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**INVOLVING COMMUNITIES IN
THE FIGHT AGAINST MALARIA IN
ETHIOPIA**

**By
Tilahun Nigatu, Berhane Haileselassie,
Samuel Hailu and Dawit Seyum**

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ABSTRACT

Malaria is still one of the leading causes of morbidity and mortality in developing countries. AMREF has been implementing a malaria prevention and control programme in Afar region since 2005. The main activities include training health care service providers, equipping health centres, training mother co-ordinators, distributing insecticide treated nets and sensitizing local leaders on malaria prevention and control.

As a result of this programme, the skills of over 200 health care service providers on diagnosis and treatment improved. There was a 34% increase in knowledge about transmission of malaria, 62.5% increase in ITN possession, and 48% increase in treatment seeking behaviour at community level. At present, about 300 mother co-ordinators are in place at community level. There has also been a significant decrease in epidemic occurrences of malaria. The programme has demonstrated a reasonable and replicable model of malaria prevention and control by strengthening and linking the different segments of health systems in pastoralist communities.

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ABBREVIATIONS

ACT	Artemisinin Combined Therapy
AIDS	Acquired Immune Deficiency Syndrome
AMREF	African Medical and Research Foundation
ANC	Antenatal Care
ARS	Afar Regional State
CHW	Community Health Worker
CIDA	Canadian International Development Agency
CSA	Central Statistical Authority
DHS	Demographic Health Survey
FGM	Female Genital Mutilation
FMOH	Federal Ministry of Health
GFTAM	Global Fund for Tuberculosis, AIDS and Malaria
HEW	Health Extension Worker
HIV	Human Immunodeficiency Virus
HMM	Home-based Management of Malaria
ICRC	International Committee of the Red Cross
IPT	Intermittent Preventive Treatment
ITN	Insecticide Treated Net
LLITN	Long Lasting Insecticide Treated Net
PCR	Polymerase Chain Reactions
PMPT	Participatory Malaria Prevention Tool
PNC	Post-natal Care
RDT	Rapid Diagnostic Tests
SP	Sulfadoxine Pyrimethamine
TFR	Total Fertility Rate
UK	United Kingdom
UNICEF	United Nations Children's Fund
USD	United States Dollar
WHO	World Health Organisation

1.1 | INTRODUCTION

Ethiopia is Africa's second most populous country and one of the poorest. In 2006, it had an estimated population of 77 million of which about 45% lived in absolute poverty. Eighty-five per cent of the population reside in the rural areas and have limited access to basic health services. In 2005/06, the maternal mortality rate was estimated at 673 deaths per 100,000 live births, and infant and under-five mortality rates were 77 and 123 per 1000 live births, respectively. Most health facilities are located in urban areas. Majority of the residents within the eastern, western, south-western and south-eastern parts of the country remain marginalised and disadvantaged, with limited access to comprehensive health care services.¹

Malaria is a major concern in the country since it is one of the leading causes of morbidity and mortality. Annual malaria mortality is about 70,000 and in a non-epidemic year, 5-6 million clinical malaria cases and over 600,000 confirmed cases are reported from health facilities. However, the actual number of malaria cases in the country is expected to be more than ten-fold of those captured through the routine public health surveillance system.²

Despite the current efforts to control malaria in Ethiopia, the situation has not improved mainly due to the increasing problems of parasite resistance to the relatively cheaper anti-malarial drugs, vector resistance to insecticides, low coverage of malaria preventive services, poor access to health care, rudimentary health service infrastructure, large population movements, and limited financial and human resources.

1. MOH. *Health and Health-Related Indicators. Planning and Programming Department, Federal Democratic Republic of Ethiopia Ministry of Health, Addis Ababa. 2005/2006*

2. Adhanom T, Deressa W, Witten KH, et al. Malaria. In: Berhane, Y., Haile-Mariam, D., Kloos, H. (Eds.), *Epidemiology and Ecology of Health and Disease in Ethiopia. Shama Books, Addis Ababa, 2006, PP. 556–576*

1.1.1 | AFAR REGIONAL STATE

The Afar Regional State (ARS) is located in the north-eastern part of the country. The region borders four national regional states i.e. in the north and north-west; Tigray region, in the west and south-west; Amhara region, in the south; Oromiya region and in the south-west; Somalia region. The ARS also shares international borders with Djibouti and Eritrea to the west and north-west, respectively. Administratively, the region is divided into five zones, which are further subdivided into 32 woredas and 404 kebeles. The total surface area of the region is estimated at 278,000 km².

