Highlights from the Sixth Annual Assessment and Mid-term Review Workshop on Malaria Control in Eritrea

Massawa, Northern Red Sea Zone
Eritrea
27-29 March 2003

National Malaria Control Program
Communicable Disease Control Division
Ministry of Health
Asmara, Eritrea
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- The Director General of Health Services, Mr. Berhane Ghebretinsae;
- Dr. Andom, previously the NMCP’s immediate supervisor as the Director of the Communicable Disease Control (CDC) Division, and now the Director General of Research and Human Resources Development.
- United Nations Children’s Fund (UNICEF) for funding the workshop;
- The World Health Organization (WHO), the United States Agency for International Development (USAID), the World Bank (WB/IDA), and Italian Cooperation for their overall support.
- The Zonal Administration, Northern Red Sea (NRS), for hosting the workshop and its overall support.

We enjoyed and appreciated the enthusiasm, good will and cooperation of the zonal administration staff and the zonal health staff. We would like to thank the zonal administration in particular for hosting the workshop in a brand new conference hall. Our thanks also go to the workshop organizing committee that was composed of the NMCP headquarters staff, NRS zonal health staff, and NRS zonal administration who worked seven-day weeks to make the workshop a reality and a success.

Thanks also go to the following workshop organizers:

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14. Mr. Worede Andemichael, HAMSeT Coordinator, NRS zone
15. Mr. Mana Yohannes, Environmental Health, NRS zone

We were honored to have had your participation at the workshop. We also wish to thank Mr. Eugene Brantly and Ms. Dina Towbin at the Environmental Health Project for their support in preparing this report.
# Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tr>
<td>CDC</td>
<td>Communicable Disease Control</td>
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<tr>
<td>CHA</td>
<td>community health agent</td>
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<td>EHP</td>
<td>Environmental Health Project</td>
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<td>ESMG</td>
<td>Eritrean Social Marketing Group</td>
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<tr>
<td>HAMSeT</td>
<td>HIV/AIDS, Malaria, Sexually Transmitted Infections and TB Project</td>
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<td>HQ</td>
<td>Headquarters</td>
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<td>IMCI</td>
<td>Integrated Management of Childhood Illnesses</td>
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<td>IPD</td>
<td>In-Patient Department</td>
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<td>IRS</td>
<td>Indoor Residual Spraying</td>
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<td>ITN</td>
<td>Insecticide-Treated Net</td>
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<td>DHS</td>
<td>Demographic Health Survey</td>
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<td>MCH</td>
<td>Maternal and Child Health</td>
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<td>MLHW</td>
<td>Ministry of Labor and Human Welfare</td>
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<td>MOA</td>
<td>Ministry of Agriculture</td>
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<td>MOD</td>
<td>Ministry of Defense</td>
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<td>MOE</td>
<td>Ministry of Education</td>
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<td>MOH</td>
<td>Ministry of Health</td>
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<td>MOI</td>
<td>Ministry of Information</td>
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<td>MOTC</td>
<td>Ministry of Transport and Communication</td>
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<td>NACP</td>
<td>National AIDS Control Program</td>
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<td>NCEW</td>
<td>National Confederation of Eritrean Workers</td>
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<td>NGO</td>
<td>Non-Governmental Organization</td>
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<td>NMCP</td>
<td>National Malaria Control Program</td>
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<td>NRS</td>
<td>Northern Red Sea</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<td>NUEYS</td>
<td>National Union of Eritrean Youths and Students</td>
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<td>OPD</td>
<td>Out-Patient Department</td>
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<tr>
<td>PFDJ</td>
<td>People’s Front for Democracy and Justice</td>
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<td>PHARPE</td>
<td>Public Health Assistance and Rehabilitation Project for Eritrea</td>
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<td>PMU</td>
<td>Project Management Unit</td>
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<td>POA</td>
<td>Plan of Action</td>
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<td>RBM</td>
<td>Roll Back Malaria</td>
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<td>SP</td>
<td>Sulfadoxine-pyrimethamine (Fansidar®)</td>
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<td>SRS</td>
<td>Southern Red Sea</td>
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<td>TASC</td>
<td>Technical Assistance and Support Contract</td>
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<tr>
<td>UNICEF</td>
<td>United Nations Children’s Fund</td>
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<td>USAID</td>
<td>United States Agency for International Development</td>
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<td>WHO</td>
<td>World Health Organization</td>
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<td>WHO/AFRO</td>
<td>World Health Organization/Regional Office for Africa</td>
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Executive Summary

The Governor of North Red Sea zone, His Excellency Mr. Alamin Sheik Saleh, opened the 6th Annual Assessment and Mid-Term Review Workshop on 27 March 2003 in Massawa, Eritrea. He noted that the National Malaria Control Program has been successful in all its endeavors and should maintain its current pace in implementing the program. He expressed his pleasure in being able to support the NMCP, welcomed participants to the NRS, and wished everyone success with the workshop. The Director General of Health Services, Ato Berhane Ghebretinsae, made opening remarks noting both the success of the malaria program to date and its challenges for the future. The representatives of several international funding partners, including the World Health Organization, UNICEF, the World Bank/IDA, U.S. Agency for International Development, and Italian Cooperation also made opening remarks.

The workshop had two purposes:

1. To report on the activities and accomplishments of the National Malaria Control Program (NMCP) and its partners in 2002

2. To review progress made by the NMCP, its partners and stakeholders since the launch of the five-year strategic plan of action (POA) in July 1999.

Workshop presentations and discussions addressed the following topics: A review of the Roll Back Malaria (RBM) program in Africa; a profile of malaria in Eritrea; malaria control activities and accomplishments in each zone; a summary of collaboration with the USAID-sponsored Environmental Health Project (EHP); results of studies on vector distribution and behavior, sporozoite rates and feeding preferences, larval ecology and larval control, and alternatives to DDT for use in indoor spraying; actions taken to scale up the bed net re-treatment process; a malaria communications strategy; economic implications of drug resistance; a review and results of anti-malarial drug efficacy studies; the Integrated Management of Childhood Illnesses (IMCI) strategy and malaria; and malaria in pregnancy.1

1 The complete agenda and PowerPoint presentations are located in Annexes A and C, respectively.
This year’s workshop included nearly 200 participants from all six zones, staff from various departments of the Ministry of Health (MOH) and other line ministries, and representatives from other Eritrean organizations. Many of the program’s international partners were also invited, including WHO/HQ, WHO/Regional Office for Africa (AFRO), USAID, the USAID-sponsored EHP, UNICEF, the WHO-sponsored Public Health and Rehabilitation Project of Eritrea (PHARPE), and the WB/IDA.

The three-day workshop yielded fruitful and lively discussions with the NMCP’s key players, namely the Zonal Malaria Coordinators, Zonal Medical Directors, and Malaria Technicians. Presentations by the heads of several MOH units, including IMCI (Dr. Michael), Pharmacy (Mr. Bernando), Health Promotion Center (Mrs. Azenegash), and Maternal and Community Health (Dr. Berhana) demonstrated the close collaboration and integration among MOH programs that is necessary for effective malaria prevention and control and achieving broader goals, namely improving the health of all Eritreans.

The workshop produced recommendations on many topics, including: pursuing further assessment and evaluation of program interventions; increasing communities’ and community health agents’ roles, health promotion activities, and insecticide-treated net (ITN) use and knowledge base; improving malaria treatment and health services; increasing the use of an integrated approach; and strengthening the NMCP’s role and integrating its services.

His Excellency, Mr. Saleh Meky, Minister of Health, closed the workshop on 29 March 2003.
1. Malaria Profile and 2002 Accomplishments: The Year in Review

Dr. Tewolde Ghebremeskel, Manager, NMCP

Over two-thirds of Eritrea’s population is thought to be at risk for malaria. According to the most recent Eritrea Health Profile (2000), malaria is the leading cause of hospital and health center admissions and of inpatient deaths among those five years and older. Malaria continues to have a serious impact on the lives of many Eritreans, as well as on the country’s overall economic condition. It has been estimated that, on average, approximately seven to 12 days are lost per episode of malaria, which has a great impact on the labor force’s productivity.

Under the MOH/CDC, the NMCP uses an integrated and comprehensive approach to malaria prevention and control. Interventions include providing for prompt and adequate case management with effective antimalarial drugs, environmental management, selective vector control, epidemic management and control, and promoting personal protection through the use of insecticide-treated bed nets (ITNs). Given the heavy malaria burden in Eritrea, the NMCP is devoted to reducing malaria morbidity and mortality by 80% over the five-year term of the current RBM plan of action.

1.1. Malaria Morbidity and Mortality

From January to December 2002, figures reported from health facilities and community health agents (CHAs) showed encouraging reductions in malaria morbidity and mortality compared to the previous year. These reductions are an indication that the malaria situation is improving.
The number of malaria cases reported through the Out Patient Department (OPD) was 74,351 in 2002, down from 125,746 for the same period in 2001 (see Figure 1). This is a 41% reduction in the total number of malaria patients seen at outpatient health facilities. The incidence of malaria cases seen at outpatient facilities was also reduced from 34 per 1000 in 2001, to 20 per 1000 in 2002. This decline was evident across all six zones of Eritrea (see Figure 2). Proportional morbidity (i.e., the proportion of outpatients diagnosed with malaria as a percentage of all patients seen at outpatient facilities) fell from 8% in 2001 to 5% in 2002.

Figure 1: Malaria morbidity (OPD) by month in Eritrea

Figure 2: Number of OPD malaria cases in Eritrea by zone, 1997–2002
Mortality due to malaria also showed a general decline in 2002 as compared to the previous year. Among children under five, the proportional mortality (i.e., percentage of deaths due to malaria) decreased from 13.4% in 2001 to 7.1% in 2002. A similar reduction was observed among the five years and older age group—from 5.8% to 3.3% in 2001 and 2002, respectively.

1.2. Interventions for Malaria Prevention and Control

Malaria program staffs in the zones, and their partners and stakeholders at the subzonal and village level, were diligent in implementing program interventions in 2002. Two interventions received special emphasis this year—changing the first-line antimalarial drug to make case management more effective and accelerating the distribution and re-treatment of ITNs.

The National Anti-Malarial Drug Technical Committee was formed in August 2001. In January 2002, the committee recommended that the anti-malarial drug policy be changed to adopt chloroquine plus SP (Fansidar®) as the first-line treatment for uncomplicated malaria. This recommendation was accepted, and in 2002 the NMCP worked in close collaboration with the Zonal Medical Officers and Zonal Malaria Coordinators to orient and retrain nearly 1,500 doctors, nurses, general health workers, pharmacists, rural drug vendors and CHAs on the new treatment regimen.

Another case management improvement was the increased use of rapid diagnostic test kits (e.g., OptiMal test kits) for the diagnosis of malaria parasites. In 2002, the NMCP made a decision to distribute these rapid test kits to rural health stations and health centers without laboratory facilities. The increased use of these diagnostic tools, coupled with the use of more effective anti-malarial drug combinations contributed to improved diagnostic and treatment services and may have prevented deaths from complications of severe malaria and anemia.

Substantial effort was also devoted to increasing the distribution and re-treatment of bed nets, following the
MOH’s decision to distribute freely ITNs for all households living in malarious areas and for all pregnant women attending antenatal clinics and health facilities. The total number of ITNs distributed in 2002 was 276,000—an increase of more than 100,000 ITNs from 2001. ITN re-treatment centers also increased in number in the zones. More than 227,000 bed nets were re-treated with insecticide in 2002, compared with 135,000 re-treated in 2001 (see Figure 3). The WHO/AFRO played a key role in improving the net re-treatment rates through technical and financial support.

1.3. Other Factors

Scanty rainfall in 2002 definitely limited malaria transmission in the country. There is a clear relationship among environmental factors, mosquito proliferation, and malaria transmission to humans. If meteorological conditions (i.e., ample rainfall and sufficient temperature and humidity) are not suitable, then there is an obvious and immediate impact on the rate of development of malaria vectors and, hence, on transmission.

The State of Eritrea has made numerous contributions to improving the lives of its citizens over a relatively short period of time following 30 years of conflict. The HAMSeT (HIV/AIDS, Malaria, Sexually Transmitted Infections, and TB), a US$ 40 million project, is a prime example of how the government is investing in the health and economic productiveness of its people through the realization that poverty and ill-
health are linked. To successfully win the battle against malaria, poverty—the underlying cause of a number of preventable diseases—must be addressed.
2. NMCP Mid-Term Assessment: A Review of Progress Under the RBM Five-Year Plan

Dr. Tewolde Ghebremeskel, Manager, NMCP

Malaria remains one of the most important vector borne diseases in the world. Each year, it causes more than 300 million clinical cases and one million deaths among children in sub-Saharan Africa. In Eritrea, malaria continues to be a serious public health problem. Over two-thirds of the population live in malaria risk areas. Malaria has been considered one of the leading causes of mortality in hospitals among children under five as well as those five years and older.

In light of this, Eritrea’s MOH adopted the WHO’s RBM Initiative in 1998 and subsequently prepared a five-year Plan of Action (2000–2004/5) to combat malaria. In writing its five-year plan, the MOH sought input from various stakeholders and participants from different ministries and organizations. At the National Conference on Roll Back Malaria in Mendefera in July 1999, the MOH five-year malaria control program took shape. Implementation began in 2000.

2.1. Objectives of the Five-Year Plan of Action

The overall objective of the five-year malaria control program is to reduce morbidity and mortality due to malaria to such a level that it is no longer considered a major public health concern in Eritrea. To achieve such an ambitious goal, three specific program objectives were outlined, namely to:
1. Reduce malaria mortality by 80% by 2004/5.

2. Reduce malaria morbidity by 80% by the end of 2004/5.

3. Reduce the incidence of malaria during epidemics by 90% by the end of 2004/5.

For each objective, the percentage reduction is with respect to baseline conditions in 1999.

To achieve these objectives, the NMCP is using an integrated, multi-pronged approach. This includes prompt and adequate case management, integrated vector control (including ITNs, selective indoor residual spraying (IRS), environmental management and larviciding), health promotion, capacity development, operational research, and monitoring and evaluation.

The NMCP foresaw in its five-year strategic POA the need to conduct a mid-term review of program activities and accomplishments. Therefore, at the 6th Annual Assessment Workshop, the NMCP’s five-year plan POA was evaluated.

The purposes of the mid-term review were to:

- Identify program aspects that are going according to plan

- Improve the program by identifying areas that are in need of mid-course corrections

- Track and demonstrate results at HQ, zonal, sub-zonal and community levels

- Assess the partners’ and stakeholders’ roles in implementation and funding.

2.2. Achievements to Date

In short, the NMCP was able to demonstrate that both the rate and incidence of malaria morbidity and mortality were significantly reduced since the launch of the five-year strategic POA. For example, the proportional mortality rate (proportion of deaths attributed to malaria) declined by 68%—from 13.3% to 4.2%—between 1999 and 2002. The proportional morbidity rate declined by 60%—from 11.2% to 4.5%—over the same period (see Table 1). The malaria mortality rate fell by 53%—from 4.7 to 2.2 per 100,000—between 1999 and 2002. The malaria incidence rate also saw a significant 51% reduction—from 41 to 20 per 1,000—during the same period (see Table 2).
Decreases in malaria mortality rates can be attributed in part to the increased availability of prompt diagnosis and effective case management services. These improvements were achieved by providing case management training for severe malaria for nurses and doctors, providing rapid diagnostic test kits to rural health facilities without proper microscopy, and ensuring widespread availability of an effective first-line treatment using chloroquine plus SP (Fansidar®). Other factors contributing to the program’s success are increased coverage of training for CHAs and general health workers, and the availability and re-treatment of ITNs.

In addition, there was a dramatic reduction in the number of malaria cases in OPDs and in-patient departments (IPDs) between 1999 and 2002. In 1999, the number of cases that OPDs reported was 179,501; this number dropped to 74,861 in 2002 (see Figure 4). Likewise, there was a significant reduction in the number of IPD cases; in 1999, 16,270 cases were admitted to health facilities, while in 2002, the number of admitted IPD cases declined to 6,815, a 58% decrease. Maintaining these significant reductions will be a major challenge.

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<td>Reduce malaria mortality by 80%</td>
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<td>Reduce malaria morbidity by 80%</td>
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<td>Reduce malaria morbidity during epidemics by 90%</td>
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<th>Table 2: NMCP Program Achievements</th>
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<td><strong>Specific Objectives:</strong></td>
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<td>Reduce the malaria mortality rate by 80%</td>
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<td>Reduce the malaria incidence rate by 80%</td>
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<tr>
<td>Reduce malaria incidence during epidemics by 90%</td>
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2.3. Challenges and Lessons Learned

There were a number of issues and constraints that were identified in the first half of program implementation. Major issues include: inadequate management of transportation facilities for activities; limited supervision of human resources; and the need to greatly intensify community-based interventions (distribution of ITNs, retreatment, source reduction, and involvement of CHAs). On the other hand, Eritrea has some positive aspects on its side—including a manageable country and population; limited rainy and malaria transmission seasons; the availability of substantial funds from the multi-sectoral HAMSeT Project; and above all, the political will and commitment of the MOH and the government.

With the reduction of malaria incidence, malaria epidemics remain a significant threat in Eritrea; these epidemics are complex and difficult to forecast. Malaria epidemics are determined not only by local factors, but also by sub-regional and regional weather conditions. The efforts made so far by the government, the MOH, and the NMCP must be congratulated, but it is important for them to remain vigilant so that malaria control efforts are not relaxed.

In conclusion, the following lessons were learned in the past three years of program implementation using the RBM strategy:

1. Eritrea has made significant progress towards its RBM goals, but it needs to sustain these achievements
2. Some process and impact indicators may need to be revised to adequately and appropriately measure outcomes

3. There is a need to further strengthen inter-sectoral collaboration for implementation and data collection and to further support the role of the CHAs in the communities.
3. Summary of Recommendations from the Assessment Workshop

Mr. David Sintasath, Epidemiologist, NMCP

The workshop’s overall recommendations included: pursuing further assessment and evaluation of program interventions; increasing communities’ and CHAs’ roles; expanding health promotion activities, and ITN use and knowledge base; ensuring prompt and adequate case management; increasing the use of an integrated approach; and strengthening the NMCP’s role and integrating its services. The detailed recommendations are presented below.

3.1. Conduct Further Assessments/Evaluations

- An assessment should be conducted to determine the impact of malaria program interventions on health indicators, including malaria cases and deaths.

- The specific impact of ITNs on health indicators should be evaluated, taking into account their usage, effectiveness, and effect on immunity.

3.2. Increase Communities’ and Community Health Agents’ Roles

- Strengthen community-based interventions, as they are important ways of reaching target populations. Communities should manage water points and other man-made water sources to reduce or eliminate potential mosquito breeding sites.

- CHAs play an important role in malaria control and should be integrated more fully into the existing health care system. Improving their supervision and ensuring regular communication between CHAs and health facility staff and malaria program staff can accomplish this.

- Although transportation constraints have generally been improved, malaria control staff in some zones still do not have sufficient access to transportation to supervise CHAs, ITN re-treatment, and vector control activities.
3.3. Increase Health Promotion Activities

- Health promotion is an important component of the malaria control strategy and should be strengthened. Health promotion activities include public health education to promote locally available health services, bed net use and re-treatment, and community efforts to eliminate mosquito-breeding sites.

3.4. Increase ITN Use and Knowledge Base

- Although significant achievements have been made with regard to ITN distribution and establishing re-treatment programs, little is known about the use of ITNs in the home and behavioral practices; operations research is needed to better understand the use of bed nets and to develop targeted health promotion messages that promote their correct use.

- Further examination is needed of the long-term sustainability of the MOH’s current ITN strategy, which involves the free distribution and re-treatment of ITNs.

3.5. Improve Malaria Treatment and Health Services

- More attention should be devoted to delivering services to vulnerable groups (children under five and pregnant women), including the use of ITNs, prompt diagnosis and treatment, anemia management, and collecting age- and gender-specific case reports for malaria surveillance.

- More operational research may be needed to understand treatment-seeking behavior among target populations (e.g., self-treatment through the use of rural drug vendors).

- The MOH should continue to monitor the efficacy of antimalarial drugs, including those used in the current first-line treatment and others that may be used as part of combination therapy in the future.

- Health facilities need additional resources and staff training to be able to track and follow-up malaria cases by locality. Currently, facilities lack the staff, records, and transport needed to track these cases.

- Health facility staff also need to upgrade their skills to be able to analyze and interpret basic epidemiological data for action.
3.6. Increase the Use of An Integrated Approach

- The community-based IMCI strategy is integral to the malaria program. The partnership for implementing IMCI should be strengthened and expanded (e.g., to provide integrated training to health facility staff and more community-based case management and interventions).

- Inter-sectoral collaboration needs to be enhanced—such as collaboration with development, agriculture, or infrastructure projects—so as to avoid activities that could contribute to an increase in mosquito-breeding habitats.

