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**Mid-Term Evaluation of a Pilot Study
of Community Participation
for Malaria Control in
West Timor, Indonesia**

by

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AR-103-3

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GLOSSARY

Kader	Village health volunteer
Kader²	Plural form of Kader (pronounced Kader Kader)
Kepala Desa	Village head(s)
Puskesmas	Health centers
Puskesmas²	Plural of Puskesmas
N.T.T. Province	Nusa Tenggara (South-East) Timor Province

I. Executive Summary

In November 1988, VBC Project consultants conducted a midterm evaluation of a USAID-funded pilot study of community participation in malaria control. The evaluation was carried out through discussions with USAID and Ministry of Health (MOH) officials in Jakarta and Kupang and site visits to the study areas in West Timor. In general, the pilot project was found to be proceeding according to the program plans. The provincial health authorities and the USAID direct hire personnel had done an outstanding job. It is expected that a great deal will be learned about approaches to involving villagers and the rural health delivery system in joint efforts to control malaria. The midterm status of major segments of the project is as follows:

Training: Modules have been developed for Puskesmas physicians (training methods), village volunteers (recognition, treatment and reporting of clinical malaria) and village inhabitants (malaria biology and control). Programs have been successfully implemented at each of these levels.

Village Malaria Surveillance and Treatment: Volunteers have been trained and are functioning well in the villages selected for this activity. Support systems for this activity from the Puskesmas² are working well with only minor problems in supplying drugs.

Correlation of clinical symptoms and malaria parasitemias: Blood specimens are being collected from the three clinically defined groups of patients coming to selected health centers. Blood slides are being collected, stained and accurately examined. Some mid-course changes have been suggested for this part of the program, including: 1) Adding two sub-Pukesmas to the blood specimen collecting program in order to have health center activities closer to study villages; 2) Increasing the number of subjects in the afebrile clinical group; 3) Recording parasites in positive blood smears in a more standard format; and 4) Recruiting one additional microscopist to support this part of the program.

Bed net study: Bed nets have been distributed and insecticide treatment schedules followed. Initial surveys indicate that the majority of villagers involved in this activity use the nets. Mosquito catches have been initiated in both experimental and control villages. Clearly village support for bed net use as a means of interrupting transmission can be developed and utilized. Evaluation of this effort will be difficult. Additional studies on vector identification and biology as well as evaluation technology will be required.

Recommendations for areas to be considered in the final evaluation of the pilot project are included in this report.

I. Introduction

The need for community involvement in decisions and programs concerning the health of its members has been recognized for some time. The concept of primary health care, which has become the cornerstone of the World Health Organization's "Health for All by the Year 2000," is dependent upon community participation in both establishing priorities and implementing specific programs. However, the use of community organizations and volunteers to promote child health, family planning, treatment of diarrhea in children, and, in Latin America, to take blood specimens from and give drugs to suspected malaria cases, has met with mixed success. In many places, in spite of the best intentions on the part of planners, the villagers were not looked upon as full partners by the traditional health workers who were developing a program to combat a particular disease or syndrome. There continues to be a tendency to make decisions and then tell the villagers what will be done and what they will have to do.

Community education for health requires carefully prepared materials and skilled, dedicated health workers. The peculiar cultural attitudes of individual groups must be given careful consideration. Thus, it is much better to prepare a local health worker to conduct a session in a particular village than to depend on an outsider. Such programs have the greatest chance for success if they are presented by an informed, concerned health worker who knows the technical aspects of the problem and understands the attitudes, desires and misgivings of the people to be served.

The task of a national effort or federal focus on this kind of program is basically two-fold: (1) preparing illustrative and support materials that are appropriate for the target group or population and (2) orienting the trainer toward the goals to be achieved, the behavior changes sought and in how to prepare for these important sessions.

