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Vector Biology
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Trip Report

Zimbabwe: Assessing the Institutional Development and Data Management Needs for Vector-borne Disease Control

August 14 - September 4, 1990

by

Barry A. Silverman, Sc.D.

Robert Lennox, Sc.D.

VBC Report No. 81141

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1. Introduction

In response to a request from USAID/Harare, the Zimbabwe Ministry of Health (MOH) and the Blair Research Institute (BRI), the Vector Biology and Control Project (VBC) provided technical assistance during August and September 1990 to assess the institutional development and data management needs of BRI and the National Malaria Control Program (NMCP).

The scope of work (SOW) for this consultancy included assessing:

1. the impact of malaria and schistosomiasis;
2. current malaria and schistosomiasis control efforts;
3. BRI's operational research activities;
4. BRI's role in control activities;
5. the vector-borne disease information system;
6. the feasibility and usefulness of computerizing malaria epidemiological, entomological and operational databases; and
7. current and future needs of BRI and NMCP.

The SOW also covered developing an agenda for potential MOH/BRI-VBC interactions.

2. Background

Blair Research Institute

The Blair Research Institute (BRI) is made up of the Blair Research Laboratory (BRL) in Harare and the DeBeers Laboratory in Chiredzi, a small town about 450 km southeast of Harare. The BRI is the Zimbabwe Ministry of Health's major research institution for operational research on controlling vector-borne and water-borne diseases, and more recently, AIDS. In addition, a new section, Health Systems Research, has been incorporated into the BRI.

BRL was established in 1939 as the Malaria and Bilharzia Research Laboratory. Its objective was to research vector- and water-borne diseases in collaboration with the London School of Hygiene and Tropical Medicine. The laboratory's early emphasis was on schistosomiasis. In 1961 the control of malaria was passed to the Federal Malaria Eradication Organization, but BRL resumed responsibility for countrywide malaria control in 1970.

DeBeers Laboratory was established by the owners of a huge irrigated sugar estate in the country's lowveld. Its original objective was to carry out schistosomiasis research and control on the irrigated sugar estates in Chiredzi. In 1966, the laboratory was donated to the government and became a BRL field laboratory.

BRI is a World Health Organization (WHO) Collaborating Centre for Schistosomiasis Research and Control.

The BRL operated the National Malaria Control Program from 1960 to 1984, when control operations were decentralized to the country's eight provinces. BRL took an advisory role and became a source of training for provincial and district personnel. BRI's current mandate is to conduct research and field activities that support the development of a comprehensive integrated malaria and schistosomiasis control program, promote the use of safe water and

waste disposal systems, develop an AIDS control program, and train health personnel in the principles of health system research. BRI is the MOH's only research component.

National health policy and strategy

In 1984 the Government of Zimbabwe (GOZ) approved a white paper, "Planning for Equity in Health," that advocated the primary health care (PHC) approach. This document identified health as a development issue, calling for other sectors to give it attention and for a clear political commitment to improving the health of Zimbabwe's citizens. The white paper also called for adequate resources to be allocated and for a clearly defined strategy with set goals.

Following an MOH study, a new health policy that took the PHC approach was formulated and a broad strategy to implement this policy was developed. The new strategy called for restructuring the health care system and reorienting health personnel. The plan identified priority areas for action.

The new health strategy has these key features:

- a primary health care approach;
- health as a development issue;
- community involvement in health;
- coordination between "modern" health systems and traditional medical practioners;
- bottom-to-top health priorities;
- increased and reoriented health staff; and
- a revised budgeting system to ensure that funds go to primary levels, while allowing controlled development at the higher levels of the health services.

The Zimbabwe health strategy gave priority to malaria and schistosomiasis control and water and sanitation programs.

Zimbabwe Health for All Action Plan (1985-1990)

To realize the new health strategy, the Ministry of Health developed a plan of action for each of the health priorities in 1985. The plan set out targets and deadlines, a plan to meet the targets and methods to evaluate progress. For malaria control, the objective was to reduce morbidity and mortality caused by malaria in Zimbabwe. Specific targets, to be accomplished by 1989, were set:

1. an 80 percent decrease in the incidence of malaria throughout the country;

2. facilities and expertise in all clinics to examine blood slides, at least during the main malaria transmission season;

3. a fully decentralized malaria control program operating in all malarious areas, applying residual insecticide annually or biennially;

4. availability of the valid, up-to-date information required to manage, monitor and evaluate the program at all levels; and

5. malaria treatment facilities that are accessible to more than 98 percent of the population.