According to official statistics, the region's population is about 1.5 million; of which 90% are pastoralists and 10% are agro-pastoralists. The rural population comprises about 92.2% of the total population. The major ethnic groups according to the Central Statistical Authority (1994) are the Afar (91.8%), Amhara (4.5%), Argobba (0.92%), Tigrayans (0.82%), Oromo (0.7%), Welayta (0.45%), and Hadiya (0.013%). Ninety-six per cent of the population are Muslim, 3.86% are Orthodox Christians, 0.43% are Protestants, 0.09% are Catholics, and other religions comprise 0.02% of the population.

The region has a high population growth rate – 2.2%, a TFR of 4.9 children per woman and a corresponding crude birth rate of 37.3 births per 1000 population (2005). The infant and under-five mortality rates of the region are estimated at 61 and 123 per 1000 live births, respectively. Children under five years of age constitute about 14% of the total population, and the number of pregnant women in the region per year is about 70,000.

Afar is predominantly (90.8%) spoken in the region and is the working language of the state. Other languages with a significant number of speakers include Amharic (6.68%), Tigrigna (0.74%), Oromo (0.68%), Argobba (0.4%) and Wolaitigna (0.26%).³

The overall health status of the Afar population is poor, with women and children particularly vulnerable to poor health. Maternal mortality (720/100,000) and under-five child mortality (229/1000) are double the national average. Women have a particularly low status, face heavy workloads, are exposed to severe risks during pregnancy and delivery, and are unable to control safe sexual practices with partners, thus increasing their vulnerability to HIV/AIDS. All these undermine efforts to improve reproductive health. Traditional practices, including FGM (94.5% in Afar) pose human rights and public health concerns. Low uptake of contraception and early pregnancy affect maternal health, leading to obstructed

3. The 1994 census was delayed in the Afar region until 22 July 1996

labour, vesico-vaginal fistulas and foetal death. Currently there are low utilisation rates of reproductive health services, ANC and PNC (7.3%, 16.1% and 1.2% respectively). Less than 10% of births are attended by skilled personnel, and Afar is not equipped to provide emergency care.

The vital statistics of Afar region, Ethiopia in 2006/7 are shown in Table 1.1.

Table 1.1: Vital statistics of Afar region

Vital statistics indicator	Indicator value
Crude birth rate per 1000	37.3
Rate of natural increase	2.20
Total fertility rate	4.9
Infant mortality rate per 1000	61
Child mortality rate per 1000	66
Under-five mortality rate per 1000	123
Male life expectancy	56.9
Female life expectancy	50.8

Source: Health and Health-related Indicators in Ethiopia 2005/06

According to the 2005/06 Regional Health Bureau data, there are two hospitals, 14 health centres, 44 health stations and 83 health posts in the region. These are run by the government. In addition, there are 10 small and medium level privately-owned clinics and only one hospital which is operated by a non-governmental organisation. There is no health training school in the region. In 2005/06, there were only 10 physicians and 10 health officers working in the area. The health professional to population ratio is very low with one physician serving 138,900 people (WHO standard is 1:10,000), and one nurse serving 5,426 people (WHO standard is 1:5000).

Malaria transmission in the region is generally unstable, with perennial transmission in areas along the Awash River Valley. In 2006/07, there were a total of 289,852 cases of all types of malaria. There were 20,323 under-fives and 1605 pregnant women with malaria who were attended to in the outpatient department the same year. In addition, there were 625 under-fives and 64 pregnant mothers with severe malaria admitted in the region .⁴

In the Demographic Health Survey estimates for Afar region, 21% of households owned at least one type of mosquito net, and only 6% had more than one net. About 6% of households reported owning at least one insecticide-treated mosquito net (ITN). According to the survey carried out in 2005, about 14% of children less than five years of age slept under a net the preceding night and only 3% of the children slept under an ITN. About 12% of all women (15-49 years) and 13.3% of pregnant women slept under a net the preceding night. Similarly, 3.8% of all women aged 15-49 years and 6% of pregnant women slept under an ITN. The 2005 Ethiopian DHS also showed that among 10,000 children less than 5 years, 18.7% had experienced fever within the previous two weeks (17% in Afar). While fever is a common symptom of malaria onset, 6.6% of those surveyed had received an anti-malarial drug within 48 hours.