This concept of community participation can be applied to a variety of health problems in developing countries, including malaria. In much of Indonesia, malaria control efforts have become too costly, and in many areas they are meeting with indifferent success. A prime example of this problem can be found in the NTT Province, and particularly in Western Timor. Many populations are quite remote from any form of organized health care. The use of residual application of DDT and other traditional control methods has reduced the incidence of the disease in some districts, but has had less effect in others. Increasing costs threaten the continuation of these efforts, at least at the same level as in the past. The need for village involvement in malaria control activities is well-recognized and the Ministry of Health (MoH) has provided a mandate for such an effort at the national level.

Planning and implementing community participation in malaria control is very complex. Techniques and methods must be identified that are appropriate for the specific epidemiologic situation and amenable to direct community involvement. Resources must be organized, participating personnel identified and evaluation methods established.

However, regardless of the appropriateness of these efforts, none will be successful if the community has not been effectively prepared to receive them and has not been involved in carrying them out. Community education on malaria is an absolute prerequisite to involvement in its control. Training materials must be carefully prepared and learning objectives established for each training session. Communicators must have a clear understanding of the learning objectives, the concepts and ideas to be presented and the methods to be used. Most important, all concerned must not lose sight of the fact that the villagers are to be considered peers and full participants in the program.

The project in Western Timor was developed with a number of ideas and goals in mind. It had become clear that the established approach of residual insecticide spraying and the collection and examination of blood films in a passive case detection program supplemented by periodic malariometric surveys was having little apparent impact on the transmission of malaria. It was also expensive and was not reaching large segments of the island's population. Health authorities in Kupang were particularly concerned that there was little reliable information about the extent of the malaria problem. Many blood films were collected, but logistical problems and the absence of well-trained microscopists rendered this effort ineffective and unreliable. In some situations, the information provided was so inaccurate as to become a liability. There was no specific information about vector habits and the seasonality of transmission in the island's variety of ecologic entities. Therefore, even if resources had been available, the continuation of the residual insecticide program would have been questionable since no reasonable assessment could have been made about where and when this effort should be carried out and appropriate evaluation techniques had not been developed.

The USAID-supported malaria control project in Western Timor was scheduled to end in December 1987, but the malaria problem remained serious and potentially explosive. There was a need to review the situation in order to identify end-of-project efforts that would be both productive and pragmatic. A structure was needed for community-based antimalaria activities that could continue, even with limited resources, once the outside assistance was no longer available. Malaria surveillance and community-based anti-vector activities were identified as specific issues that needed attention and might be amenable to study. After discussions were held between USAID and Ministry of Health officials in Jakarta, consultants from the Vector Biology

and Control Project visited Western Timor in August 1987 to gain insights from provincial health authorities and review potential field study sites.

As a result of these reviews and recommendations, three field projects were proposed and basic designs developed.

Development of a community structure for malaria control

This project included the development of training materials for:

1. Village volunteers (Kader²), on recognizing, treating and reporting occurrences of illness clinically compatible with malaria;
2. Physicians in the health centers (Puskesmas²), on conducting group discussion sessions with villagers; and
3. Villagers, on the basic nature of malaria as a disease, how it is transmitted and the control measures to be used in their areas.

Assessment of clinical reports of malaria as a surveillance tool

This project involved:

1. Identification of villages and associated Puskesmas² to participate in the study. The Puskesmas² selected would serve at least one village in which a treatment volunteer had been established.
2. Selection and training of volunteers to recognize, treat and report clinical malaria cases in their villages.
3. Development of a program in participating Puskesmas² to collect blood films from a percentage of each of three designated clinical groups coming to the health center: patients with current or recent history of fever, patients with current or recent history of fever with chills, and patients with no recent history of fever or chills.
4. Development of a program for training and the collection and microscopic examination of blood films prepared in the health center.

Assessment of Village Potential to Treat and Effectively Use Bed Nets

This project was designed to determine the potential level of participation of villagers in a program involving the insecticide treatment and nightly use of bed nets to help break the cycle of malaria transmission. Distribution of the nets, their periodic treatment with insecticides and their use would ultimately be the villagers' responsibility.

III. Program Content and Goals

A. Village involvement

Examination of training techniques and intervention technologies that would increase the involvement, commitment and eventually the independence of the people affected by the malaria problem.