The plan of action called for turning over control operations to the provinces. Malaria control programs were to be planned for each district, and a program manager identified at the district level. Temporary spraymen were to be recruited on a prorata basis from each ward in the district for the duration of the spraying. To ensure appropriate, timely and effective malaria treatment through the PHC system, by 1986 each district would be able to do blood slide diagnoses. This capability would be extended to rural health centers by 1989. The action plan made data on incidence and mortality caused by malaria a priority of a health information system.

The plan stressed the urgent need for health education materials, especially a film on the basic methods of malaria transmission and control. It recognized the importance of operational research to evaluate and monitor control operations. The plan highlighted these research areas:

- o malariometric surveys;
- o drug utilization and drug resistance;
- o serological and parasitological effects of control operations;
- o insecticide resistance;
- o transmission dynamics; and
- o entomological parameters related to control.

The plan emphasized that more personnel needed to be recruited. It also required field officers to receive more training. These officers, in turn, would train operational staff in the provinces and districts.

The plan's overall objective for schistosomiasis was to reduce morbidity caused by the disease. The specific targets, to have been met by 1989, were the following:

1. A national schistosomiasis control program implemented in 50 percent of the areas with the highest prevalence of infection. The program would include community participation in health education and the provision of water and sanitation as well as mass chemotherapy.

2. Morbidity in childhood caused by *S. haematobium* reduced to five percent in the areas covered by the schistosomiasis control program.

3. Fewer than one percent of the schoolchildren in the areas covered by the program having an *S. haematobium* infection of an intensity of 50 eggs per 10 ml of urine.

4. A stronger capability for research into schistosomiasis control.

The plan called for the immediate launching of a National Schistosomiasis Control Program to be incorporated into the PHC system. The program would be responsible on the national level for chemotherapy, snail control, safe water supplies, sanitation and health education. Its objective would be to make treatment available to the rural population and to reduce the reservoir of infection.

The plan stressed the need for improved diagnostic capabilities at health centers. Applied research was to concentrate on drug delivery, evaluation of control operations, methods and frequency of evaluating cases of the disease requiring treatment, and the use of plant molluscicides.

Evaluation of the National Malaria Control Program (December 1989)

An MOH request to the WHO African Regional Office, Dr. Awash Teklehaimanot, head of the Ethiopian National Program for the Control of Malaria and Other Vector-borne Disease, evaluated the Zimbabwe NMCP during December 1989. He held discussions with MOH and BRL staff in Harare and visited health facilities in three provinces. His major findings were the following:

1. **Role of BRL and MOH.** Although BRL was providing diagnostic services, helping procure insecticides, and planning and conducting spray operations, it had neither the administrative mandate nor the authority over the provinces, which were responsible for spraying. BRL statutory responsibility was limited to advising provincial medical directors (PMDs). The role of the MOH's Department of Epidemiology and Disease Control was even more poorly defined. At the national level, no malaria control unit was responsible for establishing national malaria control policies and guidelines or for coordinating control activities.

2. **Vector control.** DDT continued to be the predominately used insecticide. The amount used increased from 10 tons in 1981 to 300 tons in 1988. In addition to the cost of the DDT, another $1.4 million was expected to go for travel costs and to pay

temporary workers during the 1989 spraying cycle. Spray operations were large-scale and expensive; houses in all malaria-endemic areas up to 900 meters elevation and areas between 900 and 1,200 meters prone to malaria outbreaks were being sprayed. This made up a significant portion of the country. Spraying was conducted regardless of risk of disease.

The regular spray cycle was intended to be from August to December; however, logistical problems often extend it to April. Many sprayed walls were replastered to prepare for Christmas, further compromising the effectiveness of spray operations. Vector control did not include community-based source reduction and environmental management activities.

3. **Chemoprophylaxis**. Deltaprim, dapsone/pyrimethamine was the prophylactic drug of choice, with chloroquine reserved only for treatment. Deltaprim was used extensively in the Hippo Valley Sugar Estate, which had a population of 40,000 - 50,000. There was some evidence of prophylaxis breakthrough among the Hippo Valley population.

4. **Chemotherapy**. Chloroquine, Fansidar and quinine were being used for treatment. Although hospitals had guidelines for the use of these drugs, dosage and regimen were inconsistent between district hospitals.