3.7. Increase the NMCP’s Role and Services

- The NMCP should continue developing strategies for integrated vector control, including source reduction and the use of larviciding, selective IRS in epidemic-prone areas, and ITNs. Relevant operational research should be continued.

- The NMCP should develop increased community participation in vector control activities.

- Future annual assessment workshops should address all of the HAMSeT project diseases, with greater participation of women at the meetings and greater representation of ethnic groups, which would require interpreters and translation facilities.
4. Closing Remarks

The Honorable Mr. Saleh Meky, Minister of Health

First, I would like to thank my colleagues Dr. Tewolde, Mr. Berhane, Dr. Andom and the other members of the Ministry of Health’s Headquarters staff. Equally, special thanks to our colleagues in all the Zobas of the nation, who deserve our appreciation for their hard work over the past three years. Few things would have been accomplished without the dedication and commitment of these public servants. Community involvement has been crucial to all of the achievements made—thus, we express our gratitude for their efforts for the common good. To no lesser extent does our thanks include our international partners—UNICEF, the World Bank/IDA, WHO, USAID, Italian Cooperation, and others not only for being here with us today, but for providing us with timely technical and material support throughout these years.

If I may, I would like to make brief remarks concerning this important conference.

During your proceeding, I believe, it was important for you to address the following significant areas concerning malaria in our country, at this important juncture:

1. What is the MOH assessment of the current situation of malaria in the country? I think it is important to realize we have made substantial progress in controlling this public menace. Demonstrable data show that malaria is not what it used to be in the 1990s. Obviously, this doesn’t imply nor does it indicate that we have eradicated malaria. What is indisputable is, we have made a substantial and demonstrable difference both in the mortality and morbidity of malaria through all the regions of our country.

2. What lessons have been learned in the last three years of intensive malaria control activity, which are applicable to other areas of public health programs? As I just stated, malaria is different but not an isolated communicable disease in the country. It is influenced, as it influences others, in its etiology and pathological process. Thus, it is prudent to me to measure the applicability of the experiences gained in combating malaria to our efforts to address other health problems.
For instance, as Dr. Berhana’s presentation showed, we have a serious maternal health problem in our country. Our maternal mortality rate, though we don’t know for sure, is assumed to be unacceptably high. It is determined that the contributing factor to maternal death is malaria and anemia-associated complications. Is the malaria program making a difference in this case?

What is true for maternal care is more clearly seen in infant and child health. Presumably, our low infant mortality rate and the significantly reduced mortality rate in children under five is partly due to our malaria control program, but a clearer and more precise connection needs to be made to have a better picture of the relationship.

3. It is important to take note of achievements as well as to identify challenges for the future. I would like to mention three particular points:

- First, the malaria control program has clearly demonstrated the importance of using empirical evidence in the implementation of public health programs. We are working towards evidence-based health care. We are trying to be accurate. We are trying to collect data to make decisions based on data. WHO has a saying that if it is not evidence-based, it is “mush.” It is the difference between medicine and some wobbly thing from the sky. In the malaria program, we are relying on reliable numbers, things that can be measured and repeated. Malaria gave us that, and we should take that lesson and apply it across the board.

- Second, I see a lot of young men and women, which is good. We need them to gain the experience so as to assume their responsibilities for now and the future. Nevertheless, I wish the participants in this workshop were better distributed gender-wise; the tendency is for more of the participants to be male than female. Sixty percent of health care workers in this country are female; it is reasonable to expect that the number of female participants in this meeting would be much higher. We need to do better next time.

- Last, we keep mentioning “community,” but I don’t see communities represented here. Those who cannot speak English should be able to attend this meeting and use their native tongue. We should provide automatic translation facilities so that those people who want to speak in Tigrynia can do so, and communicate in a language that is comfortable to them so as to encourage active participation. We ought to find a way to accommodate this. How can we say that this workshop was successful if we don’t understand what the presenters are saying?

Thank you very much. I truly, truly feel satisfied because we have done something to help our people, and that’s the whole reason we are here—to make a difference in the lives of our people. I think that we have and we should continue to do so.

Thank you,
Saleh Meky.
## Annex A: Workshop Agenda

### Sixth Annual Assessment and Mid-Term Review Workshop on Malaria Control

**Massawa, Eritrea**

**27–29 March 2003**

<table>
<thead>
<tr>
<th>Day 1</th>
<th>Agenda</th>
<th>Speaker</th>
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<tr>
<td>8:00 - 8:30</td>
<td>Registration of Participants</td>
<td>Secretariat</td>
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<tr>
<td>8:30 - 8:50</td>
<td>Introductory Remarks</td>
<td>Mr. Berhane G/Tensae, DG Health Services</td>
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<td>8:50 - 9:10</td>
<td>Opening Addresses</td>
<td>Minister of Health/Zonal Administrator</td>
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<tr>
<td><strong>Chairperson:</strong> Mr. Berhane G/Tensae, DG Health Services</td>
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<tr>
<td>9:30 - 9:50</td>
<td>Roll Back Malaria in Africa</td>
<td>Dr. Kopano Mukelabai, Senior Health Adviser, UNICEF</td>
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<td>9:50 - 10:10</td>
<td>Malaria Profile and Accomplishments</td>
<td>Dr. Tewolde, NMCP Manager</td>
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<td>10:10 - 10:30</td>
<td>Mid-Term Review of 5 year Strategic Plan of Action</td>
<td>Dr. Tewolde, NMCP Manager</td>
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<td>10:30 - 10:50</td>
<td>Discussion</td>
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<td>10:50 - 11:20</td>
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<td><strong>Chairperson:</strong> Dr. Andom Ogbamariam, DG HRD</td>
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<td>11:20 - 11:40</td>
<td>Operational Activities for 2002</td>
<td>Mr. Asmelash, Operations Expert</td>
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<td>11:40 - 12:00</td>
<td>Data and Financial Management</td>
<td>Mr. Mehari, Survey Coordinator</td>
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<td>12:00 - 12:20</td>
<td>EHP support for malaria control</td>
<td>Mr. Gene Brantly, Project Manager, EHP</td>
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<td>12:20 - 12:40</td>
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<td><strong>Chairperson:</strong> Mr. Gene Brantly, Program Manager, EHP</td>
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<td>12:40 - 1:00</td>
<td>Vector Distribution and Behavioral Patterns</td>
<td>Mr. Fessahaye, Entomology Expert</td>
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<td>1:00 - 1:20</td>
<td>An. sporozoite rates and feeding preferences</td>
<td>Ms. Helen and Mr. Solomon, Biologists</td>
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<td>Discussion</td>
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<td>1:40 - 2:00</td>
<td>Larval ecology and larval control studies</td>
<td>Dr. Shililu, Resident Entomologist</td>
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<td>2:00 - 2:20</td>
<td>Mosquito Source Management in Eritrea</td>
<td>Dr. Bob Novak, Consultant</td>
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<td>Day 2</td>
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<td>Chairperson: Dr. Robert Novak, Medical Entomologist, Univ. of Illinois</td>
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<td>8:00 - 8:20</td>
<td>Video: Launch of RBM in Eritrea, July 1999</td>
<td>Mr. Andemariam, Malaria Coordinator, NRS</td>
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<td>Malaria Report from NRS</td>
<td>Mr. Kiros, Malaria Coordinator, Anseba</td>
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<td>8:50 - 9:20</td>
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<td>Mr. Kiros, Malaria Coordinator, Anseba</td>
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<td>Malaria Report from Gash Barka</td>
<td>Mr. Afewerk, Malaria Coordinator, G/Barka</td>
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<td>10:10 - 10:40</td>
<td>Malaria Report from Debub</td>
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<td>11:30 - 11:50</td>
<td>Video: War Against Malaria in Eritrea</td>
<td>Mr. Yohannes Bein, Vector Focal Person</td>
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<td>11:50 - 12:10</td>
<td>Scaling up of bed net distribution and re-impregnation</td>
<td>Mr. Yohannes Bein, Vector Focal Person</td>
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<td>12:10 - 12:30</td>
<td>Vector Susceptibility and Alternatives to DDT</td>
<td>Dr. Andy Arata, Consultant</td>
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<td>12:50 - 1:10</td>
<td>Communication Strategy for Malaria</td>
<td>Ms. Azenegash, Head, Health Promotion</td>
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<td>1:10 - 1:30</td>
<td>Status of anti-malarial drugs in Eritrea</td>
<td>Mr. Bernando, DG Regulatory Services</td>
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<td>Discussion</td>
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<td>Chairperson: Dr. Zemui Alemu, Director, PHC</td>
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<td>9:00 - 9:20</td>
<td>Role of IMCI in malaria</td>
<td>Dr. Michael, Head, IMCI</td>
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<td>Malaria in Pregnancy</td>
<td>Dr. Berhana, Head, Family &amp; Community Health</td>
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<td>10:30 - 10:50</td>
<td>Summary of Presentations/Recommendations</td>
<td>Mr. David Sintasath, Epidemiologist</td>
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<td>10:50 - 11:10</td>
<td>Closing Remarks</td>
<td>Dr. Tewolde, NMCP Manager</td>
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<td>11:30 - 11:50</td>
<td>Administrative Issues and Announcements</td>
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# Annex B: List of Participants

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<td>Abdurahman</td>
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Annex C: Technical Presentations
Roll Back Malaria In Africa
The Roll Back Malaria Initiative; A global Update

A paper presented at the Mid Term Review workshop for Malaria Control In Eritrea

Dr. Kopano Mukelabai
M.D. DABP, FRCP(E), Senior Health Adviser, UNICEF, New York

Under Five Mortality Rate

• 10.5 million children die annually from preventative causes
• 30,000 children dying everyday from preventable causes
• Majority of these children dying quietly at home away from the world’s media
• Deaths are occurring mainly in developing countries of Africa and Asia
• Malaria, HIV/AIDS and Respiratory infections, Diarrhoea, Measles and Malnutrition, are major challenges to child survival and development

Causes of 10.5 million deaths among children < 5 in developing countries, 1999

More than one half of all child deaths in developing countries are due to just five communicable diseases and malnutrition

Major Cause of Death among Children under Five Years of Age in Africa; Year 2000

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Under-five mortality rate, change over period 1990-2000

Source: UNICEF 2001
Under-five deaths in sub-Saharan Africa
Projections based on progress in the 1990s

Proportional Cause of Child Mortality by Region

Number of people living with HIV/AIDS in sub-Saharan Africa, 1980-2001

Impacts on child mortality
Estimated impact of AIDS on under-5 child mortality rates - Selected African Countries

UN General Assembly Special Session on Children
- A follow up to the 1990 First ever World Summit for Children.
- Held in May 2002 in New York
- Approved new goals and targets to improve maternal and child health
- New Millennium Development Goals (MDGs) and World Fit for Children goals adopted.
### Millennium Development Goals and WFFC Goals

- Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate.
- Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases (MDGs)

### Main Goals of A World Fit for Children for 2010

- Reduce infant and under-five mortality by at least one third by 2010 (and 2/3 by 2015)
- Reduce maternal mortality ratio by at least one third by 2010 (and 3/4 by 2015)

### Main Goals of A World Fit for Children for 2010

- Reduce under-five child malnutrition by at least one third by 2010, with special attention to children under two
- Reduce proportion of households without access to hygienic sanitation facilities and affordable and safe water by at least one third by 2010

### Main Goals of A World Fit for Children ...

- Reduce by 2005 HIV prevalence among young men and women age 15 to 24 in the most affected countries by 25 per cent and by 25 percent globally by 2010

### Nutrition goals: Micronutrients

- Sustainable elimination of:
  - *Iodine deficiency* disorders by 2005
  - *Vitamin A deficiency* by 2010
- Reduction by one third of *anemia*, including *iron deficiency*, by 2010
- Accelerated progress towards reduction of other micronutrient deficiencies, through *food fortification* and *supplementation*

### Why the New Global Health Agenda may succeed

- Government commitment and sustained political will - G8, AU, SADC, ECOWAS
- New resources - GAVI, GFATM, World Bank
- Poverty Reduction - Debt SWAPS, PRSPs,
- Setting new realistic targets
- Commitment to tackling new/emerging diseases - HIV/AIDS, Malaria, Tuberculosis
Why the New Global Agenda may succeed

- Cross cutting issues: Children’s Rights, Education; Gender; Governance
- Community Capacity Development
- Results based programming
- Improving public private partnerships
- Enhanced tools for scaling up health programmes

Five new organizational priorities for UNICEF

- Girl’s education
- Immunization Plus
- Early child development (health, nutrition, water sanitation and hygiene)
- HIV/AIDS
- Child protection

UNICEF’s comparative advantage

- Leadership, advocacy and mobilisation for children
- Global procurement
- Programme communication and social mobilisation
- UNICEF’s field presence: in 161 countries, 6000 staff in developing countries
- Experience in complex emergencies and difficult countries

The Burden of Malaria

- Every 30 seconds a child dies from malaria
- Leading cause of death of young African children (>20% deaths, 50% admissions)
- Anaemia, repeated illness and economic burden, major cause of poor child development.
- Malaria in pregnancy the major preventable cause of low birth weight in Africa.
- Major contributor to high maternal mortality and morbidity

Economic Impact of Malaria

- Malaria is a major cause of poverty, and poverty worsens the global malaria situation
- $10 - $12 billion lost annually due to malaria in Africa
- It slows economic growth rate by 1.3% per year; lowers GDP by 32% within 35 years.
- Reduces productivity of farmers, workers
- 25% of household income spent on malaria treatment.

Malaria: a Disease of Poverty

[Map showing GNP per capita and Malaria Index]
Global malaria drug resistance to CQ, S/P and MEFLOQUINE

- Parasite resistant to available treatments in much of the world

Roll Back Malaria Partnership

- RBM initiative launched in 1998 by WHO, UNICEF, UNDP and World Bank
- RBM is a global movement aimed at:
  - galvanizing global support
  - mobilizing resources
  - strengthening national health systems
  - building effective partnerships with governments, donors, UN Agencies, NGOs, research institutes and the private sector

The Abuja Malaria Summit
Goals and Targets

Pledged to reduce malaria mortality by 50% by the year 2010

Resolved to strengthen national health systems to ensure that by the year 2005:
- 60% of malaria patients have access to appropriate treatment within 24 hours of onset of symptoms
- 60% of children and pregnant women are protected from malaria using ITNs
- 60% of pregnant women have access to appropriate malaria chemoprophylaxis/presumptive intermittent treatment

Tools for Malaria Control:
Highly Cost-Effective Interventions

- Insecticide Treated Nets (ITNs) - for children <5 yrs & pregnant women: Reduces all cause under five childhood mortality by 20%
- Malaria Case Management - prompt access to effective antimalarial drugs
- Intermittent Preventive Treatment - for pregnant women (possibly infant IPT linked to EPI in coming year)
- Early prediction and management of malaria epidemics

Create an enabling environment

- High Political Commitment
- Increased Resources
- Elimination of Taxes and tariffs on Insecticide Treated Nets, Essential drugs
- Change of first line drug policy where chloroquine is no longer working
- Community capacity Development
- Building effective partnerships, including the private sector
Countries in the Horn of Africa
Some basic indicators

- **Country**  | **U5MR** | **IMR** | **EPI** | **Stunting**
- Eritrea     | 114      | 73      | 93%     | 38%
- Ethiopia    | 174      | 117     | 21%     | 51%
- Djibouti    | 146      | 102     | 23%     | 26%
- Somalia     | 225      | 133     | 18%     | 23%
- Yemen       | 117      | 85      | 72%     | 52%

Examples of successful malaria interventions

- Eritrea - bednet distribution to households targeting young children and pregnant women
- Ethiopia - Successful treatment of malaria at home using Community Health Workers reduced malaria mortality
- Somalia - In 1998, a coordinated response to a malaria epidemic among Somali refugees in north-eastern Kenya reduced mortality and morbidity

Post Abuja Summit successes

- Africa Malaria Day commemorated in many countries
- 18 countries have reduced/abolished Taxes and Tariffs on ITNs
- Increased production of ITNs in Africa e.g in Tanzania
- Transfer of Technology on LLITNs - Sumitomo Company to A-Z Co. in Tanzania
- Community re-treatment of nets is given free/subsidized by governments e.g in Eritrea.

Post Abuja Summit successes

- Strategies for National Malaria Control Programmes formulated and adopted
- National Malaria Drug policies reviewed, with several countries changing first line drug treatment.
- Regional monitoring of malaria drug resistance put in place.
- Policy of IPT to prevent malaria during pregnancy are adopted.
- Several countries are testing use of vouchers to target ITNs for pregnant women and children under five.
- Home based management of malaria is being scaled up. E.g in Uganda
- Infant IPT - combining malaria treatment with routine EPI - will soon be scaled up.
- Distributing ITNs with routine EPI and/or with measles and Polio campaigns e.g Ghana, Nigeria
- Forecasting of ITNs requirements is being instituted.
**Enhanced Roll Back Malaria Partnerships at national level**

- Build on current national health system approach
- Shared interest in outcomes - improved child survival
- Focus on strengthening service delivery (programme elements)
- Synergistic effects (e.g. nutrition/malaria, HIV/malaria)

**Partnership for Strengthening Child Health Services**

**Partnership for Improved Antenatal Care**

- Low use of treated Bednets
- Low re-treatment rate for bednets: Need to introduce long lasting insecticide treated nets on a commercial scale.
- Home treatment: disease recognition, drug availability
- IPT in pregnancy: building links with antenatal care, Making Pregnancy Safer
- Lack of resources
- Weak partnerships at country level
- Weak National Health Systems

**RBM Evaluation**

- Good program advocacy
- Highly cost-effective interventions
- Limited impact to date - e.g.: treated net coverage per MICS only 1%
- Goal: Achieving Impact, Increasing Coverage
- Partners reassess contributions

**Challenges to Implementation**

- RBM Steering Committee created, members: WHO, UNICEF, World Bank, Bilaterals, National Gov’t, and others
- Ghana, Senegal, Zambia are Board members representing Africa
- Reorganization of RBM Secretariat: separation of WHO technical role
- Four Sub-regional/interagency support teams proposed: Abidjan, Nairobi, Harare, Libreville
Global Fund Against AIDS, TB and Malaria (GFATM)

- Proposed by the UN Secretary General Kofi Annan in 2001
- $2.1 billion pledged over five years mostly by donor countries
- First Meeting of Board in Jan 2002
- Second Board meeting - 24 April 02, $378 million approved over 2 years to 31 countries.

Global Fund Against AIDS, TB and Malaria (GFATM)

- 4th Board meeting 29-31 Jan 2003
- Reviewed 100 proposals from 60 countries
- Board approved a total of $883 million over a two year period.

Allocation of GFATM funds approved in 1st round

AIDS 61%
TB 22%
Malaria 17%

Take Home Messages

- The major causes of childhood mortality are preventable.
- Malaria and HIV/AIDS are major impediments to improved health and development
- Better emergency preparedness can reduce deaths in Malaria Epidemics.
- Urgent need to provide needed resources to prevent and control malaria

Take Home Messages

- Community capacity development is key to scaling up ITNs and Home treatment of malaria especially where national health systems are weak.
- Need for improved partnership including the private sector to combat malaria
- The Government needs to adopt enabling policies to combat malaria
- Peace is the first pre-requisite to improving health and economic development in Africa

Quotations

- “The time will come when countries will judged not by their technological advancement or the strengths of their armies, but by the way they treat their most precious resource - children. That time is now!” UNICEF Progress of Nations Publication
- “The World was not left to us by our parents, but was lent to us by our children” Nelson Mandela
Thank You!
Asante!
Yekanyele!
National Malaria Control Program

Year 2002
Annual Report

Background

- Horn of Africa
- Population: 3.5 million
- Topographical diversity
  - Altitude: 0-2,500 meters above sea level
- Cultural and religious diversity
  - 9 ethnic groups and languages
  - 50% Muslims and Christians

Administrative map

Climate & Weather of Eritrea

- Eritrea has tropical climate moderated by altitude
- It has a long coastal line of about 1200 kms.
- Eritrea has diversified relief which ranges from 0 to 3000 meters.
- It has a table of Plateau at the Center, a gentle slope on the Western side and sharp slope on the Eastern side (3 different climates in one hour drive).
- Western and Northwestern lowlands are much drier with a hot semi-arid desert-like climate.
- Average rainfall: 100 up to 800 mm

Rainfall trends

General Health Profile of Eritrea, DHS, 2002

- DHS 2002 has shown that Eritrea has young population, 43% <15 yrs & only 6% >65 yrs
- 62% of the population resides in rural areas
- The average household size is 4.8
- 71% of HHs use iodized salt for cooking
- 76% of the children age 12-23 months are fully immunized (in some zones it reaches 92%)
- 26% of births occurred in HFs.;
- <5 mortality for the recent period (0 - 4yrs before the survey) is 93 deaths/1000 live births.
Malaria profile

- 3 epidemiologically distinct strata:
  - Coastal plains (0-1000m)
  - Western lowlands (700-1500m)
  - Highlands (1500-2000m and above)
- 67% of population live in malaria risk areas
- Parasite distribution: P. falciparum (93%), P. vivax (7%)
- Main vector: Anopheles arabiensis

Malaria profile (2)

- 2 main malaria transmission seasons:
  - September – November (central, southern, western lowlands)
  - January – March (coastal plains)
- Risk for malaria epidemics is high (e.g., 1998) since 1991 (independence)
  - Displaced populations due to border conflict
  - High population mobility/movement
  - Low immunity
  - Drug resistance

Specific Objectives

- To reduce malaria mortality by 20% of 2001 levels.
- To reduce malaria morbidity by 20% of 2001 levels.
- To prevent epidemics of malaria.

