervision from the district and from headquarters should be stepped up to insure that this is done.

VII. TRAINING

The Project Work Plan for 1986 calls for training of supernumeraries, voluntary collaborators, district supervisors, evaluators and microscopists.

A. Training Courses were given as follows:

1. Training session for supernumeraries, 2 weeks, February - March 1986.
2. Voluntary Collaborators Training, 3 days - July 1986 by Health Talents under contract.
3. Training of Supervisors, 1 day, January 1987. Surveillance was not covered. (Scheduled for 1986, but given in 1987)

B. Future Training

1. Surveillance Workshop
As a part of this consultancy a training session is scheduled February 9-14, 1987 for supervisors, evaluators and supernumeraries. A copy of the Agenda is attached as Annex C. This course should

be 2 weeks to allow time for field practice, but the time was not available.

2. If the consultant's recommendations are accepted on geographical reconnaissance, stratification and revision of the surveillance program, then additional training courses will be required.
3. The supervisors, evaluators and supernumeries should receive refresher training annually.

VIII. ACKNOWLEDGEMENTS

The consultant wishes to express his appreciation for the excellent cooperation extended to him from all members of the Belize NMCP. A special word of thanks is due Dr. Errol Vanzie, Director of Health Services for making this consultancy possible and to Mr. M.A. Wood, Pragma Project Manager, and Mr. Rafael Guerra, Chief of Operations, NMCP for guidance and support throughout the field visits to all six districts. The objectives of the consultancy could not have been met without the patience, forbearing and willingness to answer numerous questions on the part of the district supervisors, evaluators and supernumeries in all districts. It has been a pleasure to receive such good cooperation from the doctors, nurses, community health workers, voluntary collaborators and individual householders; all of whom were quite willing to take time to answer questions.

ANNEX A

ITINERARY: MALARIA CONSULTANT

JANUARY 12 - FEBRUARY 16, 1987

January 12	Arrival in Country
January 13	Orientation of Program Activities
0830	A. Meeting with Mission Personnel
1000	B. Meeting at Malaria Office to schedule Consultants activities
1330	C. Meeting with Director of Health Services, review Consultants activities
January 14	
0830	Meeting at Malaria Program Office - continue orientation
1330	Meeting at AID on Biological Control Research Activities
January 15-16	Cayo District - field evaluation
January 19-21	Corozal and Orange Walk Districts - field evaluation
January 22-23	Belize District - field evaluation
January 26-28	Punta Gorda; Toledo District - field evaluation
January 29-30	Malaria Office
February 2-6	Write report and training course organization
February 9-13	Training Course - Supervisors, Evaluators and Supernumeries
February 16	Depart Country

ANNEX B

TERMINOLOGY OF MALARIA CASE CLASSIFICATION

This terminology is derived from the recommendations of the World Health Organization. The definitions of the following terms are included for reference purposes.

1. Autochthonous
 - a. Indigenous - malaria acquired by mosquito transmission in an area where malaria is a regular occurrence.
 - b. Introduced - malaria acquired by mosquito transmission from an imported case in an area where malaria is not a regular occurrence.
2. Imported
Malaria acquired outside of a specific area.
3. Induced
Malaria acquired through artificial means, i.e., blood transfusion, common syringes, or malariotherapy.
4. Relapsing
Renewal of clinical activity occurring after an interval from the primary attack greater than that due merely to periodicity.
5. Cryptic
An isolated case of malaria not associated with secondary cases as determined through appropriate epidemiological investigation.

ANNEX C

NATIONAL MALARIA CONTROL PROGRAM, BELIZE
SURVEILLANCE WORKSHOP
FOR
SUPERVISORS, EVALUATORS, AND SUPERNUMERIES

FEBRUARY 9 - 14, 1987

AGENDA

Monday, February 9:

0900-0930	Opening Remarks	Dr. Vanzie
0930-1030	Introduction: Malaria Eradication vs. Malaria Control (lecture)	Mr. E.A. Smith
1030-1045	Coffee Break	
1045-1200	Review of Job Description for Supervisors, Evaluators & Supernumeries (lecture & discussion)	Mr. R. Guerra
1200-1300	Lunch Break	
1300-1600	Techniques of Malaria Control (lecture) Residual Spraying Case Detection & Treatment Supplementary measures: Larviciding Space Spraying Biological Control Source Reduction	Mr. E.A. Smith & M.A. Wood

Tuesday, February 10:

0900-1000	Parasitology Laboratory Discussion of Taking, Preparing, Handling and Reporting on Slides	Cruz Silva
1000-1200	Practice	
1200-1300	Lunch Break	
1300-1600	Entomology (lecture) Basic Entomology: Classification, Life Cycle, Biting Habits and Resting Habits. Entomological requirements for Malaria Control	E.A. Smith & M.A. Wood

Wednesday, February 11:

0900-1200	Health Education	T. McLean
1200-1300	Lunch Break	
1300-1500	Reporting and Statistics (Review of report forms)	R. Guerra E.A. Smith
1500-1545	Coffee Break	
1545-1645	Administrative Management and Logistics (Lecture & Discussion)	F. Westby

Thursday, February 12:

0900-1000	Stratification for Malaria Control (Lecture)	E.A. Smith
1000-1200	Geographical Reconnaissance Mapping & Collecting Information (Lecture & Discussion)	M.A. Wood E.A. Smith R. Guerra
1200-1300	Lunch Break	
1300-1700	Mapping (Field Practice)	M.A. Wood R. Guerra E.A. Smith

Friday, February 13:

0900-1100	Supervision (Lecture & Discussion)	M.A. Wood E.A. Smith
1100-1200	Relationship of Malaria Control to Primary Health Care (Lecture)	E.A. Smith
1200-1300	Lunch Break	
1300-1400	Concluding Remarks	E.A. Smith M.A. Wood Dr. Vanzie

ANNEX D

MALARIA CASES BY DISTRICT AND MONTH - 1986

District	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Totals
Corozal	62	65	74	73	70	83	82	96	111	119	98	52	985
Orange Walk	22	18	40	46	36	46	36	30	11	27	28	24	364
Belize	13	10	11	11	11	19	21	12	9	19	4	11	151
Cayo	46	37	58	42	28	59	105	130	128	60	65	62	820
Stann Creek	49	22	19	9	22	25	79	21	16	27	18	12	319
Toledo	10	11	17	17	6	10	12	15	6	13	17	6	140
Totals	202	163	219	198	173	242	335	304	281	265	230	167	2779

ANNEX E

PERCENTAGE OF P.FALCIPARUM CASES BY DISTRICT

1986

<u>District</u>	<u>Total Malaria Cases</u>	<u>No. Pv.</u>	<u>No. Pf.</u>	<u>% Pf</u>
Corozal	985	981	2	.20%
Orange Walk	364	361	3	.82%
Belize	151	146	5	3.31%
Cayo	820	769	51	6.22%
Stann Creek	319	245	74	23.20%
Toledo	140	139	1	.71%
Total Country	2,779	2,644	136	4.89%