1.2 | THE NATIONAL PROGRAMME

Malaria remains the leading cause of morbidity and mortality in Ethiopia. Combating HIV/AIDS, malaria and other diseases is among the eight Millennium Development Goals. The achievement of this goal will also contribute to reduction in maternal and child mortality.⁵

The annual report (2005/06) of the Federal Ministry of Health (FMOH) in Ethiopia states that malaria accounts for 17.8% of outpatient consultations, 14.1% of admissions and 21.8% of inpatient deaths. The disease mainly affects those living in rural areas due to the existence of abundant mosquito breeding sites, poor housing conditions and inability to afford preventive measures, coupled with low awareness of the preventive methods.

The Ethiopian Health Policy indicates that malaria is second in the list of priority issues. It is also part of the policy strategies in the health policy. As common communicable diseases and malnutrition are the major health problems accounting for about 75% of the problems, the policy has placed emphasis on interventions that reduce the impacts of these common health problems⁶. The Health Sector Development Programme III of Ethiopia has also considered the prevention and control of malaria as an integrated programme within the health system. The Health Service Extension Programme has also included malaria prevention and control among its 16 packages.⁷

Ethiopia's major malaria transmission season occurs between September and December following the June-August heavy rainfall, while the second peak, though less pronounced and mainly limited to the eastern and south-eastern parts of the country, occurs during April and May, following the short rains. However, perennial transmission occurs in lowland areas with permanent water bodies such as Awash and Genale, and in some peripheral areas of the western and south-western parts of the country.

The epidemiological pattern of malaria transmission in Ethiopia is generally seasonal and highly unstable due to variations in topography and rainfall patterns. Hence, large-scale epidemics frequently occur particularly at higher altitudes. Marked variations in the level of transmission from place to place or seasonal fluctuations in the number of cases are the main features of malaria transmission in Ethiopia. As a result of the short peak transmission and the relatively long duration of low transmission during the dry season, people are highly vulnerable to malaria due to lack of acquired immunity that comes with frequent exposure to malaria infections, resulting in the occurrence of frequent epidemics.

5. UN Millennium Development Goals available at www.un.org/millenniumgoals accessed on July 16, 2008

6. Health Policy of Transitional Government of Ethiopia, 1993

7. Health sector development plan of Ethiopia 2005-2010, Federal Ministry of Health Ethiopia

The main technical elements of the malaria prevention and control programme comprise early diagnosis and treatment, vector control and epidemic prevention and control. The supporting strategies include human resource development, operations research, information, education and communication, and programme monitoring and evaluation.

In order to reduce the overall burden of malaria by 50% in 2010, the national malaria prevention and control programme has been working to achieve the following:

(a) 100% access to effective and affordable treatment for malaria: this aims to increase the proportion of fever-related cases receiving treatment at health facilities (35.6% in 2005). It also includes training of health workers to ensure an increase in proportion of health facilities with at least one health worker trained on malaria diagnosis and treatment guidelines (53.6% in 2005). The programme also distributes diagnosis and treatment guidelines to raise the proportion of health facilities that receive the national malaria diagnosis and treatment guidelines (53.6% in 2005).

(b) 100% coverage of all households with ITNs, with at least two ITNs per household: this method aims at vector control through the use of Long Lasting Insecticide Treated Nets (LLITNs). An estimated 15.5 million LLITNs had been distributed to users by 2005. In the same period, 5,108,168 nets had been procured for future distribution. By the end of 2005, a further 700,000 nets had been secured with negotiation from partners. The total coverage was 88%, with at least two ITNs per household.