5. **Case diagnosis**. Malaria treatment was based on clinical diagnosis except at provincial and, to some extent, district hospitals, where slide confirmation was made. Health centers and rural hospitals, however, were required to take thick blood films from every case treated and to forward the slides to BRL for microscopic examination. Some of the health and field orderlies had received one month of malaria microscopy training by BRL. They examined slides forwarded by health centers and sent a duplicate slide being sent to BRL for cross-checking.

6. **Surveillance system**. The existing malaria surveillance system had several weaknesses. Since blood slide collection was not consistent at the various health centers, the slide positivity rate did not reflect the true malaria situation. The surveillance

system also lacked data on such variables as drug sensitivity, insecticide susceptibility, adverse effects to the drugs, and the important question of population movement. Data on all these variables are critical for effective control operations.

7. **Health systems infrastructure.** A highly organized and well-developed health systems infrastructure gave rural populations access to health care and justified the decentralization of the malaria control program.

The consultant recommendations included:

1. Cross-check slides at the provincial level. Doing this would free BRL resources to conduct additional operational research.

2. Reassign field officers from BRL to the Department of Epidemiology and Disease Control to conduct national planning, coordination and supervision.

3. Devote BRL resources to operational research, with particular emphasis on malaria and schistosomiasis. BRL also should look into issues of health systems research. Although BRL should be encouraged to seek external funding, the MOH should allocate an adequate budget and strengthen manpower by providing training and competitive salary.

4. Use DDT for future spray operations. These operations should be based on sound epidemiological criteria and be carried out during the transmission period.

5. The BRL should make recommendations on pesticide use, purchase the pesticides at the national level and distribute it to the various provinces.

6. Remedy shortcomings in transport and spray equipment.

7. Train personnel in malaria microscopy for four months. Provide additional training for environmental health and malaria field officers on malaria control strategies.

8. Give primary attention to prompt diagnosis, treatment and management of severe and complicated cases.

9. Use microscopists currently assigned to district and provincial hospitals to deal with treatment failures and drug sensitivity testing. Do not burden them with routine reading of blood smears.

10. Establish surveillance system that incorporates the variables needed to control vector-borne disease.

11. Reconsider the prophylaxis policy.

12. Establish a strong national control unit at the MOH.

13. Educate village health workers in malaria control.

14. Use health education to sensitize the public to the risk of malaria.

Recommendations for a strategic plan

Department of Epidemiology staff, PMDs, provincial field officers and BRL staff met in May 1990 to review the WHO program evaluation and to develop a strategic plan. BRL staff and the field officers reviewed the malaria program evaluation and status reports. Then participants developed recommendations to improve malaria control (see annex 1).

The first recommendation was to establish a five-year plan cycle to start in July 1990. Specific recommendations to implement the WHO consultant's suggestions formed the basis of the five-year plan.

3. Findings

Disease situation

Malaria remains a major public health problem in Zimbabwe. It is one of the most common cause of in-patient morbidity in most of the country's provinces (see annex 2). In 1989, BRL examined 99,547 slides; 16,318 were positive for malaria. In 1988, 1,020,214 clinical cases of malaria were reported, with 276 deaths. These figures are considered to be gross underestimates of the extent of malaria in Zimbabwe because of underreporting.

Plasmodium falciparum accounts for about 97 percent of malaria morbidity; *P. malariae* and *P. ovale* make up 1.8 percent and 0.3 percent, respectively. Malaria transmission rarely occurs on the central watershed of the country above 1,200 m altitude. Transmission increases with decreasing altitude. The Zambezi Valley in the north and the portion of the southeastern low veld below 600 m altitude are considered hyperendemic for malaria. Between 600 m and 1,200 m altitude are areas of unstable malaria. Nonimmune individuals have settled into these unstable malaria areas, so epidemics are expected. Such has been the case in Gowke, which witnessed a small-scale outbreak in 1986 and an epidemic in 1989 after laborers resettled there from non-malarious areas.

Malaria transmission peaks during the late rainy season (February - May) and is very low or absent during the cold dry and hot dry seasons (June - October). Vector mosquitoes are *Anopheles gambiae, An. arabiensis* and *An. funestus. An. arabiensis* is the major vector.

The extent of the schistosomiasis problem in Zimbabwe is unknown because until recently the country had no national schistosomiasis control program. Both *Schistosoma haematobium* and *S. mansoni* are a widespread. High transmission of *S. mansoni* occurs in limited areas such as irrigation schemes, on the shores of large dams and along perennial rivers such as the Sabi and Lundi.