B. Enhanced surveillance activities

Evaluation of a village-based reporting system in which volunteers (Kader²) provide timely information on the occurrence of chills and fever.

Correlations of clinical symptoms with presence of parasites in the blood through the collection of blood specimens in selected Puskesmas² in the same areas as the reporting villages.

C. Development of a village-based treatment program

Treatment, with appropriate amounts of chloroquine, of all patients with chills and fevers visiting the malaria Kader² in the village.

D. Examination of community-based anti-vector activities

Assessment of anti-vector activities that have the potential to be managed at the village level and possibly to serve as an alternative to the application of residual insecticides, which is expensive and of questionable effectiveness as applied on the island of Timor.

For example, distribution of insecticide-treated bed nets in selected villages associated with:

- o Vector biting and density studies.
- o Evaluation of bed net use.
- o Report of occurrence of chills and fever through enhanced surveillance activities (see 2 above).

IV. Review and Current Status

A. Training

The authors' initial review indicated that the training materials were appropriate and had accomplished their primary purpose. Training segments included training methods for Puskesmas doctors, malaria orientation efforts for villagers and programs for training prospective malaria Kader².

1. Review

Careful evaluation of the training materials is particularly important because there was no opportunity to pretest the materials. The evaluation should include:

- a. Clear definition of learning objectives for each training segment.
- b. Interviews and discussions with representatives of respective target audiences covering the following:
 1. Were learning objectives achieved?
 2. What changes in methods and program content would members of the target audience suggest?

Note: The Puskesmas doctors and the Kader² malaria should probably be involved in the evaluation of the village orientation materials. Once the evaluation has been completed, program planners should introduce changes in learning objectives, instructional methods and learning materials where indicated.

2. Expansion of Training Activity

The schools should be included in the effort to inform villagers about how malaria is transmitted, how it can be controlled and how they can participate in changing the situation. Teachers will need instructional materials with appropriate teaching aids. The instructional materials should include:

- o learning objectives
- o instructional outlines
- o evaluation methods

These materials should be pretested in the kind of rural, malarious areas where instruction is needed. If possible, pretest with teachers from schools representing the proposed target audience.

3. Priorities

The review and evaluation of the training materials used in this unique project will be very important. The potential for using this kind of approach in other areas where populations are relatively remote and more complex disease control efforts cannot be implemented is high. Assistance in this effort can be offered with materials that have been translated into English.

B. Kader² System

The village malaria volunteers are a vital part of the drug distribution program and the reporting system for clinical malaria, which is used as a surveillance adjunct. This part of the program appears to be functioning well. Malaria Kader² have been trained and are working effectively. In the project villages, people with clinical symptoms of malaria are being treated appropriately.

1. Possible Sources of Problems

- a. **Support activities.** Support activities from the Puskesmas doctor, including the supply of drugs and supervision of Kader², need to be more standardized.
- b. **Distribution of Kader².** In some areas, malaria Kader² are much closer together than is necessary.
- c. **Number of Kader² per population unit.** It may be possible to use a smaller number of Kader², and thus reduce the cost of the program.
- d. **Selection of Kader².** This system should be reviewed and standardized as much as possible. The search for volunteers should be continued.
- e. **Training.** The Puskesmas doctor should provide refresher training on a regular schedule.

The distributions of funds allocated for training activities also should be standardized. The trainees may need to know how much money is involved and how it is distributed. Such communications would help allay fears that someone is profiting from the program.

This may be particularly important because the Kader² are not being paid for their contribution to the effort.

2. Motivation

Program planners should consider introducing incentives to enhance the Kader²'s feelings of self worth. Incentives could include:

- o badges of identification
- o house signs
- o free medical care at the Puskesmas
- o training certificate
- o regular meetings with the Puskesmas doctor
- o refresher training on a regular schedule

C. Puskesmas Blood Collection System

The three clinical study groups have been identified and blood specimens are being collected and appropriately identified. Puskesmas staff members have been trained and in most cases, specimens are being appropriately prepared and stained.