(c) Early diagnosis through the use of rapid diagnostic tests: for the diagnosis of suspected malaria cases in areas where laboratory facilities are limited, rapid diagnostic tests are used.

(d) Early detection and management of 80% of the malaria epidemics within two weeks from onset: this method is intended to increase the proportion of epidemics detected within two weeks of onset (31% in 2005). This follows from an increment in percentage of districts with adequate epidemic preparedness plan on average (47.8% in 2005). This increment means training more health workers (6357 trained at the end of 2005) on the national epidemic prevention and control guidelines and distributing the guidelines to health facilities (2562 guidelines distributed at the end of 2005). It also requires instituting malaria epidemic monitoring charts at health facilities (2213 health facilities were using the guidelines by the end of 2005).

(e) Raising awareness of the public on the disease: several methods have been designed to enhance the awareness of the public on malaria transmission, symptoms, prevention and treatment. Effective media coverage and malaria week are among the key activities used in raising the awareness of the community about the disease. Basic malaria education has been incorporated in the training of the various categories of community health workers.

(f) Anti-malaria drug resistance monitoring: in addition to the operational research on anti-malarial drug resistance, a monitoring activity for the three first-line drugs is being carried out in 17 hospitals in the country. This is aimed at detecting resistance and informing the policy on anti-malarial drugs in the country.

1.3 | THE MALARIA PREVENTION AND CONTROL PROGRAMME IN AFAR

Malaria control strategies are based on the biological basis of malaria transmission. Reducing breeding sites is one of the strategies. Malaria transmission can be interrupted by reducing mosquito survival to less than the duration of sporogony. Controlling transmission is more effective than merely reducing the mosquito density and indoor residual spraying is far superior to larvicide application or space spraying to attack the mosquito populations.

It is widely understood that malaria control is too complex to be addressed by a single approach. A multi-pronged strategy tailored to the prevailing ecological and epidemiological conditions is likely to be more successful. Three control strategies in place include mortality control, transmission control and eradication.

The objectives of the intervention in Afar were to:

- Increase the use of mosquito nets by pregnant women and young children
- Improve the quality of testing being carried out to diagnose malaria
- Develop systems that allow people to treat malaria with effective drugs in the home
- Educate communities about how to control the spread of malaria
- Strengthen AMREF's partnerships in Afar and to expand the programme to cover more areas of the district.

Expected outputs of the programme include:

- Reduced morbidity and mortality among young children and pregnant women
- Reduced occurrences of fever in children under five years
- Reduced occurrence of malaria among pregnant women
- Community knowledgeable on malaria transmission and prevention
- Increased capacity of target woredas to manage malaria epidemics.

1.3.1 | ACTIVITIES

AMREF's Malaria Prevention and Control Programme in Afar region focuses on improving case management at health facility level, increasing ITN coverage and utilisation at family level, and enhancing behaviour and social change in support of malaria prevention and control. The operational components are discussed.

Strengthening the capacity of health workers

The national anti-malarial drug policy replaced SP with artemether-lumefantrine (AL) as a first-line treatment for falciparum malaria, thus when AMREF started its malaria prevention and control programme in Afar, the MOH and the GFATM had provided adequate supply of AL to health facilities in the region. However, there was an acute shortage of health manpower with adequate skills. Recognising the need for training of health workers on malaria diagnosis and treatment in Ethiopia, particularly in Afar region, AMREF carried out a series of training workshops for all categories of health professionals drawn from all over the region on the correct use of the new anti-malarial. A total of 202 health workers from six different professional categories were trained on case management, each for about five days at the capital of the region, Semera, in June 2006. The health workers comprised 10 physicians and health officers, 27 pharmacy technicians, 35 senior nurses, 80 junior nurses, eight laboratory technicians and 42 frontline health workers.

Enhancing health facilities' capacity in diagnosis and treatment

AMREF in Ethiopia provided 27 binocular microscopes and adjuvant reagents worth US\$ 44,000 to Afar Region Health Bureau for distribution to health centres and hospitals in the region. The existence of *P. falciparum* and *P. vivax*, all with different regimens, and the high cost of artemether-lumefantrine heightened the need to improve the quality of laboratory diagnosis for malaria.