Major Achievements

Integrated Vector Control (1)

- ITNs: 246,019 nets distributed and 212,165 nets re-treated
- Permethrin: 3241 litres used
- Selective intra-domiciliary spraying – DDT=6375 kgs and Malathion=2777 kgs (active ingredients only)
- Community participation in source reduction – 21185 breeding sites filled and 43018 people participated

Integrated Vector Control (2)

- Larviciding with Temephos (Abate chemical) – 9423 sites treated and 100 lts of Temephos used
- Total villages (210) and houses (103,167) sprayed in Debub and Gash Barka. In Debub, 141 villages (33,510 houses) and in Gash Barka, 69 villages (69,657 houses).
Operational Research (1)

- CQ+SP, SP and ART+AQ efficacy studies conducted
  - Mean BF positivity of febrile cases during malaria transmission season found to be 27% only.
  - 5 years and above: CQ+SP (99% effective in Tokombia n=68); SP (95% effective in Goluj n=48 and Sawa n=39); ART+AQ (100% effective in Tesseney n=47)

Operational Research (2)

- Malaria vector studies showed that we have one important vector only (An. gambiae). No important secondary vectors found.
  - Mosquito infectivity was found to be only 0.7%
- Pilot studies of efficacy of BTi and Bs conducted to alternate with temephos

Capacity Building (1)

- CHAs trained on malaria control - 1077
- Health workers trained - 234
- Public Health Technicians currently being trained - 69
- Zonal malaria technicians trained on Bio-assay and Susceptibility tests - 21
- Consultancy on study of alternative insecticide to DDT initiated
- Consultancy on Epidemic Preparedness response and forecasting

Capacity Building (2)

- Training on operational research (25 from zones and HQ)
- 9 Malaria technicians from the zones participated in study tour to Kenya.
- One of our young biologists completed Masters degree in Entomology (in South Africa).
- Two of our biologists had short term training in South Africa.

Epidemic Monitoring and Control

- Sentinel sites (14) established to monitor malaria incidence and vector densities
- Weekly and monthly sentinel sites reports have been initiated
- Constant monitoring of malaria incidence in high risk areas
- Free distribution of ITNs in malaria high risk areas, two ITNs per household
- Free distribution of ITNs to pregnant women visiting HFs.

Health Promotion (1)

- Training/ educative materials developed and distributed to zones
- Brochures on malaria and its control distributed during the malaria days and weeks
- TV and radio programs developed and disseminated
- Malaria week campaign held in last week of July
Health Promotion (2)

- Malaria/HAMSeT messages disseminated during World Soccer Matches 2002
- Formative Research for Communication Strategy of malaria completed
- Promotional video on Malaria in Eritrea prepared by UNICEF for funding

OPD Malaria Cases 1999-2002

![Malaria morbidity by zones](image)

H/F Malaria Deaths by Year

![Malaria morbidity by zones](image)

Malaria morbidity by zones (1997-2002)

![Malaria trends: Anseba zone](image)
Malaria trends: Debub zone

- Number of malaria cases over months from Jan to Dec.

Malaria Trends: Gash Barka zone

- Number of malaria cases over months from Jan to Dec.

Malaria morbidity by zones (1997-2002)

- Number of malaria cases (OPD) by zones: Anseba, Debub, Gash Barka, Maekel, NRS, SRS.
- Comparison of years 1997 to 2002.

Proportional mortality rates

<table>
<thead>
<tr>
<th>Year</th>
<th>&lt;5</th>
<th>&gt;5</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>10.8</td>
<td>14.8</td>
<td>13.3</td>
</tr>
<tr>
<td>2000</td>
<td>6.5</td>
<td>5.9</td>
<td>6.0</td>
</tr>
<tr>
<td>2001</td>
<td>13.4</td>
<td>5.8</td>
<td>7.3</td>
</tr>
<tr>
<td>2002</td>
<td>7.1</td>
<td>3.3</td>
<td>4.2</td>
</tr>
</tbody>
</table>

- Proportional mortality = % of the total number of deaths due to malaria.

Challenges

- Sustainability of community participation, ownership & support for CHAs – incentives
- Sustainability of community based interventions (bednet issues, source reduction).
- Lack of continuous monitoring and impact evaluation
- Lack of transport for supervision from HQ and in zones (particularly NRS)
- Shortage of human resources (i.e., epidemiologist at HQ and graduate biologists for the zones)

REMEMBER THAT ………..

- "If the IMPLEMENTATION is ADEQUATE, but the EFFECT/RESULT is not SATISFACTORY, we will consider the intervention but …
- if the IMPLEMENTATION is NOT adequate, the EFFECT/RESULT is ALWAYS UNSATISFACTORY."
Thank you for Listening !!!!!!!
Mid-term Review and Evaluation
Mid-Term Review and Evaluation

Dr. Tewolde G/meskel, Manager NMCP

National Malaria Control Program
Ministry of Health
27 – 29 March 2003
Massawa, NRS zone

Why a mid-term review?

• To identify aspects of the program that are working according to plan;
• To improve the NMCP by identifying aspects that are in need of mid-course corrections;
• To track (and demonstrate) results at HQ, zonal, sub-zonal and community levels;
• To assess partners’ and stakeholders’ roles in implementation and funding;
• To measure program effectiveness;
• Because M&E is the MIRROR of a Program.

M&E helps us to measure and to answer Important Questions:

• Was/were the program/activities carried out as planned?
• How well was it carried out?
• Did the expected change occur?
• How much change occurred?
• Is the change attributable to the program?
• Does the change mean program “success”?

Background

• Four main initiators (WHO, UNICEF, WB, and UNDP) launched Roll Back Malaria in 1998.
• National Conference on RBM in Eritrea was held in Mendefera, Debub in July 1999.
• Five-year Strategic Plan for Malaria Control was developed with input from various stakeholders, ministries, and organizations.
• Five-year Strategic Plan began implementation in 2000.

General Objective

• To reduce morbidity and mortality due to malaria to such a level that it is no longer considered a major public health problem.

Specific Objectives

• To reduce malaria mortality by 80% by the end of 2004/5.
• To reduce malaria morbidity by 80% by the end of 2004/5.
• To reduce the incidence of malaria during epidemics by 90% by the end of 2004/5.
**NMCP Malaria control strategy**

- Based on **Global Malaria Control Strategy**:
  - Case management (early diagnosis and treatment)
  - Vector control (environmental and larvicidal)
  - Insecticide treated nets (ITNs)
  - Health promotion
  - Capacity building (training, workshops, seminars, study tours)
  - Operational Research
  - Monitoring and supervision

---

**Program Achievements**

<table>
<thead>
<tr>
<th>Specific Objectives</th>
<th>1999</th>
<th>2002</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>To reduce malaria mortality by 80% (per 100,000)</td>
<td>4.7</td>
<td>2.2</td>
<td>▼53%</td>
</tr>
<tr>
<td>To reduce malaria morbidity by 80% (per 1000)</td>
<td>41</td>
<td>20</td>
<td>▼51%</td>
</tr>
<tr>
<td>To reduce malaria incidence during epidemics by 90% (per 1000)</td>
<td>78</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

---

**Process Indicators: Mortality**

- Necessary 1st, 2nd, and 3rd line anti-malarial drugs procured and distributed – no stock-outs reported.
- Guidelines produced and distributed:
  - Malaria control policy
  - Updated treatment guidelines
  - Standard Operating Procedures for sentinel sites
- Training materials:
  - Management of severe malaria (WHO)
  - Microscopy guide for lab technicians

- RDTs available at all health facilities without microscopy (in years 2001 and 2002)
- National blood transfusion center established in Asmara (HAMSET)
Process Indicators: Morbidity

<table>
<thead>
<tr>
<th>Indicators</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>5 yr target</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of CHAs trained on malaria case management each year</td>
<td>68.1%</td>
<td>62.4%</td>
<td>94.6%</td>
<td>71.8%</td>
<td>90%</td>
</tr>
<tr>
<td>% of associate nurses trained on malaria case management each year</td>
<td>18.7%</td>
<td>19.0%</td>
<td>14.4%</td>
<td>37.3%</td>
<td>90%</td>
</tr>
<tr>
<td>60% of HHs in malarious areas with at least 2 ITNs</td>
<td>-</td>
<td>-</td>
<td>49.5% (RBM survey)</td>
<td>58%</td>
<td>60%</td>
</tr>
</tbody>
</table>

% of HHs in malarious areas with at least 2 ITNs: 60%
5 yr target: 90%

Process Indicators: Epidemics

<table>
<thead>
<tr>
<th>Indicators</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>5 yr target</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of HHs participating in environmental control each year</td>
<td>8%</td>
<td>12%</td>
<td>16%</td>
<td>12%</td>
<td>50%</td>
</tr>
<tr>
<td>% of HWs trained on communication skills</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>92%</td>
<td>100%</td>
</tr>
<tr>
<td>% of HFs with microscopy or RDTs</td>
<td>9%</td>
<td>15%</td>
<td>16%</td>
<td>84%</td>
<td>100%</td>
</tr>
</tbody>
</table>

% of HHs participating in environmental control each year: 8%
5 yr target: 50%

Operational research

- Larval/vector distribution and behavioral studies conducted;
- Larval/vector control pilot studies conducted;
- Malaria prevalence survey conducted;
- 9 sentinel sites established for drug sensitivity monitoring;
Operational Research

- KAP studies conducted on health-seeking behavior among semi-nomads and other ethnic groups;
- Formative research conducted for malaria communication strategy;
- Situational analysis on malaria in pregnancy conducted;
- Compliance and affordability of ITNs (partially conducted by IEC)

Integrated vector control

- ITNs procured and distributed;
- Training of spraymen on IRS techniques conducted;
- IRS conducted in target villages;
- Intensified monitoring and evaluation of proper use of ITNs (RBM surveys, zonal reports);
- Guidelines on ITN (in process of revision)

Program Management

<table>
<thead>
<tr>
<th>Indicators</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>5 yr target</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of multi-sectoral committees established at sub-zones</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>32</td>
<td>52</td>
</tr>
<tr>
<td>Number of Public Health Technicians trained</td>
<td>-</td>
<td>-</td>
<td>33</td>
<td>36</td>
<td>60</td>
</tr>
<tr>
<td>% of HWs trained on HMIS</td>
<td>-</td>
<td>-</td>
<td>8%</td>
<td>17%</td>
<td>90%</td>
</tr>
<tr>
<td>% of entomology labs established at HQ and 3 zonal offices</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

Program Management

- Zonal Conferences on Roll Back Malaria conducted;
- HQ and Zonal capacity development through trainings, workshops, study tours, etc.
- TORs developed for multi-sectoral committees (HAMSET);
- Training needs assessment of health workers (not conducted);

Monitoring and Evaluation

- Monthly supervision (particularly Jun – Dec);
- Monthly HQ NMCP staff meetings;
- Quarterly zonal malaria coordinators’ meeting;
- Quarterly CDC Units meeting;
- Mid-year Health Services departmental meeting;
- Annual Ministerial Meeting of HQ and zonal staff

Challenges

- Transportation for distribution of ITNs, chemicals, and supplies
- Transportation for supervision and monitoring of malaria control activities
- Limited human resources
- Limited laboratories and equipment
- Sustainability CBIs (bednets, source reduction, CHAs)
- Difficult terrain and diverse ecology of the country
Opportunities

• Manageable size of country and population
• Commitment of MOH and the Government
• Availability of multi-sectoral and NGOs Project (HAMSET) funded by WB/IDA since 2001
• Conducive administrative structure of the country
• Relatively short malaria season
• Global initiative in rolling back malaria since 1998
• Peace, security and safety in the country at present

Lessons learned

• Eritrea has made significant progress towards its RBM goals;
• Need to sustain our achievements;
• Some indicators need to be revised – and make sure they are measurable;
• Indicators for training – need to separate previously trained vs. newly trained;
• Need to further strengthen inter-sectoral collaboration for implementation and data collection;
• Need to strengthen CBIs and the role of CHAs

REMINDER !!!

Malaria Control: “IS NOT AN INSTANT COFFEE, IT IS A LONG-TERM TASK” !!!

Thank you for listening!!!
Malaria Control Field Operations in the Year 2002

National Malaria Control Program
Malaria Control field Operations in the year 2002

National Malaria Control Program

Integrated Malaria control activities

- Based on the NMCP plan of action and strategies developed for the year 2002, the following few and important malaria control activities were conducted

Training and Preparatory activities

- Ahead of the commencement of malaria control activities health education was performed
- A total of 370 technical health staff were trained on severe malaria and its control
- 1077 CHAs were given refreshment training on malaria and its control

Mosquito nets and insecticide received from:

- HAMSET 200,000 mosquito nets
- WHO 156lt of permethrin 20% E.C.
- HAMSET 12,516lt of permethrin 50% E.C.

Mosquito nets distributed from HQs to zones

<table>
<thead>
<tr>
<th>Zone</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRS</td>
<td>2000</td>
<td>-</td>
<td>-</td>
<td>2000</td>
</tr>
<tr>
<td>NRS</td>
<td>15,265</td>
<td>41,995</td>
<td>51,500</td>
<td>108,760</td>
</tr>
<tr>
<td>Anseba</td>
<td>12,000</td>
<td>28,595</td>
<td>81,000</td>
<td>121,595</td>
</tr>
<tr>
<td>G/Barka</td>
<td>73,000</td>
<td>43,195</td>
<td>83,000</td>
<td>199,195</td>
</tr>
<tr>
<td>Debub</td>
<td>13,000</td>
<td>24,695</td>
<td>75,500</td>
<td>113,195</td>
</tr>
<tr>
<td>Maekel</td>
<td>2,000</td>
<td>4,500</td>
<td>12,000</td>
<td>18,500</td>
</tr>
<tr>
<td>Military</td>
<td>100,000</td>
<td>50,000</td>
<td>36,500</td>
<td>186,500</td>
</tr>
<tr>
<td>Other</td>
<td>4205</td>
<td>7,020</td>
<td>80</td>
<td>11,305</td>
</tr>
<tr>
<td>Total</td>
<td>219,470</td>
<td>200,000</td>
<td>339,580</td>
<td>759,050</td>
</tr>
</tbody>
</table>
**Net distribution to zones, 2000-2002**

- Military: 23%
- Ericka: 19%
- Debub: 15%
- G/Barka: 27%
- Anseba: 16%
- Others: 1%

**Insecticides and Spray equipment distributed to zones**

- Permethrin 50% EC for nets use: 7577lt
- Temephos for larvicide use: 305lts
- DDT 75% WDP (IRS): 6067kgs
- Malathion 50% WDP (IRS): 6900kgs
- Sprayers, spare parts: 17 & 7 Kits

**Transportation facilities**

- To reinforce spraying and other activities, vehicles were made available for some zones.
- TASC/JSI provided vehicles for support supervision and monitoring.
- Private cars were hired during malaria surveys and other control activities.

**Case management**

- Total patients treated CHAs and HFs: 168,472
- Malaria patients treated by HFs: 74,861 (44.4%)
- Malaria patients treated by CHAs: 93,611 (55%)
- CQ tablets dispensed by CHAs: 731,050.5
- CQ syrup bottle of 60 ml dispensed by CHAs: 4844
- Fansider tabs. dispensed by CHAs: 78,070

**Comparison of Malaria Cases Treated by HFs Vs CHAs**

**Integrated Vector Control**

- Integrated vector control is the most effective method of the malaria disease prevention and control. The work progress of each activity is stated below.
Environmental management

- Community participation in source reduction is vital in MCP
- Mosquito breeding sites avoided through source reduction 25,355
- Treated breeding sites by chemical 12547

Environmental Mgt. continued

- No. of community participated 51,666
- Temephos used in liters 145.1

Indoor residual spraying (IRS)

- Total villages and IDP camps sprayed 153
- Houses sprayed 56,336
- IDP tents sprayed 4,117
- DDT 75% WDP used in kg 8,500
- Malathion 50% WDP used in kgs 5,555

Population benefited 159,551

- House spray coverage 95%
- Dosage of DDT 75% WDP (in g/m²) 2.74
- Dosage of malathion 50% WDP in g/m² 1.8
- IRS conducted in G/Barka and Debub zones
- In general IRS seems to be satisfactory based on the house coverage and dosage applied

Insecticide treated Bed nets

NMCP/CDC MoH

Background

- 1999 ITNs distribution started in all zones
- 2001 ITNs distributed free of change to pregnant women attending ANCs and IDPs
- 2002 ITN issued free of change to all group of population living and stay temporarily in low land areas
Comparison of ITNs distributed to communities and rate increased year 2000-2002

<table>
<thead>
<tr>
<th>Year</th>
<th>ITNs distributed</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000*</td>
<td>83,873</td>
<td>2%</td>
</tr>
<tr>
<td>2001*</td>
<td>141,766</td>
<td>69%</td>
</tr>
<tr>
<td>2002</td>
<td>276,038</td>
<td>95%</td>
</tr>
</tbody>
</table>

*Compared with the previous year

Scaling up process for bed net re-impregnation

- WHO greatly assisted in scaling up process starting from year 2001

Objective:-

- Collecting baseline information on mosquito nets and ITN coverage
- Community sensitization
- To ensure timely availability of insecticides, nets and implementation of net treatment

Selection of zones

- Based on household net coverage from the RBM baseline data (2001) 3 zones were selected for scaling up of net re-treatment:
  - Anseba
  - Gash Barka
  - Debub

Re-treatment centers

- Re-treatment centers were established at HF in each zone in 2001
- Re-treatment centers have expanded beyond health centers into communities and outreach sites in 2002

<table>
<thead>
<tr>
<th>Zone</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anseba</td>
<td>30</td>
<td>50</td>
</tr>
<tr>
<td>Debub</td>
<td>45</td>
<td>46</td>
</tr>
<tr>
<td>G/Barka</td>
<td>49</td>
<td>202</td>
</tr>
</tbody>
</table>

Re treatment rates in year 2002

- Re-treatment rates have improved in all the above mentioned zones
- ITNs distribution is lately started in Debub zone when compared to the other zones

<table>
<thead>
<tr>
<th>Zones</th>
<th>No of nets distributed &amp; re-treated</th>
<th>Net dist. 1999-2001</th>
<th>Net re-treated 2002</th>
<th>Re treatment rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anseba</td>
<td>42,320</td>
<td>41,794</td>
<td>127,680</td>
<td>98.7</td>
</tr>
<tr>
<td>G/Barka</td>
<td>141,004</td>
<td>141,004</td>
<td>141,004</td>
<td>90.5</td>
</tr>
<tr>
<td>Debub</td>
<td>75,042</td>
<td>48,971</td>
<td>48,971</td>
<td>65%</td>
</tr>
</tbody>
</table>
Re treatment rates of all zones by year

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net distributed**</td>
<td>135,152</td>
<td>194,358</td>
<td>307,877</td>
</tr>
<tr>
<td>Net re-treated*</td>
<td>19,456</td>
<td>135,290</td>
<td>227,750</td>
</tr>
<tr>
<td>Re treatment rates</td>
<td>14%</td>
<td>70%</td>
<td>74%</td>
</tr>
</tbody>
</table>

* Current year
** Previous 3 years cumulative

Other Activities

- Different types of IEC materials were distributed to the zones
- Treatment guide lines were distributes to the zones
- Malaria shopping bags were distributed through the zones to the community

Constraints

- Shortage of transportation for malaria integrated control and survey activities.
- Lack of awareness in the communities of net re treatments.
- There were still some delays in reports and no narratives were submitted from some zones.