1. Problems

- a. The number of people examined in Study Group III (afebriles) is much lower than requested in the original protocol. We have made suggestions to Mr. Sujud, Mr. Azwar and Dr. Servas about how this problem can be resolved.
- b. Some project villages are located at very long distances from the nearest Puskesmas. We suggested that the sub-Puskesmas² at Takari and Tarus, who are closer to these project villages, be included in the program for blood collections from the three study group populations.

D. Microscopist Activities

This segment of the program is working particularly well. Puskesmas staff have been trained and are ably collecting and staining blood specimens. The senior microscopist has been recruited and slide examination is timely and appears to be accurate. In addition, minor problems at the Puskesmas level have been recognized and resolved.

1. Problems

- a. **Parasite counting.** The system used for parasite counting does not provide an opportunity to compare parasite densities in different population groups. We have suggested to Mr. Azwar that a system involving numbers of parasites per 100 leucocytes be adopted for the remainder of the project. (See Section III of this report.)
- b. **Chloroquine resistance.** The persistence of chloroquine-resistant P. falciparum malaria in East Timor indicates that this project should include a more extensive testing (in vivo). We suggested to Mr. Azwar that more such tests be conducted and that, where possible, the observation time be extended to 14 days.
- c. **Microscopist's time.** With the increase in drug sensitivity testing, upcoming malariometric surveys and an increase in blood collecting activities at the Puskesmas, the microscopist's time will be strained. It has been suggested that one additional microscopist be recruited. He or she will need an additional binocular microscope so that the examination of blood specimens will be standardized.

The ability to correlate clinical symptoms with presence of parasites in the blood through the collection of blood specimens in selected Puskesmas² in the same areas as the reporting villages (see A.2) will depend upon the recruitment of an expert malaria microscopist who would be able to supervise and monitor the collection and staining of blood slides and assure the accuracy of their examination. This effort was given very high priority by provincial health officials.

E. Parasite Species and Biology

- o The level of malaria transmission on Timor is high.
- o The dominant parasite species is Plasmodium falciparum.
- o Population immunity varies. Many people with no symptoms have malaria parasites in their blood, and there has been at least one local epidemic with a number of deaths, presumably due to malaria.

- o There would seem to be some hyperendemic foci where malaria transmission extends year-round. (Note: This has not been established as a fact, but the existence of such high transmission foci seems probable.
- o This combination of variable immunity and areas with high, and probably year-round transmission, provide the potential for deadly epidemics.
- o It has been suggested that the treatment Kader² system may be the most effective and economical means of dealing with the problem. Any consideration of expanding the system of malaria Kader² on Timor, however, should not be done at the expense of the malaria study.

V. Parasite Data and Procedures

A. Data Review and Organization

Final analysis of the data must wait for the end of the study and additional organization according to age, sex and location. The initial reviews of data segments below reveal trends, but they are still preliminary.

Tables I - III must be considered as first available data.

Table I clearly shows the dominance of P. falciparum in all the study Puskesmas². However, the much lower level of this species in Niki Niki will need further evaluation.

Table II indicates that the presence of chills and fever is strongly correlated with the actual occurrence of malaria parasites. Twelve percent of people with fever and no chills were positive for Plasmodium. It is interesting to note that almost five percent of the people with no symptoms referable to malaria carried malaria parasites in their blood.

Table III indicates a considerable variation in the actual amount of malaria from village to village, even in the same Puskesmas. Niki Niki appears to have more malaria than any other Puskesmas in the project group. It is much too early to draw any conclusions about the presence of bed nets and the occurrence of chills and fever in the same village.

A more complete breakdown of the data will be made when information on age and sex is available and one full year can be evaluated.

B. Proposed Enumeration System for Parasites in Positive Blood Specimens

It will be most important to have a means of directly evaluating parasite densities in the blood specimens collected from the selected Puskesmas² in the special study areas, as well as from those from the malariometric surveys. This evaluation will only be possible if the results from positive specimens are reported in specific numbers, rather than by the system of pluses currently used.