In order to improve diagnosis and management of malaria cases in areas where laboratory-based diagnostic service are not available, rapid diagnostic tests (RDTs) were introduced to complement clinical diagnosis. As a result, RDTs for malaria have offered a potentially simpler solution to malaria diagnosis in settings where microscopic facilities are unavailable.

Home-based management of malaria

Home-based management of malaria (HMM) has recently been promoted as a major strategy in the improvement of prompt access to effective anti-malarial treatment particularly in sub-Saharan Africa. In Ethiopia, access to health care facilities mostly by the rural hard-to-reach population is limited

due to geographical, economical and socio-cultural barriers. HMM is a simple and practical approach for improving the management of children with fever/malaria at community and household level.

Community-based malaria control interventions using community health workers (CHWs) and mother co-ordinators was adopted in the country in the 1990s to improve the population's access to early diagnosis and treatment, resulting in the decentralisation of facility-based malaria treatment at the village level. Consequently, malaria control strategies are closer to the community, and most first-line anti-malarial treatments are provided by CHWs. AMREF implemented HMM through mother co-ordinators and community health workers who train caregivers and refer cases early to the health facility.

Participatory communication tools and picture-based messages

To ensure participatory communication in malaria control, AMREF developed and tested a Participatory Malaria Prevention and Treatment (PMPT) toolkit in 2006 in collaboration with the Afar Regional State Health Bureau, *woreda* health offices and UNICEF.

The major topics in the toolkit focus on signs and symptoms of malaria, appropriateness of early diagnosis and prompt treatment with effective anti-malarial drugs (artemether-lumefantrine) particularly among the under-fives and pregnant women, traditional practices, the role of the mosquito in the transmission of malaria and preventive measures such as proper utilisation of ITNs/LLITNs, indoor residual spraying, and environmental management using simple pictures that can be easily understood by individuals at community level with little or no education.

The toolkit was developed and tested after a thorough analysis of the cultural and traditional beliefs towards malaria prevention and treatment, based on the findings of the baseline survey and focus group discussions of the studies carried out in 2005 and 2006, respectively.

Recruitment and training of mother co-ordinators

This included training of trainers for 24 participants selected from *woreda* health offices, peripheral health facilities, *woreda* administration offices, malaria control experts, AMREF staff, and partner NGOs such as International Committee of the Red Cross (ICRC) and UNICEF in Zone 3 of the Afar region. The trainers in turn

are supposed to conduct woreda-based training for mother co-ordinators. As a result, about 300 mother co-ordinators were trained in 2007 in five of the six districts in Zone 3.

The training of mother co-ordinators was conducted in two phases. The initial training took five days and topics covered included signs and symptoms of malaria, its mode of transmission, preventive measures with particular emphasis on ITNs/LLITNs utilisation, and the importance of early diagnosis and prompt treatment with effective anti-malarial drugs. The mother co-ordinators were then deployed to educate the community on the different aspects of malaria prevention and control. Each one was expected to educate 30 households. Thus a total of 9,000 households (about 45,000 persons) were reached with appropriate information.

Training local leaders

In pastoralist communities, traditional structures are more influential than the formally organised structures. Recognising this fact, AMREF in Ethiopia trained local leaders of the Afar pastoralist communities in malaria transmission and prevention strategies so that they could facilitate the interventions of the Foundation with regard to malaria. These local leaders were also involved in the recruitment of mother co-ordinators and distribution of ITNs. They generally facilitated the link between the health system and households.

ITN distribution

Door-to-door LLITN distribution was conducted to raise the ITN coverage in line with the increase in knowledge, attitude and practices of the community on malaria. AMREF co-ordinated the distribution of about 145,000 LLITNs in Zone 3 of Afar region. The educational efforts in the utilisation of ITNs have focused on pregnant mothers and children under five years, since they are the most vulnerable segments of the population.

1.3.2 | RESULTS OF THE INTERVENTION

Before the start of the programme, a baseline assessment on knowledge, attitude and practices of the community on malaria prevention and control was conducted.