• Different types of IEC materials were distributed to the zones
• Treatment guide lines were distributes to the zones
• Malaria shopping bags were distributed through the zones to the community
National Malaria Control Program
Financial Management

Year: 2002
National Malaria Control Program
Financial Management

Year 2002

Major Strategies
- Case management
- Vector Control & Personal Protection
- Biological Control
- Training, Workshops, Seminars
- Operational Research
- Epidemic Preparedness
- Health Promotion
- Monitoring and Supervision

Proposed budget distribution by strategy for 2002

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case management</td>
<td>32%</td>
</tr>
<tr>
<td>Vector Control &amp; Personal</td>
<td>36%</td>
</tr>
<tr>
<td>Protection</td>
<td>3%</td>
</tr>
<tr>
<td>Biological Control</td>
<td>8%</td>
</tr>
<tr>
<td>Training, Workshops, Seminars</td>
<td>11%</td>
</tr>
<tr>
<td>Operational Research</td>
<td>12%</td>
</tr>
<tr>
<td>Epidemic Preparedness</td>
<td>2%</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>2%</td>
</tr>
<tr>
<td>IEC</td>
<td>1%</td>
</tr>
</tbody>
</table>

Expenditure rate by source in 2002

- WHO: 12%
- HAMSET: 75%
- UNICEF/USAID: 7%
- PHARPE/Italian Cooperation: 6%

Main Partners in Malaria control in 2002
- WHO
- PHARPE/Italian Cooperation
- USAID
- UNICEF
- WB/HAMSET

Main activities supported by WHO in 2002
- Scaling up bed net reimpregnation
- Create/Update & Maintain composite database M & E of RBM
- Train zonal staff in M & E of RBM
- Compile annual report of M & E of RBM
- Training MOH staff on monitoring and evaluation
- Conduct Antimalarial Drug Efficacy Studies
  - Conduct SP efficacy studies
  - Conduct Artesunate + Amodiaquine Efficacy studies
  - Conduct Chloroquine + SP efficacy studies
Main activities supported by PHARPE in 2002

- Training of HWs and CHAs on the mgt. of malaria
- Vector control activities
- Community mobilization/orientation of comm. Leaders
- Production of IEC materials
- IRS in selected areas of GB and Debub zones
- Monitoring and Supervision
- Insecticide susceptibility studies

Main Activities Supported by UNICEF/USAID in 2002

- Entomological surveys
- Larva control pilot project
- Establishment of sentinel sites
- Operational research methodology training
- Study Tour

Main activities supported by UNICEF in 2002

- Sponsoring 6th annual assessment and Mid-term review workshop
- Production of documentary video film on malaria situation for Fund rising

Fund received in 2002

<table>
<thead>
<tr>
<th>Partner/donor</th>
<th>Proposed budget USD</th>
<th>Received In USD</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHO</td>
<td>510,000</td>
<td>149,150</td>
<td>25%</td>
</tr>
<tr>
<td>PHARPE</td>
<td>96,000</td>
<td>84,960</td>
<td>88.5%</td>
</tr>
<tr>
<td>UNICEF/USAID</td>
<td>69462</td>
<td>69,462</td>
<td>100%</td>
</tr>
<tr>
<td>UNICEF</td>
<td>70,144</td>
<td>20,144</td>
<td>28.7%</td>
</tr>
</tbody>
</table>

Budget Monitoring

Budget monitoring form developed
As data base for recording
- Project activities
- Source of fund
- Date received
- Amount received
- Expended/transferred to zones
- Balance

Budget monitor cont.

This system setup to help the program to manage funds properly
- Where the fund come from and when
- The amount of money received
- For what purpose is the money allocated
- To which zone the money goes
- How much money was spent
- Is there overspent or under spent
National malaria control program data management

Achievements of 2002

2003 Proposed distribution of budget by strategy in USD

- Vector control/ITNs 1,199,320
- Case Management 410,000
- Entomology/Epidemiology 91,376
- Capacity building/Training 159,380
- Operational Research 348,530
- Epidemic preparedness 401,734
- Health Promotion 38,000
- Monitoring and supervision 84,270

Proposed proportional distribution of budget by strategy for 2003

- Epidemic Research 15%
- Case Mgt 15%
- Cap Build 6%
- Vector C 44%
- Entomology 3%
- Monitoring Sup 3%
- IEC 1%

Year 2003 NMCP Proposed budget by donor in USD

- HAMSET 1,698,894 62%
- WHO 727,340 27%
- UNICEF 155,000 6%
- USAID/UNICEF 91,376 3%
- USAID/EHP 60,000 2%
- TOTAL 2,732,610 100%

Constraints

- Delay of expenditure report from zones to HQ
- Delayed transfer of fund from donors
- Delayed transfer of Advances to zones from HQs Finance Office

Improvements

- Updated monthly report forms to include malaria in pregnancy
- Monthly report forms revised at zonal level
- Improved database management to facilitate data analysis at zonal level
- Malaria Control Coordinators and data clerks trained on data management in Anseba, Gash-Barka and Debub zones
Improvement cont.

- Computers provided to 5 zones for data management
- Computerised database introduced in Gash-Barka, Anseba and Debub zones
- Data can be analysed by zones, Sub zones and health facilities level.

Community based activities and ITN distribution database updated to include Fansidar and ANC respectively

Developed data forms to monitor malaria vectors, morbidity and Meteorology data at Sentinel sites

In process

- To link NMCP data with NHMIS
- Introduce Access Database at NMCP
- Train malaria coordinators and data clerks of Maekel and NRS

Constraints

- Timeliness of reports
- No network between NHMIS & NMCP
- Lack of Data manager and clerk at HQ

Thank You
EHP Technical Support for Malaria Control in Eritrea
Outline

- Objectives
- Achievements
- Expectations
- Challenges

Objectives of EHP Support

Work with NMCP to improve
- Operational research
- Surveillance
- Vector control
- Using data for making decisions

Context for EHP Support

Support implementation of RBM 5 Year Plan

Collaborate with other NMCP Partners

EHP is one part of USAID assistance
UNICEF, TASC, Tulane University

Achievements

Operational Research

- Key studies produced important data
  - vector distribution & behavior, larval ecology, malaria prevalence, larval control
  - insecticide resistance and drug efficacy
Vector Distribution

Figure 5. Variation in densities of An. gambiae s.l. in Eritrea

Vector Distribution

90% of the mosquitoes found in 20% of villages

Figure 7. Spatial aggregation of Anopheles species within zones.

National Malaria Prevalence Survey

Figure 3. Age-adjusted prevalence rates

Achievements

Operational Research

- NMCP has strengthened its capability for operations research
- Data sets being prepared for historical analysis of malaria cases and interventions since 1996
**Achievements**

**Surveillance**
- Protocol for extracting data from HMIS
- Draft manual for epidemic preparedness
- First sentinel sites are operational
- Role of sentinel sites in OR & epidemic preparedness under serious discussion
- Arrangements being made to obtain climate data from GOE and international sources

**Supporting the NMCP in Eritrea**
- Strengthening surveillance and use of evidence

**Vector Control**
- Importance of man-made breeding sites established
- Efficacy of new larvicides demonstrated
- Efficacy of residual insecticides demonstrated
- Feasibility and impact of routine larval control operations under study
Supporting the NMCP in Eritrea

**Improving the evidence base for vector control**

- Best example: adopting SP+CQ as first-line drug
- Vector control:
  - Reducing use of insecticides
  - Eliminating some man-made breeding sites
- Planning tools being developed:
  - Risk maps
  - Epidemic forecasts

**Achievements**

**Using Data for Making Decisions**

- MCP managers and staff are updating their knowledge and tools for malaria control
- First new cadre of public health technicians will graduate soon

**Further Achievements for 2003-04**

- 1998 epidemics analyzed to identify high-risk climate scenario
- Risk maps improved based on historical case data
- Epidemic forecasts available to zonal managers
- Malaria data extracted directly from HMIS at zonal level

**Expectations**

**Training**

- 1998 epidemics analyzed to identify high-risk climate scenario
- Risk maps improved based on historical case data
- Epidemic forecasts available to zonal managers
- Malaria data extracted directly from HMIS at zonal level
Further Achievements for 2003-04

- More sentinel sites operational
- New PH technicians working
- Feasibility and potential impact of larval control operations demonstrated
- Revised vector control strategies and procedures defined for each zone
- Improved epidemic detection & response measures in use

Expectations

Other Key Challenges

Managing the malaria program
- Developing younger staff and managers
- Maintaining effectiveness as integration and decentralization proceeds
- Adjusting to changing mix and roles of partners

Challenges

Strengthening interventions
- Bednet availability, use, and retreatment
- Malaria in pregnancy
- Early diagnosis and prompt treatment

Acknowledgements

- Dr. Tewolde G'Meskel & Dr. Andom Ogbumariam
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  - David Sintasath
  - Bob Novak
  - Patricia Graves
  - Andy Arata

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- Dave Chadee
- Derek Charlwood
- Bob Fusco
- John Githure
- Ephantus Kabiru
- Kate Macintyre
- Eddy Mberu
- Charles Mbogo
- Joseph Nzovu
Malaria Vector Studies in Eritrea: Spatial Distribution & Behavior of Malaria Vectors
**Malaria Vector Studies in Eritrea:**

**Spatial Distribution & Behavior of Malaria Vectors**

**Objectives**
- Generate data on distribution and behavior patterns of malaria vectors to guide planning
  - Species composition and density
  - Transmission potential
  - Seasonality of man-vector contact
  - Mosquito behavior patterns
- Delimit malarious areas in the country
- Provide data leading to the design of a cost-effective risk-stratified malaria control strategy

**Spatial Distribution of Malaria Vectors**

**Species distribution & Composition**
- 2,513 Anopheles were collected from 302 villages
- 13 *Anopheles* spp: An. arabiensis 84.5%.
- Greater species diversity in Anseba (7) and Debub (8) zones.
- 80 *Anopheles* collected in Maekel, out of this 83% *Anopheles cinereus*.
- Presence of infected *Anopheles cinereus* and An. d’thali lead to suspicion of role in malaria transmission – (Further surveillance needed).

**Species distribution**
- Heterogeneous vector distribution observed with 68.4% collected from Hiletsidi.
- An. arabiensis is the only member gambaie complex (PCR results) and the only malaria vector.
- Significant variation in mosquito densities between and within zones – Higher in GB.
- Almost 100% of total *Anopheles* sampled from 10% of the houses and 20% of villages.

**Mean Anopheles densities**

![Map showing Anopheles densities](image)
Data summarized by subzone (I)

Entomological Parameters
- Indoor resting -- 10 houses sampled each month by PSC
- Biting -- all-night human bait catches indoors and outdoors
- Outdoor resting -- pit shelter collections at two locations

Seasonal Density
- 97.2% of total anophelines were An. arabiensis.
- Peak Anopheles densities occurred between July - November
- Gash Barka – 2 peaks observed i.e. March 5.6; July 7.4 Anopheles per house.

Biting behavior of Anopheles arabiensis
- An. arabiensis formed 97.6% of the total (2,711) Anopheles collected.
- Variation in biting tendency was significant - (Indoors - 43.3%; Outdoors – 56.7%)
- Biting onset 6-7 PM indoors and outdoors
- Peak biting 8 – 11PM outdoors and indoors; Midnight – 3 AM Indoors.
- Biting patterns similar across ecological strata.

Resting behavior of Anopheles
- 57% of the total An. arabiensis were collected outdoors & 43% indoors.
- Resting tendency variable between zones.
- Gash-Barka – high proportion collected indoors.
- NRS & Debub-- high proportion collected outdoors – exophilic.
- Anseba zone indoor and outdoor resting densities similar.
Proportion of Endophilic and Exophilic mosquitoes (An. arabiensis)

Indoor residual spraying
- Vector densities did not differ between sprayed and unsprayed houses.
- Mosquito densities among sprayed houses differed by wall type.
- Over 60% (n= 309) of the total Anopheles species were collected from sprayed houses with thatch wall type.

Anopheles Density in sprayed and unsprayed houses

Implications of the Results for vector control
- Timing of vector control activities critical based on seasonality of vector abundance
  - Ex. In Anseba zone vector control activities should target the period between July and November though this should not preclude control activities the rest of the year.
- Control efforts to take into consideration levels of transmission risk.
- Need to strengthen vector surveillance and build data base for further stratification.

Biting rhythm/ cycle
- The fact that there is a high tendency for the malaria vectors to bite outdoors and before bed time provides a challenge to protection using bed nets.
  - 56.7% of An. arabiensis bite outdoors & 43.3% indoors.
  - Biting density high between 8 –11 PM
- Integrate other measures in malaria control.
- Information and sensitization of the population for IVM critical.
Resting Tendencies

- IRS appropriate choice in Gash-Barka zone where over 70% of the vectors are endophilic.
- In the other zones its efficiency would be compromised by the high tendencies of exophily.
- House-type important for success of IRS—selective use of IRS necessary.
Sporozoite Rates and Feeding Preference of Malaria Vectors
Sporozoite rates and Feeding Preference of Malaria Vectors

**Objectives**

- To determine infection rates and feeding preference of malaria vectors.
- Provide data for the design of a risk-stratified malaria control strategy.

**Methods and Materials**

- Sporozoite and Blood meal ELISA
- Sporozoite rate = No. of positive x 100 / total tested
- Mosquitoes sample for 2000 N = 2450, 2001 N = 4127 and for 2002 N = 6,943 for sporozoite
- N = 2820 F and HG for blood meal

**Result from Sporozoite ELISA**

<table>
<thead>
<tr>
<th>Year</th>
<th>Sporozoite rate</th>
<th>Pf positive Species</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>G/B</td>
</tr>
<tr>
<td>2000</td>
<td>0.69%</td>
<td>15</td>
</tr>
<tr>
<td>2001</td>
<td>1.19%</td>
<td>49</td>
</tr>
<tr>
<td>2002</td>
<td>0.71%</td>
<td>45</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Sporozoite rate</th>
<th>Pf positive Species</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>G/B</td>
</tr>
<tr>
<td>2000</td>
<td>0.69%</td>
<td>15</td>
</tr>
<tr>
<td>2001</td>
<td>1.19%</td>
<td>49</td>
</tr>
<tr>
<td>2002</td>
<td>0.71%</td>
<td>45</td>
</tr>
</tbody>
</table>

**P. f. infection rates in An. arabiensis & other species**

<table>
<thead>
<tr>
<th>Zone</th>
<th>2000 # tested</th>
<th># pos</th>
<th>SR (%)</th>
<th>2001 # tested</th>
<th># pos</th>
<th>SR (%)</th>
<th>2002 # tested</th>
<th># pos</th>
<th>SR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ansaba</td>
<td>688</td>
<td>3</td>
<td>0.44</td>
<td>1007</td>
<td>8</td>
<td>0.59</td>
<td>1842</td>
<td>19</td>
<td>0.54</td>
</tr>
<tr>
<td>Debub</td>
<td>568</td>
<td>6</td>
<td>1.08</td>
<td>628</td>
<td>6</td>
<td>0.96</td>
<td>1524</td>
<td>16</td>
<td>0.67</td>
</tr>
<tr>
<td>Gash Barka</td>
<td>966</td>
<td>7</td>
<td>0.71</td>
<td>2371</td>
<td>37</td>
<td>1.56</td>
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<td>29</td>
<td>0.82</td>
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<tr>
<td>Mekele</td>
<td>317</td>
<td>1</td>
<td>0.32</td>
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<td>NRS</td>
<td>33</td>
<td>0</td>
<td>0</td>
<td>129</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>2450</td>
<td>17</td>
<td>0.69</td>
<td>4127</td>
<td>49</td>
<td>1.19</td>
<td>8943</td>
<td>69</td>
<td>0.77</td>
</tr>
</tbody>
</table>

**P.f. positive Anopheles in different collection techniques**

- 13% of outdoor bites infected
- Infection even with use of bed net likely
Seasonal pattern of SR in *An. arabiensis*

- Infection rates tended to rise between June and October.
- The highest proportion of infected mosquitoes recorded in September.


Feeding Behavior

- 1,966 positively identified
- 49.4% Vector species feed on humans
- 31.4% Vector species feed on cattle
- 61.4% of blood meal derived at least from cattle and other animal hosts.
- Animal close to human dwelling could act as a barrier due to the high exophagic and zoophilic tendencies.
Implications for Malaria control

- Vector control measures to be sustained throughout the year – infected mosquitoes present year round in specific areas.
- Knowledge dissemination on bed net use through health promotion critical.
- Strengthen IVM through community participation.
- Periodic monitoring of vector behavioral tendencies recommended in order to assess any shift that would predispose the population to greater risk of infection.

Thank You
Mercie
Larval Ecology and Control
Larval Ecology and Control

Why Larval control?
- Larval stages are concentrated and less dispersed.
  - Concentrated
  - Immobile
  - Accessible
- Short seasonal rainfall – Key Opportunity
  - Wet and Dry season larval control

Objectives
- Habitat diversity and temporal distribution of anopheline species.
- Efficacy and duration of Bti and Bsph in larval habitats.
- Role of source (aquatic) management in mosquito control (Village pilot project).

Objective 1: Larval habitat diversity
- Diversity of larval habitats and significance for Anopheles larval production demonstrated.
- Larval habitats ranked according to larval presence and abundance on spatial and temporal scale.
- An. arabiensis predominant species

Densities of Anopheles larvae in different habitats

Water supply
**Key Findings**
- Larval habitats present year round – Vector population production throughout the year.
- Mosquito breeding is associated with manmade larval habitats.
- Manmade habitats key for dry season vector populations.

**Conclusions**
- Dry season habitats such as water supply points need to be managed.
- Larval control must continue throughout the year.
- Controlling larval habitats throughout the year would reduce malaria transmission.

**Larval Control: Efficacy of microbial larvicides**
Objective 2.
Efficacy of microbial larvicides

- Granular formulation of *Bacillus thuringiensis israelensis* and *B. sphaericus* tested.
- Bio-larvicides mosquito species specificity
- Form spores and produces toxins that are potent gut poisons.

Application rates

- *B. sphaericus* (Vectolex® CG) – Potency 50 BS ITU/mg; 5.6 – 22.4 kg/ha
- *Bti* (Vectobac® G) - Potency 200 ITU/mg
  - 2.8 – 11.2 kg/ha (Clean water)
  - 11.2 – 22.4 kg/ha (Polluted water)

Findings

- Bti and Bsph activity variable depending on larval habitat:
  - Granular formulation not effective in habitats with high algal content.
- Bti and Bsph provided control for:
  - 2-week period in stream bed habitats & rain pools,
  - 3 week period in ponds.

Findings

- Max. & 50% label rates for Bti/ Bsph produced equivalent control.
- *Bti, Bsph* and temephos had similar duration of activity

Conclusions

- Application of *Bti & Bsph* bi-monthly.
- Application of the 2 bio-larvicides at 50% max label rates – Cost implications.
- Use Bti, Bsph & temephos on a rotational basis- Resistance and Cost

Objective 3

- Role of source (aquatic) management for mosquito control (Village pilot project)
  - Mapping
  - Application
  - Surveillance
  - Training and support
Thank You !!!
Mosquito Source Management in Eritrea
Mosquito Source Management in Eritrea

Village Pilot Project
Dr. Robert Novak

Village Pilot Study Sites

- **Anseba**
  - Adibosqual (treated)
  - Balwa (untreated)
- **Gash Barka**
  - Talatasher (treated)
  - Hiletsidi (untreated)
- **Debub**
  - Maiaine (treated)
  - Hadishadi (untreated)
- **North Red Sea**
  - Ghinda (treated)

Operational Policies

- A program to be fully effective must be large enough to encompass the sources of mosquito populations it is to manage.
- Destruction of mosquitoes at their sources is the key to effective control, all other methods are considered supplementary.
- The key to source control is good scouting (mapping) and a surveillance system followed by the elimination of mosquitoes before they emerge.

Mosquito Control Options

- Source Reduction
- Sanitation
- Water Management
- Chemical Control
  - Larviciding
  - Adulticiding (space spray, bed nets)
- Resistance Management
- Biological Control
- Public Education

Principles of Integrated Mosquito Management

- **Concentrated**
- **Immobile**
- **Accessible**

Long Term Goal of an Integrated Larval Mosquito Control Initiative.
Strategies for Village Pilot Project

• Map all Larval Breeding Sites within a 0.5 km of Village Center (Mosquito Control Borders).
• Weekly scouting to establish if larvae are present and apply appropriate management (source elimination/insecticide).
• Surveillance of adult mosquito population within and outside houses.
• Periodic assessment of larvicidal activity
• Public education on malaria and malaria control (What the Public can do to help).
• Train staff on mosquito control tactics and operations.

Mapping and Surveillance (1)

• 7 Villages divided into sections based on topography and the number of habitats
• In each section all water holding sites were mapped and given a specific site number.
• Each site inspected for the presence of mosquito larvae once per week for 12 months

Mapping and Surveillance (2)

• Sections are continually updated through ongoing inspection.
• The adult mosquito populations monitored using light traps located both inside homes and outside within the borders of the abatement area.
• A data base for each village was established including larval habitat, adult populations density, control activities and weather conditions.

Key Findings

• Seasonal distribution and abundance of larvae in the untreated and treated villages were similar
• Increases in the number of positive larval habitats was directly associated with rainfall.
• Significantly lower densities of mosquitoes found in the treated villages as compared to the untreated villages.
• High adult densities in the untreated villages as compared to the treated villages.
• Larval breeding continued throughout the year in discrete and often MAN-MADE sites.