The proposed system is as follows (P. falciparum first priority):

- Step 1: Examine the specimen until the first parasite is seen or until 200 negative fields have been seen.
- Step 2: If all 200 fields are negative, the slide is declared negative.
- Step 3: If a parasite is seen, begin to make a count of white blood cells (leucocytes).
- Step 4: Count all parasites seen until 100 white blood cells have been seen. This completes the specimen examination.

Step 5: Record results as the number of parasites in 100 white blood cells. Example: 10 pt/100 leucocytes, 1 ptg/100 leucocytes.

Very heavy infections:

- o There will be few of these.
- o Count all parasites seen in the same number of fields required to see 100 leucocytes.

P. vivax and P. malariae infections:

- o Record Plasmodium vivax and P. malariae in the same way as indicated for P. falciparum. Example: 5 Pv/100 leucocytes or 2 Pm/100 leucocytes. **Note:** The stages present (including gametocytes) of these species will not be important.

Mixed Infections:

- o Record the species seen in the way noted. Example: 10 pf/100 leucocytes 2 pfg/100 leucocytes 3 pv/100 leucocytes.

Negative Specimens:

- o A specimen is declared to be negative when 100 thick film fields have been examined and no parasites have been seen.

Positive Specimens:

- o The examination of a positive specimen is completed when a parasite count per 100 leucocytes has been made. The actual number of fields seen with positive specimens is not important.

VI. Bed Net Study Review

This study is designed to determine whether insecticide-treated bed nets are an economical and effective substitute for interior house spraying to control malaria.

1. All three pairs of bed net-control villages were inspected. The control villages are Noelbaki-Oebelo (coastal), Benu-Noelmina (forested, wet foothills), and Neke I-Neke II (dry hills). None had received interior spraying since December 1987.
2. More than 90 percent of the distributed nets were hung properly and most people claimed to sleep under them. The nets appeared to be of poorer quality than those of white cotton distributed several years ago; occasionally holes developed at creases. It is unlikely, however, that this has compromised their efficacy.
3. Retreatment (6-monthly) or preparation for retreatment was occurring at all net villages. At Benu, where nets had been retreated shortly before our visit, dead mosquitoes and other insects were found in and on nets.
4. Thrice monthly, all-night biting collections of mosquitoes were scheduled for each of the six villages, but none were witnessed. All sites were examined. Collection data (summarized in the report for the third quarter) provide no unequivocal evidence that nets affected mosquito species distribution, biting habits or the survival rates of the putative vectors Anopheles barbarostris or An. maculatus. Nor do the number of Kader treatment cases differ between control and test villages.
5. There are several reasons for the apparent lack of effect of nets:
 - a. **Seasonality.** The study began in April after annual transmission had started to subside. Analysis of a full year's data may reveal a difference.
 - b. **Experimental design.** It is difficult to match control and test populations in field experiments and it is unclear whether each net-no net pair of villages has comparable transmission. Scientifically, it would have been better to assign nets to only some randomly selected houses in each village, and subsequently to compare incidence of symptoms between protected and neighboring

unprotected houses. The use of bed nets is probably reducing malaria incidence, but this trial may not demonstrate that benefit unequivocally.

- c. **Unknown vectors.** At least five potential vectors occur in the study area: An. barbarostris, An. subpictus, An. maculatus, An. aconitus and An. vagus. Each has a characteristic attack pattern that determines whether it feeds indoors or outdoors and at what time of night. Obviously bed nets will be less effective against vectors that bite outdoors or during hours when people do not normally use nets. Vectors in the study areas have never been incriminated.

6. Interim recommendations:

- a. Vector incrimination should be attempted. This might be accomplished by having Lt. Bangs at NAMRU-Jakarta test captured parous Anopheles for the presence of P. falciparum or vivax sporozoites using the ELISA, an immunological assay.
- b. Data should be computerized; otherwise, proper statistical analysis at the end of the project will be difficult. Files should be created so that as many components as possible can be compared. For example, chills and fever in children younger than five in net vs. no net pairs.
- c. A final assessment of the cost-effectiveness of nets vs. house spraying is planned. Those conducting the assessment should consider the life of the nets and the possibility of villagers contributing to their purchase or construction.