Three operational research questions were set following the start of the programme:

- What are the test performances of RDTs compared to blood microscopy and Polymerase Chain Reactions (PCR) under field conditions in Afar?
- Can RDTs be handled by community health workers including the mother co-ordinators?
- How effective is the traditional cooling system (*beha*) in keeping the RDT kits at the recommended temperature (4-30°C) in Afar?

This baseline study established the status of the indicators of the programme's success in Afar region.

As a result of the programme's activities, the proportion of community members who correctly identified the transmission methods of malaria had increased from 27.4% in 2005 to 61.5% in 2007. This means there was a 34.1% increase in knowledge about the transmission of malaria among the community in the given programme period. In addition, knowledge of communities on the signs and symptoms of malaria had increased from 84.3% in 2005 to 88.4% in 2007 indicating an increase of 4.1%. This is because of the initial high baseline rate of knowledge.

On the other hand, knowledge on the prevention methods of malaria before and at the end of intervention remained at around 67.5%. This knowledge is simply whether the community members know some of the prevention methods of malaria. However, comprehensive knowledge about the prevention and control of malaria is still low in the target communities of Afar region.

As a result of the door-to-door distribution of LLITNs, the coverage of at least one ITN in the target communities had increased from 7.5% in 2005 to 70.2% in 2007. This has demonstrated the effectiveness of distributing LLITNs in conjunction with utilisation-focused health education. However, the need for replacement of torn and worn out ITNs is imminent.

The proportion of pregnant mothers who slept under ITNs the previous night in Afar community had increased from 27% in 2005 to 86.5% in 2007. Similarly, the proportion of children under five years who slept under ITNs the previous

night had increased from 17% in 2005 to 84% at the end of 2007. Besides, the increase in the ownership and the utilisation of ITNs can be attributed to the change in knowledge about the transmission methods of malaria among the target communities.

Treatment seeking behaviour for fever among the community had increased to 48%. Of those who sought treatment for fever, 16.4% did so within 24 hours of onset of fever. However, only 14.3% of under-five children with fever sought treatment within 24 hours of onset. This indicated that there were improvements in treatment seeking behaviour, but there were other limiting factors like long distances to access treatment services. During the years of AMREF's presence in the area, the epidemic occurrences in malaria declined significantly.

1.3.3 | RELATED ISSUES

Based on the experience of the Malaria Prevention and Control Programme in Afar, the sustainability, multiplier effects, attributability and cost-effectiveness issues are as follows.

Sustainability and multiplier effects

The major activities in the programme were training and deployment of mother co-ordinators, strengthening the health systems through training of health workers and support of health facilities, increasing ownership and utilisation of ITNs, and appropriate case management at the community and facility level. To address the concern of sustainability, the programme linked the mother co-ordinators and local leaders (trained and supporting the programmes) to the Health Extension Workers (HEWs). This was achieved by establishing a working team of HEWs, mother co-ordinators and local leaders at community level.

It is also assumed that the health system, the capacity of which was strengthened by this programme, would be able to take over and effectively handle the community-based malaria prevention scheme. For the communities in Afar, formal health systems transformed, strengthened, and included communities. District health plans integrated malaria prevention and control activities within the other activities.

The multiplier effects of using mother co-ordinators were designed systematically. That is, one mother co-ordinator was selected among 30 mothers based on relevant and locally applicable criteria. A mother co-ordinator was responsible for educating up to 30 mothers based on the distances between households. The health system has recognised the mother co-ordinators who are currently reporting to the nearby community health worker.

The Epidemic Prevention, Preparedness and Response Committee with a representative from the community was established in Afar Zone 3. The committee is currently working on early warning, preparedness and management of common epidemics and disasters like flooding. These initiatives have been adopted by NGOs and UNICEF to develop a comprehensive disaster prevention plan.

Though the sustainability of the effects of the intervention will depend on the continuous efforts of the health system in using the availed links with the community, AMREF in Ethiopia has laid the foundation. During the mid-term evaluation study conducted in December 2007, it was evident that the knowledge and practices embedded in the community-owned social capital was still operational.