Treated versus Untreated Villages in Gash Barka

Treated versus Untreated Villages in Anseba
Key Outcomes

- Larval management is a feasible vector control option and an expanded program could play a significant role in reducing malaria in Eritrea.

- In order for larval management to be most effective, implementation must be done throughout the year, with special emphasis during the dry season, particularly in MAN-MADE SITES.

- Staff at the Zonal level have been trained in mapping, surveillance, control and database base management, thus providing the core for training and implementation activities within their Zones.

Estimated Cost of Larval Control

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>COSTS IN NAKFA</th>
<th>COSTS YEAR 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZONAL PERSONNEL (Training and Support)</td>
<td>Per/Month (NKA)</td>
<td>Per Month (NKA)</td>
</tr>
<tr>
<td>Mapping &amp; Surveillance (2 Med. Techs.)</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Operations (2 Med. Techs., 1 day)</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Support (2 Med. Techs., 4 days)</td>
<td>360</td>
<td>360</td>
</tr>
<tr>
<td>VILLAGE PERSONNEL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personnel (1 Community Health. Adv.</td>
<td>360</td>
<td>360</td>
</tr>
<tr>
<td>MATERIALS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bti/Bsph (0.225 kg), Temephos</td>
<td>485</td>
<td>485</td>
</tr>
<tr>
<td>Mosquito Sampling Equipment</td>
<td>409</td>
<td></td>
</tr>
<tr>
<td>ENVIRONMENTAL EQUIPMENT</td>
<td>680</td>
<td>0</td>
</tr>
</tbody>
</table>

Future Course

"Where Do We Go From Here"

Expansion of Larval Control within the Zones

[Diagram of Larval Control Expansion within Zones]
Operational Research Needs (1)

• Develop and test multiple malaria management techniques at the village level (integrated malaria management).
• Insecticide formulation for specific aquatic habitats.
• Impact of agriculture (irrigation) and the relationship of rainfall on expanded Anopheles mosquito production.

Operational Research Needs (2)

• Initiate and expand larval control efforts within each Zone.
• Dispersal, migration of adult population thresholds for malaria transmission.
• Develop an emergency malaria management plan.
• Impact of man-made landscape changes (roads, urbanization etc.) on mosquito production.
# Introduction
- Bordered by Sudan (to the north and NW), Anseba, Debub, and Southern Red Sea zones
- 280 villages – 10 subzones
- Population: 336,107
- Ethnic groups: Tigre, Afar, Saho, Rashaida, Tigrigna, and Hidareb
- Number of HFs: 45

## Workshops and study tours
- National Malaria Annual Conference conducted (Jan 02);
- Zonal Malaria Coordinator participated in workshop on Larval Control in Kampala (Apr 02);
- Study tour for 2 malaria technicians to Kenya (Jun 02);
- 1st and 3rd Quarter meeting for Malaria Coordinators in Asmara (May, Dec 02)
- 2nd Quarter meeting for Malaria Coordinators in Barentu (Aug 02)

## Operations research
- Formative research on malaria (Apr 02);
- Training workshop on Operations Research in Keren (Jun 02);
- Entomology training for 3 malaria technicians in Tesseney (Sept/Oct 02)

## Sentinel Sites
- Established at Ghinda Hospital and Foro Health Center;
- Entomological and parasitological activities being carried out since June in Ghinda;
- 4 assistant entomology technicians trained (Nov 02)

## Village Health Committees
- 10-day campaign carried out in all HFs to form Village Health Committees;
- 80 previously and newly formed VHCs are functioning in the whole zoba.
Training of VHAs

- 47 Village Health Agents trained in early Sept 02 for four sub-zones;
- 153 VHAs trained in Dec 02 for the remaining 5 sub-zones

Case management

- 200 VHAs treated a total of 6424 patients;
- 43 HFs treated a total of 6005 patients;
- Therefore, 52% of cases were treated by VHAs

Environmental management

- 57 perennial streams are continuously monitored;
- Filling, draining, and larviciding with Temphos conducted;
- Water bodies drained - 24,093
- Water bodies treated - 13,756
- Temphos used - 175 L
- Number of participant – 18,235

Epidemic preparedness

- Strengthening of community-based activities;
- 15-day campaigns at all HFs conducted to sensitize communities and to strengthen activities of VHAs;
- VHAs actively working and treating cases during the first 6 months of the year

ITN distribution and retreatment

- Data from each malarious village collected to find out the number of bed nets previously distributed to each household;
- Objective was to obtain baseline data prior to bednet distribution;
- 119,302 ITNs distributed since 1999;
- 36,046 ITNs re-impregnated in 2002;
- New ITNs provided for 70 villages – bringing up the number of villages with ITNs to 154 out of 280 villages in the zone.

Health Promotion

- Africa Malaria Day
  - Sensitization of communities in 24 villages;
  - 7,560 people participated;
  - Environmental management was conducted;
  - 70 banners were prepared and distributed
- Malaria Week
  - Sensitization in 9 subzones (45 villages);
  - 10,747 people sensitized;
  - 6,121 bednets distributed and 5,255 re-impregnated
**Core indicators**

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual malaria incidence (per 1,000)</td>
<td>49.0</td>
<td>51.8</td>
<td>53.5</td>
<td>17.9</td>
</tr>
<tr>
<td>Incidence of severe malaria (per 100,000)</td>
<td>529</td>
<td>450</td>
<td>632</td>
<td>216</td>
</tr>
<tr>
<td>Case fatality rate &lt;5</td>
<td>3.1</td>
<td>4.1</td>
<td>2.0</td>
<td>0.8</td>
</tr>
<tr>
<td>Case fatality rate &gt;5</td>
<td>1.1</td>
<td>0.9</td>
<td>1.1</td>
<td>1.0</td>
</tr>
</tbody>
</table>

**Core indicators**

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportional malaria morbidity</td>
<td>7.0</td>
<td>7.0</td>
<td>7.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Proportional malaria mortality</td>
<td>10.2</td>
<td>15.8</td>
<td>15.7</td>
<td>4.5</td>
</tr>
<tr>
<td>Net re-treatment rate</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>30.2</td>
</tr>
</tbody>
</table>

**Challenges**

- Transport – no vehicles assigned for malaria control in our zone;
- Malaria Village Health Agents are not fully paid for their services;
- Shortage of malaria technicians
Annual Report 2002 and Mid-term Review

Anseba Zone
Malaria Control Program
Annual Report 2002 and Mid-Term Review

Anseba Zone
Malaria Control Program

Introduction
- Area: 21,500 km²
- Semi-arid; mostly mountainous (600 – 2040 meters above sea level)
- Four ethnic groups: Tigre, Tigrigna, Bilen, and Hidareb
- 11 sub-zones, 106 kebabis, and 422 villages (369,481 population)
- 386 villages (298,925 population) are in malarious areas
- Total of 32 health facilities: 1 referral hospital, 8 HC, and 23 HS.
- Health facilities run by about 269 health workers.

Objectives
- To reduce morbidity by 10% of 2001 levels;
- To reduce mortality by 10% of 2001 levels;
- To prevent malaria epidemics

Strategies
- Prompt diagnosis and early treatment (24 hours)
- Distribution and re-impregnation of ITNs
- Environmental management
- Health promotion
- Operational research
- Monitoring, evaluation, and supervision

Strengthening capacity (1)

<table>
<thead>
<tr>
<th>Planned Activities</th>
<th>Accomplished</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strengthen capacity of HW on malaria diagnosis and treatment</td>
<td>38 HWs trained for 3 days</td>
<td>2,180 out-patients treated properly</td>
</tr>
<tr>
<td>Strengthen capacity of VHAs</td>
<td>287 VHAs trained for 5 days</td>
<td>13,546 suspected malaria cases treated</td>
</tr>
<tr>
<td>Train influential people for community mobilization</td>
<td>546 people from 91 kebabi trained</td>
<td>Community leaders engaged in communities</td>
</tr>
<tr>
<td>Strengthen capacity of HW on management of severe malaria</td>
<td>20 nurses, 17 ANs, 1 lab technician trained</td>
<td>38 HWs able to treat or refer 564 IPD cases</td>
</tr>
</tbody>
</table>

Strengthening capacity (2)

<table>
<thead>
<tr>
<th>Planned Activities</th>
<th>Accomplished</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orient HWs on combination therapy</td>
<td>40 HWs oriented in 1 day training</td>
<td>Mortality reduced from 22 last year to 6 this year</td>
</tr>
<tr>
<td>Orient RDVs on combination therapy</td>
<td>41 RDVs oriented in 1 day training</td>
<td>RDVs able to apply new guidelines</td>
</tr>
<tr>
<td>Train 3 malaria technicians on entomology</td>
<td>3 malaria technicians trained in Tesseney</td>
<td></td>
</tr>
<tr>
<td>Participate in study tours and workshops</td>
<td>Mal. Tech. – study tour in Kenya; MC – symposium in Uganda</td>
<td>Both gained exposure and experiences of other countries</td>
</tr>
</tbody>
</table>
Vector control

<table>
<thead>
<tr>
<th>Planned Activities</th>
<th>Accomplished</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobilize communities in environmental sanitation</td>
<td>6,336 breeding sites filled: 1,638 treated with 1.2 L Temephos</td>
<td>Source reduction activities low compared to last year</td>
</tr>
<tr>
<td>Distribute 24,000 ITNs to households in malarious areas</td>
<td>Up to Dec 2002, 75,931 given freely; 3,610 sold</td>
<td>Protection from mosquito bites</td>
</tr>
<tr>
<td>Distribute 13,498 ITNs to pregnant women (ANC)</td>
<td>Up to Dec 2002, 8,042 distributed</td>
<td></td>
</tr>
<tr>
<td>Re-treat 51,422 ITNs issued up to 2001</td>
<td>41,794 nets re-treated</td>
<td>Re-impregnation rate increased to 81%</td>
</tr>
</tbody>
</table>

Epidemic preparedness

<table>
<thead>
<tr>
<th>Planned Activities</th>
<th>Accomplished</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collect weekly / monthly malaria data</td>
<td>All HFs reported on weekly / monthly basis</td>
<td>Malaria situation monitored</td>
</tr>
<tr>
<td>Establish sentinel sites at Elabered and Hagaz HCs</td>
<td>Established and weekly data routinely collected</td>
<td>Experience gained to expand the system</td>
</tr>
<tr>
<td>Provide epidemic threshold charts to all HFs</td>
<td>Provided charts to 32 HFs with 5 yrs data</td>
<td>HF's were better able to monitor malaria situation</td>
</tr>
</tbody>
</table>

Operations Research

<table>
<thead>
<tr>
<th>Planned Activities</th>
<th>Accomplished</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduct pilot study on Bti and Bs</td>
<td>Study conducted at Elabered sub-zone (from 2001)</td>
<td>Bti, Bs found to be good alternatives to Temephos</td>
</tr>
<tr>
<td>Conduct drug efficacy study</td>
<td>Study carried out in 3 sites for 2 months</td>
<td>HFs gained experience in conducting drug efficacy studies</td>
</tr>
<tr>
<td>Conduct ITN susceptibility and bio-assay testing</td>
<td>Inadequate numbers of mosquitoes</td>
<td>Postponed to next year</td>
</tr>
<tr>
<td>Conduct formative research on health seeking behavior</td>
<td>Conducted for Bilen and Hidarab</td>
<td>Improved awareness and enhancement of IEC promotion</td>
</tr>
</tbody>
</table>

IEC

<table>
<thead>
<tr>
<th>Planned Activities</th>
<th>Accomplished</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide health education at HFs</td>
<td>736 sessions (45,950 people) conducted</td>
<td>Awareness of malaria control and prevention</td>
</tr>
<tr>
<td>Commemorate Africa Malaria Day</td>
<td>Activities in 8 sub-zone towns; seminar for 1,600 people</td>
<td>Awareness of RBM and its significance</td>
</tr>
<tr>
<td>Commemorate Malaria Week campaign</td>
<td>26 HFs gave health education to 20,582; 10,345 ITNs re-treated</td>
<td>Increased awareness for ITNs &amp; EM</td>
</tr>
<tr>
<td>Give health education to development workers</td>
<td>685 development workers given health education</td>
<td>Better awareness among dev. workers</td>
</tr>
</tbody>
</table>

Core indicators

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual malaria incidence (per 1,000)</td>
<td>57.7</td>
<td>22.3</td>
<td>14.4</td>
<td>5.9</td>
</tr>
<tr>
<td>Incidence of severe malaria (per 100,000)</td>
<td>568</td>
<td>259</td>
<td>275</td>
<td>163</td>
</tr>
<tr>
<td>Case fatality rate &lt;5</td>
<td>3.0</td>
<td>1.3</td>
<td>3.3</td>
<td>1.4%</td>
</tr>
<tr>
<td>Case fatality rate &gt;5</td>
<td>1.2</td>
<td>1.6</td>
<td>1.9</td>
<td>1.0%</td>
</tr>
</tbody>
</table>

Core indicators

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportional malaria morbidity</td>
<td>26.0</td>
<td>16.8</td>
<td>2.1</td>
<td>0.9</td>
</tr>
<tr>
<td>Proportional malaria mortality</td>
<td>14.0</td>
<td>6.2</td>
<td>8.7</td>
<td>2.5</td>
</tr>
<tr>
<td>Net re-treatment rate</td>
<td>43</td>
<td>91</td>
<td>98</td>
<td>81.0</td>
</tr>
</tbody>
</table>
**RBM achievements**

- Malaria morbidity reduced by 88%
  - 18,613 cases in 1999
  - 2,180 cases in 2002
- Malaria mortality reduced by 77%
  - 26 deaths in 1999
  - 6 deaths in 2002
- Malaria inpatients reduced by 71%
  - 1969 IPD in 1999
  - 564 IPD in 2002

**Malaria morbidity trend**

**Insecticide-treated bed nets**

- Since 1997, 139,065 ITNs distributed to 60,960 households (90% coverage)
- 55,092 ITNs sold (1.6 million Nakfa)
- 8,042 ITNs provided to pregnant mothers
- 75,931 provided to vulnerable groups
- 41,794 bed nets treated out of 51,422 (previously distributed up to 12/2001) = 81% re-impregnation coverage


**Rainfall and morbidity, 2002**

**HFvs. CHAs**
Challenges

- Lack of transport facilities hampering supportive supervision activities
- Inadequate health promotional materials in various languages

Anseba’s motto:

“Watch for any fire splinters and put it out before it becomes a big fire.”

Thank you!
Gash Barka Zone
Annual Report for Y2002

Ministry of Health
Malaria Control Unit
Introduction

- Area: 34,000 sq km
- Population: 515,566
- Administrative Units: 14 sub-zones, 784 villages
- Altitude: generally 600 – 800 meters above sea level, but range is 450 – 2000 meters
- One main rain season: July to August
- Malaria transmission season: August to November
- Almost the whole zone is malarious

Objective: By the end of year 2002 malaria proportional at health facilities will reduce by 20% of 2001 levels.

<table>
<thead>
<tr>
<th>Activities</th>
<th>Accomplishments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Train of health workers on diagnosis &amp; management of severe &amp; complicated malaria</td>
<td>62 health workers trained</td>
</tr>
<tr>
<td>Assess the availability of anti-malaria drugs in all health facilities</td>
<td>There was no shortage of drugs in all health facilities</td>
</tr>
<tr>
<td>Conduct operational research on drug efficacy</td>
<td>Conducted in Goluj, Tesseny &amp; Tokombia</td>
</tr>
<tr>
<td>Distribute existing training materials</td>
<td>Distributed to all doctors &amp; other participants</td>
</tr>
</tbody>
</table>

Proportional health facilities malaria mortality and fatality rate

<table>
<thead>
<tr>
<th>Year</th>
<th>T.in-patients</th>
<th>M.in-Patients</th>
<th>T.Mortality</th>
<th>Mortality</th>
<th>CFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>16,436</td>
<td>3,437</td>
<td>598</td>
<td>160</td>
<td>20.8</td>
</tr>
<tr>
<td>1999</td>
<td>14,648</td>
<td>5,883</td>
<td>412</td>
<td>85</td>
<td>20.6</td>
</tr>
<tr>
<td>2000</td>
<td>9,282</td>
<td>2,550</td>
<td>276</td>
<td>42</td>
<td>15.2</td>
</tr>
<tr>
<td>2001</td>
<td>14,839</td>
<td>4,784</td>
<td>352</td>
<td>51</td>
<td>14.5</td>
</tr>
<tr>
<td>2002</td>
<td>14,142</td>
<td>3,426</td>
<td>456</td>
<td>62</td>
<td>13.6</td>
</tr>
<tr>
<td>Total</td>
<td>69,267</td>
<td>25,080</td>
<td>2,094</td>
<td>400</td>
<td>19.1</td>
</tr>
</tbody>
</table>

Objective: By the end of 2002 reduce the level of malaria morbidity by 20% of the 2001 levels

<table>
<thead>
<tr>
<th>Activities</th>
<th>Accomplishments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Train of all level health workers &amp; drug vendors on early diagnosis &amp; treatment</td>
<td>93 health workers and 22 drug vendors were trained</td>
</tr>
<tr>
<td>Train over 300 village malaria agents</td>
<td>202 health agents were trained</td>
</tr>
<tr>
<td>Intensify community education and orient community leaders</td>
<td>313 Community leaders participated in the seminars</td>
</tr>
</tbody>
</table>
Reduction of malaria morbidity (Continued)

<table>
<thead>
<tr>
<th>Activities</th>
<th>Accomplishments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduct formative research on malaria</td>
<td>Formative research conducted</td>
</tr>
<tr>
<td>Develop communication strategy at zonal level</td>
<td>Communication strategy developed</td>
</tr>
<tr>
<td>Disseminate strategy to all health workers</td>
<td>Not conducted</td>
</tr>
</tbody>
</table>

Proportional health facilities malaria morbidity rate & incidence rate

<table>
<thead>
<tr>
<th>Year</th>
<th>Total OPD</th>
<th>Malaria OPD</th>
<th>Morbidity rate</th>
<th>Incidence rate (per 1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>373,777</td>
<td>114,534</td>
<td>30.6%</td>
<td>222.1</td>
</tr>
<tr>
<td>1999</td>
<td>356,151</td>
<td>82,967</td>
<td>23.3%</td>
<td>171.0</td>
</tr>
<tr>
<td>2000</td>
<td>338,276</td>
<td>54,367</td>
<td>16.1%</td>
<td>109.8</td>
</tr>
<tr>
<td>2001</td>
<td>438,736</td>
<td>70,287</td>
<td>16.0%</td>
<td>139.1</td>
</tr>
<tr>
<td>2002</td>
<td>427,252</td>
<td>45,545</td>
<td>10.7%</td>
<td>88.3</td>
</tr>
<tr>
<td>Total</td>
<td>1,934,192</td>
<td>367,700</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Proportional malaria morbidity rate comparison 2001 vs 2002

Annual Rainfall (1997-2002)

Village malaria agents
- In the year 2002 the malaria agents treated 46,812 malaria cases and 45,545 by health facilities, which means 50.7% by malaria agents and 49.3% by the health facilities.
- This shows that the malaria agent play a good role on decreasing severe malaria & death due to malaria.

Malaria agents activity

<table>
<thead>
<tr>
<th>Year</th>
<th>No of MAAs</th>
<th>No of village</th>
<th>People treated</th>
<th>CQ.tab</th>
<th>CQ.sysy.</th>
<th>Neo.spoo</th>
<th>SP.tab</th>
<th>Anti. pain tab</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>244</td>
<td>197</td>
<td>66,296</td>
<td>452,583</td>
<td>69,944</td>
<td>0</td>
<td>108,842</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>268</td>
<td>260</td>
<td>67,760</td>
<td>431,355</td>
<td>101,206</td>
<td>0</td>
<td>150,445</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>202</td>
<td>212</td>
<td>46,812</td>
<td>325,751</td>
<td>39,568</td>
<td>31,254</td>
<td>79,188</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>704</td>
<td>689</td>
<td>380,868</td>
<td>1,209,689</td>
<td>210,718</td>
<td>31,254</td>
<td>328,755</td>
<td></td>
</tr>
</tbody>
</table>
**Objective:** By the end of year 2002, reduce incidence of malaria morbidity during epidemics by 20%.