S. haematobium is a major problem in the north of Zimbabwe, which reportedly has as much as 90 percent prevalance during school surveys. It is also at unacceptably high levels in central and south-eastern Zimbabwe. The high transmission rate has been attributed to inadequate sanitation, unavailable contact with unprotected water sources, and a lack of community understanding about how schistosomiasis is transmitted. It is reported that some school students are taught that transmission is caused by using dirty toilets.

Vector-borne disease control

Recently, two BRL malaria field officers were assigned to the Disease Control Division of the MOH Department of Epidemiology. This division will advise the PMDs, who oversee control activities in their provinces. Theoretically, malaria epidemiology and control activities have been decentralized to the provinces and districts. Blood slides, however are still being sent to BRL for primary examination in many cases and validation of results in other cases. Although the MOH adopted a set of recommendations at the debriefing described above, no management plan to implement those recommendation has been developed. This division does not have a supervisory role, merely an advisory one. In addition to the two malaria field officers mentioned, one field officer has been transferred to the disease control division to oversee schistosomiasis control. There is currently no national schistosomiasis program, but one is planned.

Vector Control

Vector control has been decentralized to the provinces. Malaria control plans are drawn up for each of the province's districts, and a program manager for each district is selected. This plan needs to be supported by the district administrators, district council health committees, ward and village development committees and community members.

Temporary sprayers are hired locally for the spraying cycle. The spraying program is supposed to begin in August and end in February; however, because of a problem in acquiring foreign currency and exchange, this year's purchase and delivery of DDT has been postponed by at least two months.

DDT 75 percent wettable powder is still widely used, but there has been no recent susceptibility testing. Deltamethrin, delivered at 12.5 mg/sq m, is rapidly becoming the insecticide of choice in most of the provinces. PMDs report great public reluctance to use DDT, primarily because many other nuisance insects, including bedbugs, roaches and houseflies, have become resistant to it. Deltamethrin is locally formulated from imported components.

Blair Research Laboratory

The BRL is organized into five sections: health systems research, AIDS, water and sanitation, schistosomiasis, and malaria. Although the health systems research section has recently been added to the BRL, it seldom interacts with the other sections of the laboratory. Its mandate is to teach peripheral health personnel the methods of health systems research through two workshops and field experience. Several BRL staff members from other sections could benefit from this training.

The AIDS section is also new and is developing its agenda. The water and sanitation section is divided into three subsections: 1) technology development, which is testing several upgraded wells and variations on the Blair toilet; 2) microbiological water-borne disease; and 3) health education.

The schistosomiasis section conducts operational research and has additional funding from the Danish Bilharziasis Laboratory. The malaria section is divided into entomological and parasitological subsections.

Reading a vast number of blood smears received from the provinces continues to occupy much of the BRL's time. Fourteen microscopists read slides at BRL; they read more than 99,000 slides

in 1989. During this consultancy they were reading slides taken in April. The slides therefore are not useful for guiding control operations or for case management. The database for these slides is maintained manually and all calculations are performed manually.

The BRL staff seem highly motivated. Several junior workers who recently joined the staff lack broad research experience and would benefit from short-term training courses. Staff members of the malaria section suggested courses in protocol development and on recent advances in entomological, immunological and parasitological techniques.

The malaria section research has included:

- o assessing drug sensitivity of *P. falciparum*;
- o investigating insecticide resistance;
- o evaluating alternative insecticides;
- o studying disease epidemiology in areas of high malaria prevalence;
- o developing serological and cytotaxonomic techniques for studying malaria epidemiology and mosquito vectors; and
- o investigating attractants and repellents in vector control.

The schistosomiasis, intestinal helminthiases and other tropical infection sections' work has covered the following:

- o the epidemiology of helminthic infections, particularly transmission dynamics and epidemiological modeling;
- o control of schistosomiasis and hookworm morbidity in communal areas and irrigation and commercial farming schemes;
- o a national schistosomiasis prevalence survey;
- o snail biology;

- o molluscidal potency tests and field trials with plant molluscicides and slow-release copper compounds for controlling snail hosts;
- o the use of ducks to control snail hosts;
- o drug trials to assess the efficacy and tolerance of anthelminthic drugs;
- o knowledge, attitude and practice surveys, water contact studies, and morbidity assessment using physical and ultrasonographic techniques;
- o assessment of the impact of infection on nutritional status;
- o immunological and biochemical techniques for use in studies of schistosomiasis epidemiology and treatment; and
- o monitoring plague epidemiology

The sanitation and water supplies section has focused on developing and implementing such technologies as the Blair Latrine, the Blair Pump and the Bucket Pump. The section is very interested in developing and putting into use an upgraded family well. Other work includes studying the etiology and factors affecting transmission of diarrhea and assessing the bacterial quality of water from different sources.