Attributing results to intervention

At the beginning of the malaria programme, AMREF conducted a baseline study in six districts of Afar region zone 3. This baseline set the benchmarks for the monitoring and evaluation of the programme. The malaria programme intervention was in place in all the six districts of the zone. The activities were monitored every three months and the final evaluation was conducted in all the six districts.

The evaluation design used was the non-randomised pre-intervention and post-intervention comparison of the basic indicators. This described the difference between the initial and final measures of the indicators. The limitation in using this design is that it only provides the status of the indicators at the beginning and end of a programme. The changes may not be completely attributed to the intervention put in place.

However, the changes in the indicators in the Afar situation can mostly be attributed to the malaria programme implemented by AMREF since it was the sole community-based intervention in the area. Other stakeholders were mainly focused on HIV/AIDS and other reproductive health issues.

It is evident that there are cross-cutting interventions like the media that disseminates information on malaria prevention and control. There are also movements of the Afari people that can expose them to different types of information on malaria.

Table 1.2 : Comparison of baseline and end-line indicators of the programme

Variable	Baseline	End-line	Change
Proportion of community members who correctly identified the transmission methods of malaria	27.4%	61.5%	34.1%
Knowledge of communities on the signs and symptoms of malaria	84.3%	88.4%	4.1%
Knowledge of the prevention methods of malaria	67.5%	67.5%	0%
The coverage of at least one ITN in the target communities	7.5%	70.2%	52.7%

Variable	Baseline	End-line	Change
The proportion of pregnant mothers who slept under an ITN the previous night	27%	86.5%	59.5%
The proportion of under-five children who slept under an ITN the previous night	17%	84%	67%

Though the whole change cannot be attributed to the Malaria Prevention and Control Programme, there is no doubt it has contributed to the majority of the changes in the basic indicators.

Cost-effectiveness of the programme

Besides the direct comparison of the cost incurred in the implementation of this programme and the actual outcomes, there are several proxy indicators that indicate the cost effectiveness of the programme. Above all malaria prevention and control activities in Afar region, where pastoralists are dominant and remained under-served by the formal sector (both service and information), is an issue of equity. Moreover, malaria prevention is not all about disease prevention and curing; the benefits are above and beyond the individual. For instance, a community-based cross-sectional study of 2195 households in the nearby zone of Oromia, East Shewa (Adami Tulu district) in 2003 indicated that among 12,225 surveyed individuals, 1748 (14.3%) reported perceived malaria during the preceding two weeks. Seventy-seven per cent (77%) sought some form of treatment and 70% had recovered at the time of interview. The average treatment cost per patient at private clinics was Birr 24.00 (\$2.76) and Birr 12.50 (\$1.44) at public facilities. The average estimated direct cost of malaria per patient was Birr 14.00 (\$1.60); the average indirect cost, Birr 35.26 (\$4.08). Only 5% of all households reported any preventive expenditure in the preceding month, with a mean of Birr 0.76 (\$0.09). Thus, externalities (economic, social and environmental) are visible in such interventions.

The use of community-owned social capital

Mother co-ordinators are volunteers who are motivated to work without being paid. Local technologies like PMPT and picture-based messages were designed locally. The traditional system was used to reach the community. All these indicate that the most cost-effective methods were used rather than the formal and costly methods. Community members easily detect fever using community embedded capacity and refer children and women to health facilities, which implies no cost for initial diagnosis.

Working within the existing structure and infrastructure

The programme activities were aligned to the national malaria prevention and control strategy which enabled the utilisation of facilities and human resource established by the government of Ethiopia. ITNs were also accessed from UNICEF for distribution.

PMPT tools

The cost of PMPT tools reproduction is as easy as writing on a piece of paper and laminating it. Reproduction and distribution of PMPT tools can be handled by anyone. The tools are easily portable, usable and replicable. They are also flexible for adoption and community needs and changes can be incorporated as needs arise with minimal support from specialists and professionals. Once a PMPT tool is produced it can be utilised for a number of years.

Capital goods

At the end of the programme capital goods such as computers, vehicles and microscopes with a current book value of USD 72,720 will continue to serve the community.