<table>
<thead>
<tr>
<th>Activities</th>
<th>Accomplishments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strengthen &amp; expand sentinel sites</td>
<td>Tesseney, Mulki, Tokombia, Goluj &amp; Forto</td>
</tr>
<tr>
<td>Monitor malaria transmission in the sentinel sites</td>
<td>In progress</td>
</tr>
<tr>
<td>Monitor malaria morbidity &amp; vector density routinely</td>
<td>In progress</td>
</tr>
<tr>
<td>Monitor increases in mosquito breeding sites</td>
<td>In progress</td>
</tr>
</tbody>
</table>

**Accomplishments:**

- In progress
- Monitor increases in mosquito breeding sites
- In progress Monitor malaria morbidity & vector density routinely
- In progress Monitor malaria transmission in the sentinel sites
- In progress

---

**Objective:** By the end of 2002, 20% of households in malarious areas will have 2 ITNs.

<table>
<thead>
<tr>
<th>Activities</th>
<th>Accomplishments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impregnate &amp; distribute bed nets</td>
<td>90,378 ITNs distributed free of charge &amp; 113,137 nets re-impregnated</td>
</tr>
<tr>
<td>Health education on use of ITNs &amp; other protecting measures</td>
<td>Health education provided on ITN use</td>
</tr>
</tbody>
</table>

**Accomplishments:**

- In progress
- Monitor malaria morbidity & vector density routinely
- In progress Monitor malaria transmission in the sentinel sites
- In progress

---

### Bed net distribution

<table>
<thead>
<tr>
<th>Year</th>
<th>ITNs Dist.</th>
<th># HH w/ ITNs</th>
<th># HH w/ 2 ITNs (%)</th>
<th># Re-impregn.</th>
<th>ANC</th>
<th>Primetr in used</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>67,460</td>
<td>24,018</td>
<td>16.9</td>
<td>5,063</td>
<td>0</td>
<td>312.2</td>
</tr>
<tr>
<td>2001</td>
<td>50,507</td>
<td>19,231</td>
<td>13.5</td>
<td>25,570</td>
<td>0</td>
<td>141.5</td>
</tr>
<tr>
<td>2002</td>
<td>90,378</td>
<td>55,927</td>
<td>39.4</td>
<td>113,137</td>
<td>5.562</td>
<td>2.707.1</td>
</tr>
<tr>
<td>Total</td>
<td>208,345</td>
<td>99,176</td>
<td>69.9</td>
<td>151,601</td>
<td>5.562</td>
<td>3.460.8</td>
</tr>
</tbody>
</table>

---

### Vector Control (Continued)

<table>
<thead>
<tr>
<th>Activities</th>
<th>Accomplishments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduct supervision to all health facilities</td>
<td>Supervision to health facilities conducted</td>
</tr>
<tr>
<td>Conduct spraying operations selectively</td>
<td>22,826 Houses were sprayed in 12 villages of 4 subzones</td>
</tr>
<tr>
<td>Train spraying team leaders at subzonal level</td>
<td>Spray teams trained</td>
</tr>
</tbody>
</table>

**Accomplishments:**

- In progress
- Monitor malaria morbidity & vector density routinely
- In progress Monitor malaria transmission in the sentinel sites
- In progress

---

### Spray operations

<table>
<thead>
<tr>
<th>Year</th>
<th>No of Rounds</th>
<th>Village spraye d</th>
<th>Houses spraye d</th>
<th>Pop.in spraye d house</th>
<th>DDT</th>
<th>Mal.</th>
<th>Other insecticide</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>9</td>
<td>36</td>
<td>28,284</td>
<td>76,324</td>
<td>2386.2</td>
<td>2399.2</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>12</td>
<td>57</td>
<td>46,831</td>
<td>122,141</td>
<td>1789</td>
<td>6151.2</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>4</td>
<td>12</td>
<td>22,826</td>
<td>76,831</td>
<td>1964.5</td>
<td>2810.8</td>
<td></td>
</tr>
</tbody>
</table>

---

### Environmental management

<table>
<thead>
<tr>
<th>Year</th>
<th>Villages &amp; leveling</th>
<th>Treated by chemical</th>
<th>Chemical Abate used</th>
<th>People part.</th>
<th>Trucks involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>3496</td>
<td>2634</td>
<td>20</td>
<td>22,604</td>
<td>0</td>
</tr>
<tr>
<td>2001</td>
<td>4262</td>
<td>2331</td>
<td>36</td>
<td>14,673</td>
<td>0</td>
</tr>
<tr>
<td>2002</td>
<td>3445</td>
<td>5671</td>
<td>21</td>
<td>14,780</td>
<td>6</td>
</tr>
</tbody>
</table>
Operations Research

- Drug Efficacy Studies
  - # Enrolled
    - SP alone (Goluj) 59
    - CQ + SP (Tokombia) 60
    - ART + AQ (Tesseney) 55

Insecticide susceptibility

The study was commenced in the month of September 2002 on different insecticides. This study will continue monthly. The purpose of the 2 types of study are:

1. Bio-assay test:
   - To know the residual effect of insecticides inside walls of houses and on bed-nets
   - To know whether the insecticide sprayed was uniformly sufficient to kill mosquitoes.

Insecticide susceptibility (continued)

2. Susceptibility test:
   - To provide baseline data program planning and insecticide selection
   - To detect the presence of resistance of mosquitoes on the insecticide
   - To monitor the level of resistance over time

Results of susceptibility test

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>1 hr</th>
<th>24 hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bendiocarb</td>
<td>98.7</td>
<td>100</td>
</tr>
<tr>
<td>Lamda-cyhalothrin</td>
<td>99.4</td>
<td>99.4</td>
</tr>
<tr>
<td>Malathion</td>
<td>97</td>
<td>100</td>
</tr>
<tr>
<td>DDT</td>
<td>76</td>
<td>94</td>
</tr>
<tr>
<td>Cyflutrin</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Etofenprox</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Primiphos-methyl</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Results of Bio-assay

<table>
<thead>
<tr>
<th>Months</th>
<th>DDT</th>
<th>Icon</th>
<th>Ficium</th>
</tr>
</thead>
<tbody>
<tr>
<td>September</td>
<td>99%</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>October</td>
<td>96%</td>
<td>99%</td>
<td>100</td>
</tr>
<tr>
<td>November</td>
<td>94.5%</td>
<td>97%</td>
<td>100</td>
</tr>
</tbody>
</table>

Larvicide study

- Bacillus thuringiensis var israelensis (Bti) and Bacillus sphaericus (Bs) were studied in Tesseney subzone.
- The objective of the efficacy study is to determine the duration of larvicidal activity of Bti and Bs after application to breeding sites.
- Bti and Bs provide over 95% reduction in larval densities in the habitat tested (HQs report).
Malaria formative research

- Formative research was conducted in two ethnic groups Kunama and Nara.
- Community has the knowledge of malaria transmission, prevention and treatment.
- But community participation was low on malaria prevention.

Core indicators

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual malaria incidence (per 1,000)</td>
<td>171</td>
<td>110</td>
<td>139</td>
<td>88</td>
</tr>
<tr>
<td>Incidence of severe malaria (per 100,000)</td>
<td>1277</td>
<td>514</td>
<td>957</td>
<td>679</td>
</tr>
<tr>
<td>Case fatality rate &lt;5</td>
<td>1.8</td>
<td>1.8</td>
<td>2.4</td>
<td>3.3</td>
</tr>
<tr>
<td>Case fatality rate &gt;5</td>
<td>1.1</td>
<td>1.4</td>
<td>0.7</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Core indicators

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportional malaria morbidity</td>
<td>23.3</td>
<td>16.1</td>
<td>16.0</td>
<td>10.7</td>
</tr>
<tr>
<td>Proportional malaria mortality</td>
<td>20.6</td>
<td>15.2</td>
<td>14.5</td>
<td>13.6</td>
</tr>
<tr>
<td>Net re-treatment rate</td>
<td>16.2</td>
<td>6.7</td>
<td>21.1</td>
<td>76.3</td>
</tr>
</tbody>
</table>

Thank you
Malaria Control Program
Debub – Zone

Annual Report for Year 2002
**Introduction (1)**
- Zoba Debub is one of the most densely populated Zone in Eritrea.
- Estimated population of 700,000 people reside in an area of 10,000 Sq.Kms.
- 12 Administrative sub-zones, 219 Kebabis and 979 villages.
- Malarious villages: 430 (with est. population of 274,536)
- Altitude ranges 1400-2380 meters above sea level.

**Introduction (2)**
- Malaria is one of the top 10 leading causes of morbidity in the Zone.
- The peak transmission periods coincide with the planting & harvesting season, following the end of the rains in September to December.
- Malaria is quite stable at lower altitudes, but characteristically unstable in higher areas (>1800 meter above sea level).
- Normally 2000 meters is considered the upper limit for malaria transmission, but periodically there are outbreaks above this level.

**Planned Activities (1)**
- Conduct distribution of 100,000 ITN's.
- Conduct re-impregnation of 50-70,000 old nets.
- Conduct indoor residual spraying in selected localities.
- Conduct environmental management.
- Train new and refresher courses for senior CHA's.
- Conduct training for health workers on case management of severe malaria.
- Conduct training for health workers on control and prevention of malaria.

**Planned Activities (2)**
- Conduct malaria week and Africa Malaria Day campaigns.
- Conduct anti-malarial drug efficacy studies.
- Conduct entomological studies.
- Strengthen sentinel sites in two sub-zones.
- Re-activate health committees.
- Monitor malaria epidemics/outbreaks during the peak transmission period.

**Accomplishments**
Core indicators

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual malaria incidence (per 1,000)</td>
<td>66.8</td>
<td>27.0</td>
<td>38.9</td>
<td>23.5</td>
</tr>
<tr>
<td>Incidence of severe malaria (per 100,000)</td>
<td>637</td>
<td>349</td>
<td>345</td>
<td>228</td>
</tr>
<tr>
<td>Case fatality rate &lt;5</td>
<td>1.2</td>
<td>1.1</td>
<td>2.2</td>
<td>1.4</td>
</tr>
<tr>
<td>Case fatality rate &gt;5</td>
<td>0.5</td>
<td>0.3</td>
<td>0.7</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Core indicators

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportional malaria morbidity</td>
<td>13.6</td>
<td>8.8</td>
<td>7.5</td>
<td>4.0</td>
</tr>
<tr>
<td>Proportional malaria mortality</td>
<td>10.3</td>
<td>5.6</td>
<td>11.4</td>
<td>5.0</td>
</tr>
<tr>
<td>Net re-treatment rate</td>
<td>-</td>
<td>7</td>
<td>41</td>
<td>65</td>
</tr>
</tbody>
</table>

H/F morbidity, 2001 vs 2002

<table>
<thead>
<tr>
<th></th>
<th>General morbidity</th>
<th>Malaria Morbidity</th>
<th>Proportional malaria rate</th>
<th>Lab. Result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;5</td>
<td>&gt;5</td>
<td>&lt;5</td>
<td>&gt;5</td>
</tr>
<tr>
<td>2001</td>
<td>10828</td>
<td>249647</td>
<td>5936</td>
<td>20771</td>
</tr>
<tr>
<td>2002</td>
<td>89189</td>
<td>267525</td>
<td>2592</td>
<td>13893</td>
</tr>
</tbody>
</table>

Malaria morbidity

- Proportional malaria morbidity reduced in both age groups compared to last year.
- Of the total 9927 blood films, 990 were positive (10% positivity rate).
- Species distribution:
  - P.f. (84.5%)
  - P.v. (15.5%)

Malaria OPD vs IPD, 2002

General vs. Malaria morbidity, 2000-2002

Number of cases (1000s)

<table>
<thead>
<tr>
<th>Year</th>
<th>General Morbidity</th>
<th>Malaria Morbidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>205553</td>
<td>257933</td>
</tr>
<tr>
<td>2001</td>
<td>357933</td>
<td>356714</td>
</tr>
<tr>
<td>2002</td>
<td>18570</td>
<td>26787</td>
</tr>
<tr>
<td>2003</td>
<td>16404</td>
<td>16404</td>
</tr>
</tbody>
</table>
Malaria mortality, 2000-2002

<table>
<thead>
<tr>
<th>Year</th>
<th>Gen. Mortality</th>
<th>Mal. Mortality</th>
<th>Proportional mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;5</td>
<td>&gt;5</td>
<td>Total</td>
</tr>
<tr>
<td>2000</td>
<td>78</td>
<td>82</td>
<td>160</td>
</tr>
<tr>
<td>2001</td>
<td>72</td>
<td>130</td>
<td>202</td>
</tr>
<tr>
<td>2002</td>
<td>68</td>
<td>172</td>
<td>240</td>
</tr>
</tbody>
</table>

Proportional mortality

<table>
<thead>
<tr>
<th>Year</th>
<th>&lt;5 % mortality</th>
<th>&gt;5 % mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>5.0</td>
<td>7.5</td>
</tr>
<tr>
<td>2001</td>
<td>5.4</td>
<td>7.5</td>
</tr>
<tr>
<td>2002</td>
<td>5.7</td>
<td>7.5</td>
</tr>
</tbody>
</table>

Distribution of ITNs
- From 1999 – 2001, a total of 75,042 ITNs was distributed in 12 sub-zones.
- In 2002, a total of 76,971 ITNs distributed.
- 9084 ITNs distributed at antenatal clinics.
- Total ITN sales (1999 – 2001) was 12,674 nets (380,220 Nakfa).

Bednet re-impregnation
- A total of 48,971 bednets re-impregnated in 2002.
- A total of 75,042 bednets distributed since 1999 (not including 2002).
- Re-impregnation rate = 48,971/75,042 = 65.3% in malarious areas.
- 1,540 L of Permethrin used for both new and used nets.

Indoor residual spraying (1)
- Total villages sprayed 141*
- Total houses sprayed 33,510
- Total population protected 82,738
- DDT 75% WDP used (kg) 6,535
- Malathion 50 WDP (kg) 2,744
- Spray coverage 95%
- Dosage (g/m²) 2.77

Indoor residual spraying (2)
- 8 out of the 12 sub-zones were sprayed.
- 141 localities selected for spraying based on epidemiological situation.
- Sub-zonal offices prepared assessment reports of their respective areas.
- Submitted lists of malarious villages and catchment populations.
Community-based activities

- Breeding sites filled/drained: 2348
- Community participation: 17,384
- Febrile cases treated*: 23,713
- CQ tabs dispensed: 243,678
- CQ syrup dispensed: 74,260
- SP (Fansidar dispensed): 15,965

* Treated by 622 CHAs

Training

- 622 CHAs – refresher course;
- 50 health workers – severe and complicated malaria;
- 15 health workers – drug efficacy studies;
- 5 malaria technicians – bio-assay and susceptibility tests;
- 60 drug vendors and 60 health workers – new drug policy;
- 350 kebabi administrators – prevention and control of malaria.

Operations Research

- Anti-malarial drug efficacy studies
  - Adiquala (ART+AQ), Tsonora (Fansidar), Mai Dima (CQ+SP)
- Bti and Bs pilot studies – Mai Aini and Hadish Adi;
- Mosquito species and behavioral studies – Adiquala and Engela;
- Malaria formative research among Tigrigna and Saho
- Insectory in Mendefera near completion; equipment currently being procured.

Health Promotion

- Banners, pamphlets, and posters distributed during malaria week and Africa Malaria Day campaigns;
  - Seeking early treatment;
  - Using insecticide-treated nets;
  - Conducting environmental management
  - Health education given to 35,000 people

Some possible reasons for malaria morbidity reduction ...

- Short rainy season and scarce rainfall
- Provision of free ITNs to the community
- Environmental management and source reduction
- Application of larvicides
- IRS in target localities
- Drug distribution based on new policy
- Mass campaigns for re-impregnation
- Good awareness and involvement of health personnel
- Good intersectoral collaboration with line ministries (esp. local government and kebabi administration of the subzones)
Action plan for 2003

- Distribute 100,000 new bednets for free (including ANCs) and for sale
- Re-impregnate 100,000 to 152,000 old nets
- Conduct extensive environmental control through community mobilization
- Conduct IRS in target villages
- Train 50-60 medical personnel on severe malaria
- Train 100 general health workers on malaria control and prevention
- Refresher training for 622 CHAs
- Orientation for health committees
- Strengthen existing sentinel sites and establish 2 new ones (Mai Dima and Dubarwa)
- Conduct seminars for kebabi administrators and influential people
- Monitor malaria epidemics/outbreaks

Thank you
Scaling Up the Bed Net
Re-treatment in Eritrea
**Background**

- **1995** – ITN distribution began as a pilot project in 11 pilot villages of Gash-Barka (2 sub-zones) under Save the Children/UK.
- **1996** – Distribution expanded to 24 villages (5 sub-zones).
- **1997** – Distribution increased from 24 to 96 villages (10 sub-zones); and
- Distribution in Anseba zone began.
- **1998** – Distribution to military camps began.

**Background (Cont.)**

- **1999** – ITNs distributed to all zones with RBM implementation.
- **2001** – Free ITNs issued to pregnant women attending ANC and IPD.
- **2002** – Free ITNs issued to general populations living in malarious areas.

**ITN distribution**

- Promotion and distribution of ITNs:
  - mainly through NMCP (HQ + ZONES + SUB-ZONES) and health facilities.
- Channel of distribution:
  - through health facilities and local administrations.
- ITNs were sold at cost recovery (2 USD) to those who can afford it (until 2001).
- Currently, Net re-treatment is free.

**ITN distribution (Cont.)**

- ITNs are provided for free to pregnant women, IDP camp populations, military, and those who can’t afford (validated through local admin).
- Treatment of mosquito nets organized at treatment centers located at health centers and local administration offices.
- New nets are treated prior to distribution.

**ITNs distributed to date**

- [Graph showing total ITNs distributed (1995-2002)]
Scaling up process

Rational
• The use of mosquito nets impregnated with pyrothroid insecticide
• An important advance in malaria control
• Greatly reducing malaria morbidity and mortality
• However, despite the high bed net coverage, the re-treatment rate was very low at least up to 2000.

Scaling up process (cont.)

• Consultancy by E. Lyimo in Aug 2001 and 2002
• Objectives:
  – Support the NMCP in collecting baseline information on net and ITN coverage;
  – Support the NMCP in community sensitization;
  – Ensure timely availability of insecticides and implementation of net treatment

Selection of districts

• Based on household net coverage in malarious areas from the RBM baseline survey report (2001), 3 districts (zones) were selected for scaling up of net re-treatment:
  – Gash Barka (14 sub-zones)
  – Debub (12 sub-zones)
  – Anseba* (11 sub-zones)

Preparatory work

• Discussions were held with relevant sub-zonal administrators and community leaders.
• Number of agents available for net treatment were obtained.
• Number of additional agents required per sub-zone was estimated.
• Amount of insecticide required was estimated.

Re-treatment centers

• “Re-treatment centers” are semi-permanent sites where individuals can bring their nets for insecticide treatment prior to the malaria transmission season.
• Prior to 2001, re-treatment of nets was done at health facilities using announcement campaigns before the malaria transmission season.

Re-treatment centers (Cont.)

• In 2001, “Re-treatment centers” were established at health facilities in each zone.
• “Re-treatment centers” have expanded beyond health centers into communities and out-reach sites in 2002.

<table>
<thead>
<tr>
<th>Zone</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anseba</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>Debub</td>
<td>45</td>
<td>56</td>
</tr>
<tr>
<td>Gash Barka</td>
<td>49</td>
<td>202</td>
</tr>
</tbody>
</table>
Logistics

- **Human resource**: 2 persons per site
  - Community health agents or individuals identified by community
- **Remuneration**: 40 cents (Nfa)/net re-treated
- **Transportation**: 2 dedicated vehicles required for at least 3 weeks in each zone.
- Frequent *supervision* and monitoring required by malaria coordinators and local administrators
- *Re*-treatment supplies provided at each site

Activities at each site

- **Health education**
- **Advocacy/campaign**
- **Free re-treatment of old nets**

Re-treatment rates (1)

- The re-treatment rate was very low until the scaling up program for net re-treatment started (17% in 2000).
- However, the Re-treatment rates have improved in all three zones since 2000.
- In Debub zone, re-treatment started in 2000 (distribution started in 1999).

<table>
<thead>
<tr>
<th>Zones</th>
<th>Ameha</th>
<th>Debub</th>
<th>G/Barka</th>
</tr>
</thead>
<tbody>
<tr>
<td># nets re-treated in 2002</td>
<td>40,159</td>
<td>15,765</td>
<td>93,728</td>
</tr>
<tr>
<td># nets distributed (1999-2001)</td>
<td>51,422</td>
<td>15,042</td>
<td>180,720</td>
</tr>
<tr>
<td>Re-treatment rates (%)</td>
<td>77.3%</td>
<td>54.9%</td>
<td>55.9%</td>
</tr>
</tbody>
</table>

Re-treatment rates (2)

<table>
<thead>
<tr>
<th>Zones</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td># nets re-treated*</td>
<td>21,946</td>
<td>118,386</td>
<td>179,633</td>
</tr>
<tr>
<td># nets distributed**</td>
<td>127,274</td>
<td>222,121</td>
<td>307,184</td>
</tr>
<tr>
<td>Re-treatment rates (%)</td>
<td>17.2%</td>
<td>53.3%</td>
<td>58.5%</td>
</tr>
</tbody>
</table>

Summary

- Re-treatment rates significantly increased following establishment of “re-treatment centers” in 2001 in collaboration with WHO/AFRO.
- Awareness of net re-treatment is low; but increasing.