VII. Discussion with Provincial Health Officials

Before the review team departed Timor for Jakarta, a debriefing session was held for NTT provincial health officials in Kupang. Due to an emergency on the Island of Flores, Dr. Lada was unable to attend this meeting. However, we gave Drs. Lafumoko and Aswar and Mr. Frans Pello a review of what we had seen, some general indications of the problems encountered and our recommendations for the remainder of the project. The following outline reviews the material presented to this group.

A. Program Progress

The program has developed and progressed better than any of us might have expected.

- o Training materials were developed.
- o Training was implemented.
- o Kader² were put into place.
- o Villagers were oriented.
- o Treatment was started.
- o Bed nets were distributed
- o Bed nets were treated
- o Mosquito catches were initiated.
- o Blood specimens were collected, stained and examined.

That all of this was done, and done well, is due to a great deal of effort by a number of people working in Dr. Servas' CHIPPS project, including:

- o Mr. Sujud and Mr. Azwar
- o A group of dedicated Puskesmas doctors, nurses and support staff
- o Many Kepala Desa and Kader²
- o Entomology field staff
- o Many villagers who have become convinced that they can participate in efforts to improve their own health.
- o Drs. Frans, Muharyoto, Arbani and Gunawan

This does not do justice to the efforts of the wide variety of people who have cooperated in this project.

B. Lessons Learned

1. There is a great deal of malaria on Timor.

2. P. falciparum is dominant to a surprising degree.
3. Population immunity seems to vary and the possibility of focal and deadly epidemics is very real.
4. P. falciparum is still responding to chloroquine (as far as we know).
5. Villagers can understand facts about malaria.
6. Local volunteers can be trained to recognize and treat cases of chills and fevers.

C. Future Directions and Issues.

1. The drug distribution system will not stop transmission.
2. The drug distribution system will mitigate morbidity and prevent mortality due to malaria.
3. Malarionetric surveys
 - a. Limited school surveys could augment village surveys.
 - b. Data on current and recent (past two weeks) history must be recorded.
 - c. Areas for malarionetric surveys should include the villagers in the special study areas.
 - d. Malarionetric surveys should come at (or towards) the end of the transmission season, if possible.

D. Parasite species

The level of P. falciparum is both surprising and alarming. There may be hyperendemic foci with continuous transmission. Such areas would be most dangerous for introduced non-immunes.

E. Kader² System

1. The system appears to be working very well.
2. The malaria Kader system should remain uncomplicated and focused.
3. Motivational factors for Kader² should be considered. For example: signs for Rumah Kader, badges for Kader² (different colors could

indicate length of time served), free medical care at Puskesmas or refresher training.

4. A more formalized system is needed to ensure that Kader² are active, receiving drugs and have no problems. **Note:** These methods should be standard for all areas.
5. Hold a meeting of the concerned Puskesmas doctors in Kupang.
6. Review training.
7. Review progress of the program.
8. Get suggestions for changing and formalizing the support system by holding a meeting of the Puskesmas doctor and the Kader² from a particular Dusun every three months.
9. Demonstrate continued concern for the work being done by volunteers
10. Expand to other populations:
 - a. where spraying will be stopped
 - b. remote groups (consider distance from Puskesmas)
 - c. areas with high levels of transmission as revealed by malarionometric surveys
 - d. Ladang areas during harvest and planting season.
11. Consider treating all febriles.

F. Training Review

1. Evaluation should include input from the Puskesmas physicians who were trained to be trainers:
 - a) What changes would they suggest?
 - b) What were the best and worst features of their own sessions with villagers and Kader²?
2. Refresher training for all groups involved, particularly new Puskesmas doctors.
3. Prepare instructional materials to be used in the schools. (Teachers will use them if they have them.)
4. Consider more direct and active involvement of teachers in this and other village-based health promotion activities.

G. Other recommendations

1. The numbers of afebriles providing blood specimens is much lower than proposed.

Blood specimens should be taken from the first 30 people seen each week who have no fever or chills. If this number is reached the first day, no more people in this group will be bled that week.