Beneficiary/dollar ratio

The programme results are obtained with an investment of USD 4.2 per beneficiary. This is less than an average health expenditure of a family's single hospital visit. The cost is equivalent to an earning of three healthy days, assuming that an Ethiopian unskilled labourer earns USD 1.5 per day (Yared, 2006).⁸ Conversely, given the prevalence of 13.7% (final evaluation figure reported for two weeks, the lowest figure after intervention), within the beneficiary of 210,000, it is estimated that 28,770 individuals suffer from fever every two weeks. If the patients are sick for only one day, and are not engaged in any economic activity, the population loses USD 949,410 within one year inclusive of treatment cost. As indicated above⁹ the average estimated direct cost of malaria per patient was Birr 14.00 (\$1.60); the average indirect cost was Birr 35.26 (\$4.08). Thus, the programme investment per beneficiary can be safely described as cost effective. Harsh environmental conditions, the need to travel long distances to reach communities, and mobility of the community during the implementation of the programme accounted for a lot of the challenges.

8. Yared Birhanu (2006): *Determinants of Daily Earnings in the Plantation Sector*, MA Thesis, Department of Development Studies Addis Ababa University.

9. See Wakgari et.al (2008)

1.3.4 | LESSONS LEARNED

The following lessons were learned from this intervention.

The need for concurrent actions on health workers and health facilities

Building the capacity of human resource for health cannot result in change if the health facilities' capacity is not enabled to exercise the built capacity. In this programme, the effectiveness of concurrent actions on health workers and health facilities is demonstrated.

Linking mother co-ordinators with the health system

The malaria programme in Afar region has implemented its community-based interventions using mother co-ordinators selected by the community, requiring the need to link them to the health facilities in the areas. The critical issue with respect to sustaining the services of community-based mother co-ordinators is that they provide the services without payment, making it difficult to maintain their motivation. In this regard, there is an evident need to link the mother co-ordinators with the HEWs assigned in their villages.

Involving local community leaders in health interventions

In pastoralist communities there are local traditional leadership systems that are deep-rooted and respected by the majority of community members. This programme recognised the role of the traditional leadership system and utilised it to reach and influence the behaviour of the community at large. Thus, the greatest lesson learnt is that interventions can be facilitated if the local structure is recognised and well utilised.

Involving the local health system in programme activities

The district, zonal and regional structures play a crucial role in formulation and implementation of policies. The most effective strategy in influencing policy and practice is to involve policy makers during the early stages of programme implementation. The Malaria Prevention and Control Programme in Afar involved the district health systems in all critical activities of the programme.

Door-to-door distribution of insecticide treated nets

The most reliable method to ensure a service reaches and is used by households is to provide the service directly to the target community and educate them on the utilisation. The malaria programme had implemented door-to-door distribution of LLITNs with concurrent education on its utilisation. This has contributed a lot in narrowing the difference between possession and utilisation.

Utilisation of locally applicable technology for intervention

Modern and electronic materials are hardly used in nomadic communities. The programme thus developed locally applicable and culturally-sensitive methods. AMREF designed user- and consumer-friendly PMPT and complementing picture-based messages. In addition, counting of gravel was used to report activities by mother co-ordinators.

1.3.5 | RECOMMENDATIONS

Based on the experiences in the implementation of the Malaria Prevention and Control Programme in Afar, the following recommendations were made:

1. Given the high turnover of trained staff in Afar region, there is continuous need to provide in-service training for the new health workers. In addition, there should be a system in place to retain the trained staff.
2. Since communities are the centre of a health system, the district health offices should utilise the community structures to narrow the gap between the communities and the health system. It would also be helpful to create networks and organise these structures for successful implementation.
3. To effectively reach the community with user-friendly services the mother co-ordinators should have a greater role. Hence there is need to integrate these co-ordinators' activities with those of the rest of the health system to ensure appropriate follow up.

Generally, this programme has demonstrated a reasonable and replicable model of malaria prevention and control by strengthening and linking the different segments of a health system in pastoralist communities. Enhancing the capacities of health workers and health infrastructure at facility level, improving the capacity of the community to own their health, and creating a linkage between communities and the health facilities by community accepted agents were the key components.

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