Major constraints

- Lack of manpower at re-treatment centers
- Lack of transportation for supervision of activities
- Lack of awareness in the communities on the usefulness of net re-treatment
- Period for re-treatment coincides with farming activities – people are too busy
Lessons learned

• Useful to recruit individuals identified from the communities (i.e., CHAs)
• National Malaria Week (end of July) campaign can be an ideal time to promote net re-treatment.
• Adequate funds for supervision, monitoring and technical support should be ensured.
Susceptibility of *Anopheles Arabiensis* to Insecticides and Study on Residual Action: Wall Bioassay
SUSCEPTIBILITY OF \textit{Anopheles arabiensis} TO INSECTICIDES AND STUDY ON RESIDUAL ACTION: WALL BIOASSAY

\textbf{1: Introduction}

- Insecticides have been used in malaria control programmes in Africa since the 1930’s and they will continue to play a vital part of the integrated vector control programme in the foreseeable future.
- Initially, pyrethrum extracted from \textit{Chrysanthemum} as short-term knockdown insecticide.
- Second World War: replaced with cheap and long-lasting DDT shortly after DDT, dieldrin and gamma BHC -- no longer in use.

\textbf{2: Common insecticides in malaria control}

- Dichloro-phenyl trichloroethane (DDT)
- Dieldrin (not in use)
- Hexachlorocyclohexane (HCH) -- not in use
- Malathion
- Bendiocarb (FICAM)
- Pyrethroids: Etofenprox, Permethrin, Lamdacyhalothrin, Deltamethrin (ICON), Cyfluthrin
- Temophos (larvicide and space spray)

\textbf{3: Rational}

- In Africa, agricultural use - main cause for resistance: Increase in prevalence of vector-borne diseases.
- In Aligidr, extensive use of insecticides for cotton protection and bed nets re-impregnation.
- As the extensive use of pesticides in this area continues, it is likely that such resistance will evolve regardless of the organised use of pyrethroids in a properly managed malaria control programme.

\textbf{4: Objective of the study}

- Providing baseline data for programme planning and insecticide selection before the start of control operations;
- Detecting resistance at an early stage so that timely management can be implemented;
- Continuously monitor the effect of control strategies on resistance.
5: Materials and methods

Study site:
- Hiletcide village, Tessenei sub-zone

Mosquito selection
- Fully fed mosquitoes
- Collected by hand catch from indoor human resting places
- Collection: 6.30-8.00 am and
- Mosquitoes were transported in ice bag covered with a wet towel to the temporary test room, Tessenei.

Test conditions (WHO kit)
- All tests were conducted at room temperature and relative humidity.
- A one-hour pre-testing holding period was used so that any dead or damaged individual could be removed before conducting the test.
- In each test, 20-30 fed mosquitoes were used and
- Three test tubes with treated papers and one test tube without the insecticide were used.

Result and Discussion

Table 1: Result of WHO susceptibility trials on wild caught Anopheles gambiae s.l. to various insecticides

<table>
<thead>
<tr>
<th>Insecticides</th>
<th>Concentration</th>
<th>Total Tested</th>
<th>1 Hour (Control)</th>
<th>24 Hour (post-exposure)</th>
<th>Average % Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malathion</td>
<td>0.05%</td>
<td>455 (6)</td>
<td>72.2</td>
<td>72.2</td>
<td>2.7</td>
</tr>
<tr>
<td>Pyrimiphos-methyl</td>
<td>0.15%</td>
<td>70 (1)</td>
<td>97</td>
<td>97</td>
<td>0.5</td>
</tr>
<tr>
<td>Bendiocarb</td>
<td>0.05%</td>
<td>100 (2)</td>
<td>100</td>
<td>100</td>
<td>0.0</td>
</tr>
<tr>
<td>Carbaryl</td>
<td>0.05%</td>
<td>100 (2)</td>
<td>100</td>
<td>100</td>
<td>0.0</td>
</tr>
<tr>
<td>Cyfluthrin</td>
<td>5%</td>
<td>70 (1)</td>
<td>97</td>
<td>97</td>
<td>0.5</td>
</tr>
<tr>
<td>Etofenprox</td>
<td>5%</td>
<td>70 (1)</td>
<td>97</td>
<td>97</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Result and Discussion (Cont.)
- Except for DDT, 94.3%, all other insecticides tested showed over 98.8 percent mortality.
- However, the percent mortality for Pyrimiphos-methyl was zero, showing that there was a problem with the papers.
- Based on the study carried out the species is susceptible to all insecticides tested except for DDT was slightly lower but above 90%.
- The result obtained in this study is similarly with the results obtained from studies carried out in the past four years (table 2).
- Indicating that the species is still susceptible to the insecticides that we use for malaria control.

Table 2. Result of the susceptibility tests carried out in the country by year

<table>
<thead>
<tr>
<th>Insecticides tested</th>
<th>1998</th>
<th>1999</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bendiocarb</td>
<td>100%</td>
<td>95%</td>
<td>100%</td>
<td>95%</td>
</tr>
<tr>
<td>Malathion</td>
<td>100%</td>
<td>96.3%</td>
<td>100%</td>
<td>96.3%</td>
</tr>
<tr>
<td>Permethrin</td>
<td>99%</td>
<td>99%</td>
<td>99%</td>
<td>99%</td>
</tr>
<tr>
<td>Temephos</td>
<td>96%</td>
<td>96%</td>
<td>96%</td>
<td>96%</td>
</tr>
<tr>
<td>Lambdaciluthrin</td>
<td>99%</td>
<td>99%</td>
<td>99%</td>
<td>99%</td>
</tr>
<tr>
<td>Cyfluthrin</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Etofenprox</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>DDT</td>
<td>95%</td>
<td>95%</td>
<td>95%</td>
<td>95%</td>
</tr>
</tbody>
</table>
STUDY ON RESIDUAL ACTION: WALL BIOASSAY

**Introduction**
- The application of water-dispersable (wettable) powders of residual insecticides to the interior surfaces of walls, ceilings and roofs of houses is the most widely practiced method of vector control.
- In Eritrea, as in most part of Africa, use of DDT for house spraying has a long history and still it is one of the insecticides in use in the country.
- In the absence of resistance, DDT remains an effective insecticide.
- However, many prefer not to use it due to:
  - accumulation in mammalian tissues and
  - residue found in human breast milk, etc

**Objective**
- The National Malaria Control Program has a plan to replace DDT with other safe, effective and long lasting residual effect insecticides.
- Examining insecticides that can serve as possible alternatives to replace DDT for indoor house spraying for malaria control program.

**Materials and Methods**
- **Study area**
  - Carried out in Shieb (Tessenei).
  - Reason: No spraying carried out for the last two years
- **House selection**
  - Nine houses of similar size and construction: circular huts with thatched roofs and mud wall were used.
  - Three insecticides (DDT, Lambda-cyhalothrin and Bendiocarb) were tested
  - One insecticide per three houses

**Materials and methods (Cont.)**
- **Mosquito selection**
  - All fed *Anopheles arabiensis* were used for this trial.
  - Collected from Hiletci village
  - Early in the morning from human dwellings and
  - Transported to Shieb (about 3 Kms away from the village) in ice cool box.

**Materials and Methods (Cont.)**
- **Test procedure**
  - In each house three cones,
    - Top of wall
    - Middle and
    - bottom were placed
  - 10-15 fed *Anopheles arabiensis* mosquitoes were introduced in each cone.
  - left for 30 minutes so that they can come in contact with the insecticide and take the lethal dose.
Test procedure (Cont.)
- After 30 minutes, they were transferred into clean paper cups and left at room temperature for 24 hours.
- After 24 hours, the percent mortality was recorded for each cup.
- This was done every month from Sep. to Dec. 2002 for four months at almost the same time.

Result and Discussion
- All insecticides showed good percent mortality.
- 100% for FICAM - for all months (Sep-Dec).
- As to DDT and ICON, their potency was decreasing from month to month.

SUMMARY 1
- Local An. arabiensis is susceptible to all insecticides tested (OC, OP, C & Pyr).
- Wall bioassay show high (>90%) mortality after 3 months (Sep-Dec).
- May be longer - will be tested when laboratory and colonies are available, using other pyrethroid insecticides.

SUMMARY 2
- Based on information obtained in 2002 trials in Tessenei, both the carbamate Bendiocarb (FICAM) or pyrethroid lambda-cyhalothrin (ICON) are suitable replacement for DDT in 2003.
- Trials should continue annually and indifferent areas.

Thank u!!
Research Findings, Communication Strategy and Implementation Plan on Malaria
Research Findings, Communication Strategy and Implementation Plan on Malaria

Presented by Azebgetah Ghebreselassie
Health Promotion Center, MOH
March 27-29, 2003
Massawa

Researches Done on Malaria
- KAP Survey, carried out in 2001
- Formative research, 2002

KAP Survey on Malaria

Objectives of the study:
1. Gauge the level of knowledge, attitudes and practices associated with malaria.
2. Establish benchmarks against which to measure the achievements of planned IEC activities.
3. Gather information that may alert implementers to themes and geographic areas that may need IEC attention and focused health communication strategies.
4. Establish a format for future studies to measure changes in KAP related to malaria.

Findings of KAP Survey on Malaria
- All three target groups had heard of malaria and could name the causes.
- They all said they would go to the health facility if they thought they had malaria.
- They knew how to protect against malaria, had all heard of mosquito nets, and could give the advantages of sleeping under one.

However, only half of the WAR and a third of the men said they had impregnated nets in their homes even though they all know impregnated nets killed more mosquitoes.

Most respondents considered anti-malaria prophylaxis as unsafe for a pregnant woman to take one.

Therefore, the majority of the WRA had done nothing to protect themselves (take prophylaxis) against malaria the last time they were pregnant.

Cont..
- 93 percent of respondents from all three target groups said they knew what causes malaria.
- 84 percent of all respondents said malaria was caused by mosquito bites.
- 86 percent said they would go to health facility
Anseba  | G. Barka  | Debub  | Maekel  | N. Red Sea  | S. Red Sea
--- | --- | --- | --- | --- | ---
% of WRA who said they didn't know cause of Malaria:

% of WRA who said they didn't know how to protect themselves against Malaria:

% of WRA who said they didn't use mosquito nets:

What kind of mosquito nets do you use:

Disadvantage of impregnated nets usage:

Frequency of re-treatment:

- Responses of women of reproductive age:
  - 36% - once a year
  - 25% - did not retreat
  - 10% - every three months
  - 20% - every six months
Findings of Malaria Formative research

- **Goal**
  To verify the results of earlier studies and gather additional information to guide development of a strong malaria prevention, treatment and compliance communication strategy.

**Objectives**

The objectives of the study were to:

1. Assess respondent’s knowledge of the causes, signs and symptoms of malaria and the measures that can be taken to prevent malaria.
2. Establish and describe people’s perceptions of the prevalence and seriousness of malaria.

**Objectives cont…**

3. Describe the measures taken in the community to treat and prevent malaria and how community prevention management of malaria can be strengthened.
4. Establish the level of community participation in prevention of malaria and what can be done to increase the level of participation.
5. Identify malaria prevention and communication activities which take place in the community and what needs to be done to strengthen these activities.

**Research Methods**

- **Structured observation, two sites per zone**
- **Focus group discussion, six FGDS per zone**
- **Key informer interviews, 12 key informer interviews.**

Respondents were key people in prevention and treatment of malaria generally, with emphasis on prevention of malaria among pregnant mothers and children below 5 years of age. (Women, men youth, malaria agents traditional healers, TBAs health workers and administrators.

**Socio-linguistic groups**

<table>
<thead>
<tr>
<th>Zone</th>
<th>Nationality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debub</td>
<td>Shao &amp; Tigrinya</td>
</tr>
<tr>
<td>Maekel</td>
<td>Tigrinya</td>
</tr>
<tr>
<td>Anseba</td>
<td>Bilen &amp; Hedareb</td>
</tr>
<tr>
<td>Gash Barka</td>
<td>Kunama &amp; Nara</td>
</tr>
<tr>
<td>Northern Red sea</td>
<td>Tigre</td>
</tr>
<tr>
<td>Southern Red Sea</td>
<td>Afar</td>
</tr>
</tbody>
</table>

**Summary Findings**

- Virtually all respondents had heard of Malaria
- All knew the key signs and symptoms of Malaria
- Virtually all thought that malaria was a serious disease
Population most at risk of getting Malaria:
- Children, pregnant women, the sick and the old
- Frequent travelers, nomads, people who live in wet/rainy places
- Men ‘because they stay out for long periods”
- Young people “because they have hot blood”

Definition and Scope of Malaria
- Transmitted through a mosquito bite
- Transmitted by eating raw maize, milk that is not boiled, keeping poor body hygiene and etc.

Treatment;
- People delay taking Malaria patients to the health facility
- Widespread use of traditional treatment
- Patients are first treated with traditional medicine and later taken to the health facility if they are not getting better
- Those who do not get better on treatment from the health facility go for traditional treatment

Treatment Cont.
- Very sick patients are taken to the health facility because “it is better that the patient dies at the health facility.”

Substance and Methods used in traditional treatment
- Herbs
- Food substances e.g. butter, honey, milk
- Inhaling smoke
- Inhaling steam
- Massaging
- Inserting twigs in the throat
- Scarring

Objectives of traditional treatment
- To cure/relieve symptoms by:
  - Inducing vomiting
  - Causing the patients to sweat
  - Lowering the temperature
  - Inducing diarrhoea
  - To ‘cure” the enlarged spleen
Treatment with medicine from the health facility

- Virtually all respondents knew that malaria is treated with tablets
- Many, especially men knew that these were Chloroquine tablets (some call them Aspero or Panadol)
- Many knew the adult treatment does for Chloroquine
- A large proportion did not know the treatment dose. The majority did not know the dose for children (Tablets/syrup)

Malaria treatment (Health Workers)

- Many knew that Chloroquine was the first line of treatment for Malaria
- Health workers differed on which was the second line of treatment: Fansidar or Quinine
- Health workers differed on how long a patient who is not improving should be on one treatment before moving to the second and third line of treatment

Malaria treatment (Health Workers) Cont.

- Health workers believed that most people took treatment correctly, but others did not comply
- There is no reliable way of monitoring and finding out the level of compliance

Malaria Prevention

- Most people know what to do to prevent Malaria:
- Malaria prevention initiatives in study areas included the following:
  - Identification & training of Malaria Agents, distribution of mosquito nets (for free, sale, or on credit), destroy mosquito breeding sites and malaria education

Malaria Prevention Cont.

- These activities were least developed in the Southern Red Sea Zone
- Many participate in destroying malaria breeding sites
- Many use mosquito nets or ensure that family members use mosquito nets
- Many other people do not participate in Malaria prevention activities for a variety of reasons

Malaria Prevention Cont.

- People believe that the key partners in Malaria prevention are MOH, administrators, Health Workers, community Malaria Agents and etc.
- Community Health Agents have not performed as well as they could
- Respondents give many recommendations for improving participation in malaria prevention activities
Information about Malaria
- Information about malaria is not commonly available in the community. More frequently, it is given when people sick with malaria go for treatment. Sometimes it is given by Malaria Agents and Rural Drug Vendors when people go to buy Malaria drugs
- Young people said they get education about Malaria from Pharmacies as well

Information about Malaria Cont.
- On probing respondents added the following sources of information on malaria: Health workers, Radio, Adult literacy classes, in schools, especially on Malaria Days
- The most preferred sources of Malaria education included the following: Village meetings, Malaria Agents, health facilities and adult literacy classes

Health Education Materials
- The most frequent response was “we don’t know. We shall accept anything you give us!”
- Other responses: video, drama, seminars, flipcharts, radio and TV materials

Malaria communication Strategy
Communication Objectives:
- To increase the number of HHs who plan to correctly and consistently use impregnated bed nets by the year 2003.
- To increase the number of HHs who plan to or seek early treatment from health facilities/CHAs when they have fever and complete the prescribed medications.
- To decrease the number of potential breeding sites through community participation

Target Audiences
Primary target audience
- Heads of households/caregivers with <5 yrs children
- Pregnant women
Secondary target audience
- Community leaders
- Drug vendors
- CHAs
- Village administrators
- Health workers
- Teachers and students

Creative materials
- Radio spots
- Radio programs
- Stickers
- Posters, Flip charts and brochures (already developed)
- Bill boards
Together Everyone Achieves More

Thank you
Anti-Malarial Drug Therapeutic Efficacy Studies: A Review
Anti-malarial drug therapeutic efficacy studies: a review

National Malaria Control Program

State of Eritrea

Background

• CQ resistance studies began in Gash Barka in 1994.
• Subsequent studies conducted in Anseba, Debub, and Gash Barka from 1997–2002.
• Results have shown consistently high rates of clinical failure particularly in children < 5 years.

Methodology

• Study Protocol
  – WHO Handbook for Therapeutic Efficacy assessment (1999) was used.
  – Modifications to the protocol were made:
    • Parasite density inclusion criteria reduced from 2,000/ul → 1,000/ul
    • Cases with persistent vomiting on Day 1 were excluded from the study
    • Inclusion of both <5 and >5 age groups

Results (1998-2001)

<table>
<thead>
<tr>
<th>Age</th>
<th>Year</th>
<th>N</th>
<th>TTF* (%)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5</td>
<td>1998</td>
<td>119</td>
<td>56.3</td>
<td>47 – 65</td>
</tr>
<tr>
<td></td>
<td>1999</td>
<td>79</td>
<td>50.6</td>
<td>39 – 62</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>92</td>
<td>39.1</td>
<td>29 – 49</td>
</tr>
<tr>
<td></td>
<td>2001</td>
<td>52</td>
<td>67.3</td>
<td>54 – 80</td>
</tr>
<tr>
<td>&gt;5</td>
<td>1999</td>
<td>263</td>
<td>35.7</td>
<td>30 – 42</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>216</td>
<td>19.9</td>
<td>15 – 25</td>
</tr>
<tr>
<td></td>
<td>2001</td>
<td>157</td>
<td>33.1</td>
<td>26 – 41</td>
</tr>
</tbody>
</table>

* Total Treatment Failure
Technical support

• **WHO/AFRO**
  – Dr. Walker (1998)
  – Dr. Thomas Sukwa (May 01, Jan 02)
  – Dr. Nathan Bakyaita (Nov 01)
  – Dr. Walter Kazadi (Nov 02)

• **WHO/Geneva**
  – Dr. Peter Olumese (Dec 01)
  – Dr. Pascal Ringwald (Jan 02)

• **USAID**
  – Dr. Edward Emberu (1999)

Validation

• **Validation of studies** by WHO/AFRO consultants:
  – Review of previous documents and reports;
  – Interviews with NMCP national and zonal staff;
  – Field visits to study sites;
  – Review of the national drug efficacy database;
  – Review of SOPs and Quality Control;
  – Meeting with Anti-malarial Drug Efficacy Technical Committee.

Drug efficacy studies in 2002

Objectives

• To assess the therapeutic efficacy of CQ and Fansidar (SP) for uncomplicated Plasmodium falciparum.
• To train health care workers on how to undertake the assessment of drug efficacy.
• To provide relevant data for updating the national drug policy.

Methodology (1)

• **Sample Size and Design**
  – 3 sentinel sites were selected for each drug arm (CQ + SP, SP alone, and ART + AQ);
  – At least 50 cases of uncomplicated, non-severe falciparum malaria for each age group were required at each of the selected sites;
  – Studies were conducted during the peak 2002 transmission season (September – November);
  – Standard classification of responses used.