2. In some areas, study villages are very far removed from the Puskesmas.

The sub-Puskesmas at Tarus (Obelu and Noelbaki) and at Takari (Benu and Noelmina) should be included for blood collecting activities.

3. The number of In vivo sensitivity studies for chloroquine susceptibility should be increased.

This activity should be concentrated toward the border with East Timor where chloroquine resistant P. falciparum is known to exist. Where possible, 14 day observations should be made in order to get a better idea of the distribution of R-1 resistant strains of this parasite.

4. Add one additional microscopist for the remainder of the study period.
 - a. Increase the numbers of in vivo sensitivity tests.
 - b. Activate two sub-Puskesmas².
 - c. Increase the number of afebriles to be examined.

5. Change the system for recording parasite positive specimens to one using a direct number/100 leucocytes instead of the system of pluses currently used.

Note: A standard system using the number of parasites/100 leucocytes has been discussed with Mr. Azwar and detailed written instructions provided.

The direct number system will provide an opportunity to compare parasite densities in the various study groups involved, including afebriles, children and geographic locations.

H. Bed net study

1. Evaluation potential
2. Actual vector identification
3. Transmission studies

VIII. Summary of Recommendations

1. The content and effectiveness of the training materials must be evaluated and materials should be revised where necessary.
2. A regular program for evaluation of Kader² should be established.
3. A schedule for refresher training should be developed and implemented.
4. Efforts to monitor possible problems with chloroquine resistant P. falciparum malaria should be expanded.
 - a) In vivo studies only.
 - b) Carry out as many 14-day studies as possible.
 - c) Extend the areas for these studies, especially toward the border with East Timor.
5. Continue the blood specimen collection program in Puskesmas² and extend the program to sub-Puskesmas² at Tarus and Takari. Increase the number of afebriles examined in all Puskesmas².
6. Recruit one additional microscopist to support the increased number of slides from Puskesmas², malariometric surveys and in vivo drug studies.
7. Provide one additional binocular microscope in order to standardize blood specimen examination.
8. Include Dr. Ratina as part of the final evaluation of the Kader² system.

The Kader² system has been recommended to provincial health officials as the most uncomplicated and economical means of dealing with large amounts of P. falciparum malaria in a population containing significant numbers of non-immunes. Such a situation produces the potential for focal epidemics with mortality. It is assumed that this problem will be a high priority for decision makers in the provincial health office.

The special study using malaria Kader² as a combined surveillance mechanism and drug distribution system has not been completed and should not be altered until the program is over and an evaluation has been conducted. However, we have learned enough to know how to select, train and put into action Kader² who can serve as reporting and treatment posts

for possible malaria cases. With this available experience provincial health officials may wish to consider extending the Kader² system:

- a. to populations remote to a Puskesmas
- b. in Ladangs where other protective measures will not be applied
- c. in areas where residual insecticides will be withdrawn
- d. in villages where malariometric surveys have revealed a high potential for outbreaks.

Note: This extension, if carried out, must not be part of the ongoing special project. It should be a separate effort by the provincial health authorities.

IX. Remarks and Comments

A. Vector Identification

This is clearly crucial issue. No reasonable decision about vector control methods can be made without vector identification. The feeding, resting and breeding habits of the vector mosquito species is vital basic information for determining whether such approaches as residual application of insecticides, source reduction or distribution of bed nets have the potential to influence the transmission of malaria.

Any assistance or encouragement to pursue this issue would be of great value not only on Timor but on other outer islands in Indonesia. The establishment of a paradigm for this type of investigation in Indonesia would support vector identification efforts in other areas.

Residual insecticides will continue to have place in Indonesia's malaria programs. However, total coverage is not possible or reasonable. The judicious application this technique will depend on the species identification of the malaria vector.

B. Variable Epidemiology of Malaria

The epidemiology of malaria on Timor may vary not only with the season, but with the specific location. Therefore, the vector in one village in August may be different from that in a village only a few kilometers away. Vector species transmitting malaria during the rainy season will probably not be the same as those involved in this activity during the dry season. The malaria epidemiology of a well-watered area such as Benu will probably be quite different from that of a place such as Neke. The point is that general statements about malaria on Timor, and therefore general statements about appropriate control methodologies, are out of order and contribute little to resolving the problem.