BRL's 11 computers are distributed between the administrative and schistosomiasis sections. The malaria section does not have a computer. BRL plans to acquire two more computers. With a few exceptions, the computers are being used for word processing. BRL does have desktop publishing capabilities and prepares the *Zimbabwe Science News*, a very professionally done science newsletter. Staff members expresssed a need for both basic and advanced computer training. BRL staff members also suggested training in using the computer for basic statistical analysis.

The malaria section was serving as host to two researchers from the Kenya Medical Research Institute, who were at BRL for further inservice training.

The entomology subsection of the malaria section has an interest in insecticide repellents and would encourage collaboration.

The current BRL library contains a good selection of literature related to vector-borne disease control. Although there is no librarian, there are plans to fill that vacancy. The BRL also has access to current literature through the medical school library, which is equipped with the CD ROM version of Medline. After a librarian is hired, the BRL might be a suitable site for a VBC Project regional VBD information center. BRL staff requested VBC Project journal holdings list and a list of essential books.

Major constraints to BRI's research operations include limited transportation and equipment. The recent loss of senior researchers to the university and the private sector has constrained the research program.

DeBeers Laboratory

The DeBeers laboratory is in an area endemic for malaria and both the intestinal and urinary tract forms of schistosomiasis, but it concentrates on schistosomiasis. The laboratory also monitors schistosomiasis control on the two sugar estates. A recent study, for example, examined the economic impact of schistosomiasis on sugar production. This work is being written up for publication.

DeBeers has thirteen professional and support staff.
The laboratory is well equipped and suitable for research and training but appears to be underused because of problems with transportation and accommodations. A five-week course on schistosomiasis control sponsored by the Danish Bilharziasis Laboratory began the week of August 26. Field officers from the eight provinces, two from BRL, one each from Hippo Valley and

Triangle sugar estates, one each from Ghana and Swaziland participated. They were housed in a local motel, at the expense of the donor agency.

Department of Epidemiology, MOH

With the transfer of the malaria field officers from BRL to the Disease Control Section, the Department of Epidemiology has assumed responsibility for monitoring spray operations and advising the provinces on these operations. The department gathers national malaria and schistosomiasis data. It also assists in the decentralization of malaria control and purchases insecticide for the provinces.

The head of the Department of Epidemiology, Dr. Shiva Murugasampillary, stressed the need for a management plan to decentralize malaria control. He also emphasized the need for an improved surveillance system that would incorporate the variables needed to control vector-borne diseases and not rely soley on blood slide results. He said the Centers for Disease Control (CDC) planned a trip by Dr. Music in October to discuss the potential of CDC's involvement in strengthening Zimbabwe's health surveillance capability. Dr. Shiva would like to see vector-borne disease surveillance integrated into the general health surveillance system. He suggested the development of a surveillance system based on sentinel sites.

Dr. Shiva also stressed the problem of inconsistent case definition. He said Zimbabwe needed a standardized and systematically applied case definition. The staff of the Disease Control Division suggested that provincial health staff attend short courses on epidemiological methods and environmental management.

Vector-borne disease information system

The only malaria data being collected routinely are slide data, data on clinically diagnosed cases and spray operations data. Clinics and hospitals report clinically diagnosed cases to the PMDs

weekly. PMDs supply this information to the Department of Epidemiology where the Biostatistics Section computerizes the data. The Department of Epidemiology consolidates the data weekly, monthly and annually. The provinces report spray operations data to the Disease Control Division. The BRL supplies slide data monthly to the Department of Epidemiolgy. Neither the disease control section nor the malaria section of BRL has a computer.

Hippo Valley and Triangle sugar estates

Tours of the sugar estates and discussions with the estates' medical staffs revealed a well-organized, active malaria control program. The staffs supply Deltaprim weekly to all employees and their dependents. Deltamethrin is sprayed twice a year in all Hippo Valley residences, and DDT is used at Triangle. The staffs believe these measures are giving an extremely high level of control.

Dr. Davey of Hippo Valley said he could make a large malaria database available for future analysis. Dr. Sauders also expressed his willingness to cooperate and said he needed someone to look at the use of insecticides at the Triangle Estate.

Chiredzi District Hospital and Chibwedziva and Chilanga clinics

A discussion was held with Dr. P.M. Mgre, district medical officer and superintendent of Chiredzi District Hospital, about the treatment of malaria cases. Slides are read at the hospital, but duplicate slides are sent to BRL. Chloroquine is used for treatment, and Fansidar is used with patients who don't respond to chloroquine treatment.