Methodology (2)

• **Modifications to protocol**:
  – Used dosage regimen according to manufacturer’s leaflet (5 mg/kg, b.i.d.)
  – ART was not received in sufficient time, or quantity.
Study sites

<table>
<thead>
<tr>
<th>CQ + SP</th>
<th>SP alone</th>
<th>ART + AQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hagaz (Anseba)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tokombia (G/Barka)</td>
<td>Sawa (G/Barka)</td>
<td>Tesseny (G/Barka)</td>
</tr>
<tr>
<td>Mai Dima (Debub)</td>
<td>Tsurona (Debub)</td>
<td>Aduquela (Debub)</td>
</tr>
<tr>
<td>Elabered (Anseba)</td>
<td>Goluj (G/Barka)</td>
<td></td>
</tr>
</tbody>
</table>

Results (1)

- **Positivity Rate**
  - Mean 27% (range 9 – 59%)
  - Mostly febrile but negative
  - Few P. vivax cases (10%)
- Aggregated number of valid samples
  - CQ + SP  (n = 113)
  - SP alone  (n = 102)
  - ART + AQ  (n = 66)

Results (2)

- **CQ + SP Treatment Outcomes**

<table>
<thead>
<tr>
<th>Site</th>
<th>N</th>
<th>ACR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tokombia</td>
<td>79</td>
<td>96</td>
</tr>
<tr>
<td>Mai Dima</td>
<td>13</td>
<td>92</td>
</tr>
<tr>
<td>Elabered</td>
<td>13</td>
<td>100</td>
</tr>
<tr>
<td>Hagaz</td>
<td>8</td>
<td>100</td>
</tr>
</tbody>
</table>

Results (3)

- **SP Treatment Outcomes**

<table>
<thead>
<tr>
<th>Site</th>
<th>N</th>
<th>ACR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goluj</td>
<td>60</td>
<td>93</td>
</tr>
<tr>
<td>Sawa</td>
<td>39</td>
<td>95</td>
</tr>
<tr>
<td>Tsonora</td>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>

Results (4)

- **Total treatment failure**
  - CQ + SP: 4% (95%CI: 0.3,8)
  - SP alone: 6% (95%CI:1,11)
  - ART + AQ: 0%
Summary

- SP efficacy (94%) is generally good (for now);
- CQ + SP efficacy is also high (96%);
- ART + AQ highly efficacious – no clinical or parasitological treatment failures.
- Sample size remains a problem for some sites.

Conclusions

- CQ + SP is an interim strategy – there is a need to find other alternatives;
- Further tests on the efficacy, acceptability, and cost-effectiveness of other combinations will be needed.
Malaria in Pregnancy
Malaria and Motherhood
Malaria in Pregnancy
Malaria and Motherhood

Dr Berhana Haile, Massawa, Eritrea

Women’s Special Situation

Women’s Higher Risk to Exposure to Diff Communicable Diseases

- Due to heavy farm work and water seeking role exposes them to – malaria & schistosomiasis
- Domestic roles- dengue & leishmaniasis
- Biological characteristics – Being pregnant - Malaria in pregnancy - abortions, miscarriages, stillbirths, anemia, LBW, neonatal deaths, maternal death

Higher Risk to Different Diseases.

- Low Social status, prone to - HIV infection.
- If HIV+ in pregnancy – Reduced ability to control P. falciparum infection resulting in high prevalence of severity than in their non-HIV infected counterparts

Malaria & Pregnancy

Malaria
Pregnant Women
- parasites
- spleen rates
- mortality
- anemia
- fever illness
- cerebral malaria
- hypoglycemia
- puerperal sepsis
- mortality
- severe disease
- hemorrhage

Foetus
- abortions
- stillbirths
- congenital infection

Newborn
- low birthweight
- prematurity
- IUGR
- malaria illness
- mortality
**Malaria during pregnancy in areas of high or moderate (stable) transmission**

- Acquired immunity - High
- Asymptomatic infection
- Placental Sequestration
- Anaemia
- Altered Placental Integrity
- Less Nutrient Transport

**Maternal Morbidity**

- Low Birth Weight

**What is Known**

- Serious effects of malaria during pregnancy to both the mother and child is chiefly by *P. falciparum*.
- Malaria is a major contributor to chronic anemia in pregnancy and neonatal and infant mortality.
- Pregnant women are immunodeficient and suffer four times more malaria attacks than their non-pregnant counterparts, and doubles their risk of death from malaria.

**Known .....**

- Infections are more severe during the 1st & 2nd pregnancies
- Where seasonal transmission increases, 55-68% of pregnant women are anemic, and 20% of births are of LBW
- LBW contributes to 80% of neonatal death, 46% of perinatal death and 38% of infant mortality
- Pregnant women at risk of *P. vivax* infection live primarily in areas of low or unstable transmission
- *P. vivax* infection in pregnancy is also associated with maternal anemia & LBW but to a lesser extent

**Making Pregnancy Safer in High Malaria Transmission**

- Four pronged approach:
  - Use of ITNs to improve the safety of women and children
  - Preventive treatment of malaria, at least two doses, during pregnancy as prophylaxis (IPT). IPT should be included within the routine maternal and child health care
  - Mechanism for early identification of clinical malaria and access to effective treatment.
  - Prevention of anemia-iron folate at ANC

**Malaria in Pregnancy - Eritrean Context**
In Eritrea

- Malaria in Eritrea is unstable transmission therefore prone to epidemics.
- Data on malaria in pregnancy currently not routinely captured in the NHMIS.
- Anemia in pregnancy seem to be common in Eritrea especially in western lowlands.
- GB & AN- 80% of pregnant women were anemic – recent study (2001)
- Severe anemia associated with complicated malaria is also reported by obstetricians in Debub

Strategies for malaria Control in pregnancy

- Use of ITNs made available for ANC & post partum mothers
- Intermittent Preventive Treatment (IPT):
  - Proguanil 200 mg/d PO and chloroquine (CQ) 300 mg PO weekly (treatment guideline June 2002).
  - Compliance very low-1%: Proguanil not routinely available
- Effective Case management of malaria
  - with Quinine as a sulphate taken PO 600mg 8hrly for 7d (uncomplicated)
  - Severe malaria in pregnancy- IM or IV Quinine

IPT – High Transmission

- WHO Recommends - that all pregnant women should receive at least 2 doses of IPT after quickening, during routinely scheduled antenatal clinic visits.

- Presently, the most effective drug for IPT is SP due to its good safety profile in pregnancy, relative efficacy in reproductive-age women, and good programme feasibility, with the opportunity to deliver it as a single dose treatment under observation by the health worker

IPT- High Transmission …

- Use of 2 doses of SP for IPT significantly reduced incidence of LBW from 34% to 13.5% in primigravidae, and from 14% to 6.5% in multigravidae (Malawi – 1998, in a WHO’s report of 2002)
- Pregnant women taking two or more doses of SP as IPT delivered babies 135gm heavier than those of not taking any IPT. (Malawi- Rogerson- 2000 in WHO report 2002)

Low Transmission Environment like Eritrea

- Severe malaria is a common presentation in pregnant women
- Mortality is unacceptably high
- LBW is common
- Because of low immunity, silent parasetaemia is less common

IPT- Low Transmission Environment like Eritrea

- At present there are no fully effective and feasible IPT approaches to prevent malaria in non-immune pregnant women in epidemic-prone areas (WHO).
- Non-immune pregnant women exposed to malaria require prompt access to treatment of febrile illness.
- Essential elements of the ANC package should include malaria diagnosis, where available and needed, and treatment with antimalarial drugs which have an adequate safety and efficacy profile for use in pregnancy
Strategies for malaria control in pregnancy – Low transmission areas- Eritrea

- Three Pronged Approach:
  1. Emphasis on use of ITNs to improve the safety of women and children
  3. Prevention of anemia with iron folate at ANC and nutritional counseling

Recommendations for RBM in Eritrea

- Active promotion of ITNs use by all pregnant women during increased malaria transmission seasons.
- Target women for increased awareness on recognition of signs of severity, management, and prompt care seeking behaviour when fever occurs.
- Define the roles of different stakeholders to strengthen and maintain their support and participation in malaria in pregnancy control efforts.
- Proper orientation and involvement of different stakeholders on risk of malaria in pregnancy, what they can do.

Recommendations cont....

- Because the ANC coverage in Eritrea is relatively low, other ways of reaching pregnant women with information and care should be tried e.g. integrated outreach services and community based programs.
- Data on malaria in pregnancy should be integrated with the current NHMIS

Recommendations Cont........

- The current malaria sentinel surveillance studies should include malaria in pregnancy as well to document its status.
- Studies should be conducted for the Eritrean situation on the effect of malaria in pregnancy- i.e. anemia in pregnancy, placental parasitaemia, low birth weight, etc.

Thank you for making this happen
Sixth Annual Assessment & Mid-term Review Workshop on Malaria control

March 27 – 29, 2003
Massawa
Malaria is a killer disease. It affects productivity and national economy. Malaria is a killer disease. It affects productivity and national economy. Malaria is a killer disease. It affects productivity and national economy.

**Economic Implications of Resistance to Anti-malarial Medicines:**

- A Decision Analysis Technique to Assess Cost-effectiveness of Treatments Out-comes

**My Objectives**

- Discuss key factors that need to be considered when making choices to treat malaria.
- Highlight the rationale of CEA technique for analyzing treatment options.

**Introduction**

- Widespread of drug resistances in malarial parasites.
- Ineffectiveness of Chloroquine to treat severe malaria.
- Development of alternative Anti-malarial drugs.
- Cost of treatment failures and economic implications.
- Seeking Cost-effective treatment options.

**Effectiveness of Anti-malarial Medicines**

- Uncomplicated cases => affordable drugs for use on a large scale.
- Cost considerations MAY force countries to employ less expensive, and less effective drugs to enable drug coverage of large population, to aim clinical, BUT not necessarily radical cure.

**Evaluation and impact of drug resistance**

“Ability of a parasite strain to survive and/or multiply, despite the administration and absorption of a drug in doses equal to or higher than those recommended doses, but within the limits of the tolerance of the patient”


Economic Implications of Resistance to Anti-malarial Medicines:

- A Decision Analysis Technique to Assess Cost-effectiveness of Treatments Out-comes
What is that all about???

- Drug Efficacy
- Cost
- Adverse effects
- Potential drug interactions
- Contraindications
- The simplicity of the proposed regimen

(When resistance to an anti-malarial drug becomes high enough to justify a change in drug course of therapy, a number of factors are relevant in identifying a suitable ALTERNATIVE treatment.

- Drug Efficacy
- Cost
- Adverse effects
- Potential drug interactions
- Contraindications
- The simplicity of the proposed regimen

(Malaria in pregnancy is particularly serious and can result in anemia, abortion, stillbirth, low birth weight and increased infant mortality...

Cost of Treatment

- Drug resistance results in increased costs related to the use of an ineffective drug or to the greater costs of the next line Drug of therapy.

- Drug cost per treatment increases rapidly after CQ and SP with most expensive drugs (such as artemisinin derivatives).

Relative Costs (2002 values) of anti-malarial therapy

Adapted from J. Pharmacoeconomics Sep. 10(3): Resistance to Antimalarials

<table>
<thead>
<tr>
<th>Drug</th>
<th>Cost of Adult Dose (US$)</th>
<th>Cost per capita to all treated malaria cases (US$)</th>
<th>Cost of treating 100% infected malaria cases (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CQ</td>
<td>0.06</td>
<td>0.001</td>
<td>3.9</td>
</tr>
<tr>
<td>CQ + Co-SP</td>
<td>0.06 x 2.5 x (74,861 x 0.19) + 3.9</td>
<td>3.9</td>
<td></td>
</tr>
<tr>
<td>Q (oral)</td>
<td>0.06 x 74,861 x 0.81 / 3.5 mil = 0.001</td>
<td>28.20</td>
<td></td>
</tr>
<tr>
<td>Q (Parenteral)</td>
<td>1.26</td>
<td>0.02</td>
<td>30.9</td>
</tr>
</tbody>
</table>

1. IDA price indicator Nov. 2001, freight and insurance exclusive.
2. Based on 74,861 malaria cases, 19% in children, population 3.5 million, child dose 25% of an adult.
3. Based on the data on NMCP annual report of 2002.

Cost-effectiveness of Alternative Strategies

1. Clinical failure rate in 1st line drug of therapy should not exceed 25%.
2. Switching drugs is recommended when the mean duration of clinical response decreases below 14 days and hematological recovery does not occur.

Example:

In a given health facility, the proportion of treatment failure with CQ (C_{fa} = 2.40 nkf) has reached 40% (F_{a}) and each failure incurred a burden valued at 3.40 nkf (registration fee + cost of the drug).

SP+CQ (C_{fa} = 3.48 nkf), the alternative drug being considered has high cure rate/success (F_{b} = 4%).

\[ C_{fa} - C_{fb} = [(7.40 nkf x (40% - 4%)] = 2.66 nkf\]
\[ F_{a} - F_{b} = [3.48 - 2.40 = 1.08 nkf] \]

In this case, switching from CQ alone, to CQ + SP is worthwhile!

Cost –Effectiveness Analysis (CEA):

To assess treatment outcomes of AM medicines.

- CEA – make choices/decisions for allocating health care resources
- Decision analysis – application of decision tree
- To compare CE of treatment options

"A given health benefit goal may be set, the objective being to minimize the cost of achieving it."
Analysis

In this instance:
If CQ +SP is used as 1st line drug of therapy, the cost per year would be 389,695.42 Nk less than using CQ alone.

The optimal alternative (not necessarily the least costly) for accomplishing an objective must be possible.

Remarks ....
- If resistance to anti-malarial drugs is confirmed, switching from one line of therapy to another is justifiable. BUT,
- It should NOT be driven by pharmaceutical Companies.

Effective drug therapy:
- saves lives,
- saves money, and
- increases PRODUCTIVITY

Malaria is a killer disease. It affects productivity and national economy ++ ++ ++ ++
Malaria Control is the responsibility of the whole Nation!
Sixth Annual & Mid-term Review of Malaria control In Eritrea

March 27 – 29, 2003
Massawa
Introduction

- Widespread drug resistance of anti-malarial medicines.
- Chloroquine the mainstay drug for the treatment of Malaria.
- Development of alternative Anti-malarial drugs.
- Cost of treatment failures and economic implications.
- Seeking Cost-effective treatment/s.

1. Effectiveness of Anti-malarial Medicines

1. Timely administration of EFFECTIVE anti-malarial drug regimen
2. Complete elimination of all parasites from the body through parasitological (radical) cure
3. A rapid acting drug, preferably parenteral for patients with server and complicated malaria
4. For patients with uncomplicated malaria, long duration of action is desired/preferred

Evaluation and impact of drug resistance

- Drug resistance is traditionally defined by the degree of clearance of asexual parasitaemia in treated patients.
- Ability of a parasite strain to survive and/or multiply, despite the administration and absorption of a drug in doses equal to or higher than those recommended doses, but within the limits of the tolerance of the patient.

(WHO: Chemotherapy of malaria and resistance to antimalarials... Geneva, 1990)
What is that all about ???

When resistance to an anti-malarial drug becomes high enough to justify a change in drug course of therapy, a number of factors are relevant in identifying a suitable ALTERNATIVE treatment.

**Key Factors for Treatment Choices**

- Drug Efficacy
- Cost
- Adverse effects
- Potential drug interactions
- Contraindications
- The simplicity of the proposed regimen

(WH0 Anti-malarial drug policies: data requirements, treatment of uncomplicated malaria and management of malaria in pregnancy; 1994, WHO/PM/94.1070)

**Cost of Treatment**

- Cost for the lowest adult does differs markedly
- The actual prices paid by governments can be very different
- Cost of a specific anti-malarial drug can vary markedly from country to country

**Relative Costs (2002 values) of anti-malarial therapy**

*Adapted from J. Pharmacoeconomics Sep. 1996: 10(3)*

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<tr>
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<th>Cost of treating 74,861 actively detected malaria cases (US$ '000)*</th>
</tr>
</thead>
<tbody>
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<td>0.001</td>
<td>3.9</td>
</tr>
<tr>
<td>CQ + SP</td>
<td>0.12</td>
<td>0.002</td>
<td>7.7</td>
</tr>
<tr>
<td>Q (oral)</td>
<td>0.44</td>
<td>0.008</td>
<td>28.20</td>
</tr>
<tr>
<td>Q (oral, 7 days)</td>
<td>1.26</td>
<td>0.02</td>
<td>80.90</td>
</tr>
</tbody>
</table>

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**Cost-effectiveness of Alternative Strategies**

1. Clinical failure rate in 1st line drug of therapy should not exceed 25%
2. Switching drugs is recommended when the mean duration of clinical response decreases below 14 days and hematological recovery does not occur


**Choice of drug/Therapy**

Switching from drug “A” (current therapy) to Drug “B” (alternative therapy)

\[ C_{ta} + (F_a \times C_f) > C_{tb} + (F_b \times C_f) \]

Or

\[ C_f (F_a - F_b) > C_{tb} - C_{ta} \]

*Adapted from: Pharmacoeconomics Sep. 1996; 10 (3)*
Example:

- In a given health facility, the proportion of treatment failure with CQ ($C_{t_a} = 2.40 \text{ nkf}$) has reached 40% ($F_a$) and each failure incurred a burden valued at 7.40 nkf. (registration fee + cost of the drug).
- SP+CQ ($C_{t_b} = 3.48 \text{ nkf}$), the alternative drug being considered has high cure rate/success ($F_b = 4\%$).

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C_f (F_a - F_b) = [7.40 \text{ nkf} \times (40\% - 4\%)] = 2.66 \text{ nkf}
\]

\[
C_{t_b} - C_{t_a} = [3.48 - 2.40] = 1.08 \text{ nkf}
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In this case, switching from CQ alone, to CQ + SP is worthwhile!

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Analysis

In 2002, the number of malaria cases was 74,861pts*.

1. CQ:
   - Initial $T_c = (74,861 \times 0.60) \times 2.40 \text{ Nk} = 107,798.84 \text{ Nk}$
   - Second $T_c = (74,861 \times 0.40) \times 19.74 \text{ Nk} = 591,102.45 \text{ Nk}$
   - Total $T_c = (107,798.84 + 591,102.45) = 698,901.29 \text{ Nk}$
2. CQ + SP:
   - Initial $T_c = (74,861 \times 0.96) \times 3.48 \text{ Nk} = 250,995.62 \text{ Nk}$
   - Second $T_c = (74,861 \times 0.04) \times 19.74 \text{ Nk} = 59,110.25 \text{ Nk}$
   - Total $T_c = (248,391.80 + 58,707.55) = 309,205.87 \text{ Nk}$

* Source: NMCP annual report 2002

Just few words …

1. If one treatment provides greater health benefit than another but costs a lot more, wrongly we reject the more effective therapy in favor of the less expensive and less effective one.
2. Choice of drug therapy or switching from one drug of therapy to another, should be based on effectiveness and safety

Remarks ….

- If resistance to anti-malarial drugs is confirmed, switching from one line of therapy to another is acceptable. BUT,
- It should NOT be driven by pharmaceutical Companies.
Summary and Recommendations
Summary and Recommendations

6th Annual Assessment and Mid-Term Review Workshop
27 – 29 March 2003
Massawa, Eritrea

Day One

• Presentation on RBM in Africa and the world
• Malaria Profile and Accomplishments
• Mid-Term Review of the 5 year Strategic POA for RBM in Eritrea
• Operational Activities
• Data and Financial Management issues

Day One (2)

• EHP technical assistance in Eritrea
• Vector Distribution and Behavioral Studies
• Sporozoite rates and feeding preferences
• Larval ecology and larval control studies
• Village Pilot Studies (Mosquito Source Management)

Day Two

• Report on activities and accomplishments from the zones
• Videos: Launch of RBM in 1999 and War Against Malaria in Eritrea for advocacy
• Scaling up of bednet re-impregnation
• Vector susceptibility
• Alternatives to DDT

Day Two (2)

• Communication Strategy for Malaria
• Economic implications of drug resistance
• A review and results of anti-malarial drug efficacy studies to date

Day Three

• IMCI Strategy and Malaria
• Malaria in Pregnancy
### Findings
- Eritrea is keen on collecting and using data for decision-making;
- Much work has been accomplished in a relatively short period of time;
- CHAs play an important role in case management for malaria;
- Distribution and re-impregnation rates have significantly improved by going to the kebabi level;
- CQ + SP is an effective treatment option (for now);

### Recommendations (1)
- Much work has been accomplished in a relatively short period of time; however, an assessment of **IMPACT** with respect to various control measures should also be considered;
- Community-based interventions are important ways of reaching target populations and should be strengthened;

### Recommendations (2)
- Inter-sectoral collaboration needs to be enhanced – (e.g., development projects);
- Man-made water points and other potential breeding sources should be addressed and managed by the communities;
- Health Promotion is an important component of the malaria control strategy and should be further strengthened;

### Recommendations (3)
- Role of CHAs in case management is significant and their involvement should be further integrated into the existing health care system;
- Although significant achievements have been made with regard to ITN distribution and re-impregnation, there is a need to focus more on the **USE** of such commodities;

### Recommendations (4)
- The impact of ITNs with regards to a number of issues (usage, effectiveness, and immunity) should be investigated;
- Sustainability issues related to ITNs should be examined;
- Efficacy of current first-line treatment should be continuously monitored and other potential CT candidates should also be evaluated;

### Recommendations (5)
- More information is needed on treatment-seeking behavior (e.g., RDVs);
- Health facilities should be able to track and follow-up cases of malaria by locality.
- Although transportation constraints have generally been improved, there are some areas that should be addressed (e.g., management and maintenance of these resources).
Recommendations (6)

- The IMCI strategy is integral to a number of programs (such as malaria) and the partnership should be further strengthened and expanded (e.g., integrated training, community-based case management);
- More attention should be placed on vulnerable groups (<5s and pregnant women) – such as use of ITNs, prompt diagnosis and treatment, management of anemia, surveillance etc.