C. Evaluation of the Kader² System

Dr. Ratina will be very valuable in the final evaluation of this project. Her observations on the cultural, social and political factors influencing the effectiveness of volunteer health workers should be very helpful and of considerable value in extending this kind of activity to other parts of Indonesia.

D. Evaluation of Training Materials

This will probably be one of the single most important activities in the entire project. Any encouragement and assistance that can be provided during this process will be of great value.

X. Outline of Activities

October

27 Arrive Jakarta

28-30 Jakarta

Meetings and Conferences

USAID: Ms. McDonald, Ms. Ellickson-Brown,
Mr. Voulgaropolous, Dr. Ziel Rosenberg
GOI: Dr. Arbani
Dr. Arwati
CDC: Dr. Linan
Dr. Bernstein

General outline of program completed
Travel arrangements finalized

31 Travel Jakarta-Kupang

November

1 Meet Dr. Lada
Dr. Servas and other Provincial officials
Visit two Kader² in village of Kupang
Outline program for time in Timor

2 Travel Kupang Soe

Meet District Governor, Soe
Visit Puskesmas - Niki Niki - Dr. Made Sukarmini
Visit - Village - Bone
Conference with Kepala Desa and Kader²

3 Visit to villages Niki I and Niki II

Conference with Kepala Desa
Direct visit with Kader²
House-to-house review of bed net program
Visit mosquito collection area

- 4 Visit to villages, Niki Niki, UN and Sopo
 - Conference with Kepala Desa and Kader²
 - Visit House of Ketua Kader in Niki Niki - UN
 - Return to Kupang - Visit Noelmina mosquito collection area (Kuskesmas-Champlong)
- 5 Visit to Puskesmas - Champlong (Doctor - Away)
 - Discussion on slide collection program with microscopist
 - Visit to Benu
 - Discussion with Kader² in both sections of the village
 - Review of bed net programs and mosquito collection areas
- 6 Visit to Puskesmas Baumata
 - Review of bed net Programs
 - Stops in Villages of Noelbaki, Oebelu, Karaklald
 - Particular attention to new population moving into Noelbaki that is clearly not receiving the benefits of the Government sponsored health delivery system including the special malaria program.
- 7 Conference with Sujud, Azwar, Muharyoto and others to review discussion points with Drs. Lada and Servas.
 - Prepare final outline for discussion with Provincial health officials.
- 8 Conference with Provincial health officials. Dr. Lada unable to attend because of emergency in Flores.
 - Visit to Subpuskesmas at Tarus
 - Return to Jakarta
- 9 Conference with Dr. Ratina on sociological features of the Kader² system for malaria in Timor.
 - Meeting with Ms. McDonald and Ms. Ellickson-Brown on general aspects of the malaria project on Timor.
 - Completion of travel arrangement for return to U.S. on November 1.
- 10 Conference with Drs. Arwati, Arbani and Mr. Muharyoto, Government of Indonesia Ministry of Health.

- 11** Preparation of report and data review.
- 12** Free
- 13** Return to U.S.A.

XI. Contacts

JAKARTA

USAID

Dr. Mani Voulgaropolous
Ms. Katie McDonald
Ms. Debra Ellickson-Brown

U.S. State Department

Mr. Michael Connors
Dr. Arbani
Mr. Muharyoto

University of Indonesia

Dr. Ratina

U.S. Navy Medical Research Unit

Mr. Michael Bangs

TIMOR

Provincial Health Office

Dr. Lada
Dr. Lafumoko
Dr. Servas
Mr. Frans Pello

USAID Project

Mr. Sujud
Mr. Azwar

Puskesmas Doctor (Niki Niki)

Dr. Made Sukarmini

Kepala Desa and Kader² Malaria

Bone
Nicki Nicki-Un
Neke I and II
Sopo
Noelmina
Benu I and II
Noel Baiki
Kuaklalo