At the two clinics, which serve the population living on communal lands next to the sugar estates, malaria treatment is based on a patient's symptoms when he or she comes to the clinic because slides are not taken. Clinics and personnel said that from thirty to fifty patients per day present during the peak malaria season.

4. VBC's Proposed Technical Assistance Plan

The Vector Biology and Control Project proposes a multifaceted, multiple-year program of technical assistance to the MOH of Zimbabwe that is directed toward broad-based institutional strengthening and increased sustainability. Some of the proposed actions have policy and management implications for improving program efficiency and sustainability, and others are aimed at technical issues. At least one action is intended to give other countries in the region better access to information and training in vector-borne disease control. How far VBC will be able to go with proposed plan of work will depend upon the interest of the MOH and USAID/Harare, the extent to which CDC can participate through its VBC PASA and, of course, the financial resources available.

The plan offers assistance in three basic areas:

1. developing a more effective, cost-efficient epidemiological and entomological surveillance and data management system;

2. developing a more effective, cost-efficient strategy for reducing morbidity caused by malaria; and

3. defining and developing the research and program goals of the Blair Research Institute.

Epidemiological and entomological surveillance and data management systems

The MOH has committed to decentralizing its epidemiological and surveillance services. As yet, it has not planned how to fulfill this commitment. Decentralized epidemiological surveillance would improve the efficacy and reduce the cost of treatment. A sentinel system for monitoring mosquito populations and blood slide positivity rates would cut the cost of processing slides at BRI and would enable the NMCP to identify outbreaks quickly.

A computer-assisted system for tracking epidemiological and entomological data at the district and control level would provide current information on which to make managerial decisions about personnel development, drug distribution and spray operations, and to project resource needs.

VBC could assist the decentralized surveillance system with the following activities:

- A four-week assignment of a VBC or CDC malaria specialist to plan a sentinel surveillance system at the district level. The result would be a model for collecting epidemiological and entomological data, a definition of personnel required, scopes of work, resources needed and requirements for reporting. The sentinel system protocol also would detail how the provinces and central health systems should respond to the existing data.

- A three-week assignment for a VBC malaria specialist to help the MOH produce a training-of-trainers course to develop a cadre of microscopists who could diagnose malaria at the district and health clinic level. The course also would train managers to ensure proper reporting and quality control.

- A six-week assignment for a VBC management information specialist to produce a computer-assisted program to enter and process information from the district sentinel stations and the PHC system. The program would be designed to enable the MOH to use the information to make management decisions.

Cost-effective reduction of malaria morbidity

The MOH is convinced that nearly 80 percent of malaria treatments are being delivered to people with no blood film indications and insufficient clinical evidence of infection. In

addition, no active program of health education advises community members about community or personal actions they can take to protect themselve from malaria.

VBC proposes to provide the following assistance in these areas:

- A four-week assignment of a VBC malaria epidemiologist to help the MOH define malaria cases and develop criteria for treatment at health clinics.

- A four-week assignment of a VBC health education specialist to help the MOH produce a community health education campaign aimed at prevention, early case recognition and personal protection.

Defining the future role of the Blair Research Institute

BRI's present role is a mixture of field research and operations management. As the district health centers take more responsibility for control operations, BRI will be able to concentrate on operational research concerns such as insecticide resistance and antimalarial drug efficacy. BRI also will be able to contribute greatly to policy and strategy for program stratification, outbreak containment, and insecticide and drug selection and monitoring. Essential issues of sustained personnel development, data analysis and interpretation, and planning also are considered within the institute's mandate.

VBC is prepared to help the MOH define BRI's new role through a series of activities.

- VBC will provide a field research specialist and an institutional development specialist for four weeks each to help 1) produce a research agenda with staff job definitions and deadlines for implementation; 2) plan staff reallocation and finances plan to ensure cost-effective resource development for BRI's new mandate; and 3) project manpower and material needs.

- VBC will provide a specialist in data management and analysis on a four-week assignment to improve BRI staff members' ability to analyze and interpret data using the computer.

- VBC is interested in exploring BRI's potential to be a regional information dissemination and training institution for other vector-borne disease control agencies in A.I.D.-assisted countries in southern Africa.

- VBC would provide an information and training specialist for three weeks to assess the feasibility of such a regional center. Proceeding with this initiative would depend upon the interest of other missions in the region and upon the appointment of a full-time BRI librarian.