THE
CARTER CENTER

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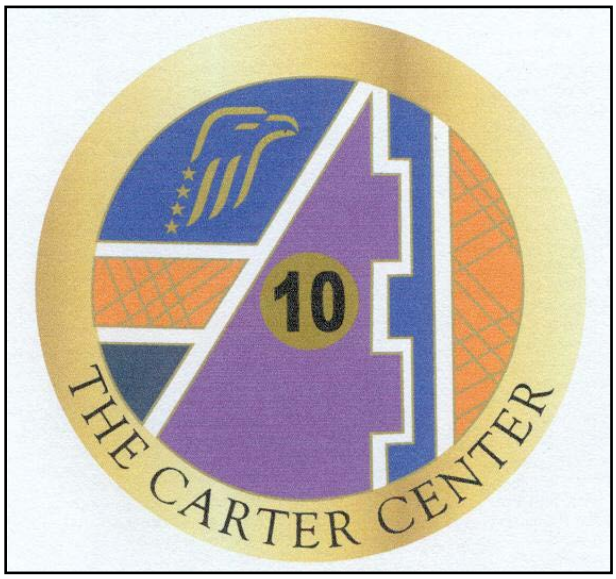
SUMMARY PROCEEDINGS

3rd ANNUAL MALARIA CONTROL PROGRAM REVIEW
Ethiopia and Nigeria

Held on February 24, 2012 at
The Carter Center, Atlanta, Georgia

September 2012



In 2011, The Carter Center surpassed the milestone of helping the Nigeria and Ethiopia Ministries of Health to distribute 10 million insecticide-treated bed nets to fight malaria and lymphatic filariasis since 2004. On this pin, the hatched line pattern and the color white, which respectively symbolize "heroic efforts" and "peace" in Nigeria, represent the millions of people now able to sleep peacefully, undisturbed by biting mosquitoes that transmit these diseases.

Design by Sherri Richards

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ACRONYMS

ACT	Artemisinin-based Combination Therapy
ACSM	Advocacy, Communication and Social Mobilization
AMFm	Affordable Medicine Facility – Malaria
ATO	Annual Treatment Objective
BCC	Behavior Change Communication
CDC	Centers for Disease Control and Prevention
CDDs	Community Directed Distributors
CDTI	Community Directed Treatment with Ivermectin
CHP	Community Health Promoter
CI	Confidence Interval
FMOH	Federal Ministry of Health
FCT	Federal Capital Territory (Nigeria)
GF	Global Fund for AIDS, Tuberculosis and Malaria
HEW	Health Extension Worker
IEC	Information, Education and Communication
IDSR	Integrated Disease Surveillance and Response
IPTp	Intermittent Preventive Treatment of malaria for Pregnant women
IRS	Indoor Residual Spraying
ITN	Insecticide Treated Nets (both conventional nets and long-lasting nets)
LF	Lymphatic Filariasis
LGA	Local Government Area
LLIN	Long-Lasting Insecticidal Nets
M&E	Monitoring and Evaluation
malERA	Malaria Eradication Research Agenda
MACEPA	Malaria Control and Evaluation Partnership in Africa
MCP	The Carter Center Malaria Control Program
mf	Microfilariae
MalTra weeks	Malaria and Trachoma (Carter Center integrated activity involving mass drug administration for trachoma, and malaria testing and treatment for people with fever)
MDA	Mass Drug Administration
MIS	Malaria Indicator Survey
MOU	Memorandum of Understanding
MOH	Ministry of Health
NMCP	National Malaria Control Program
NTD	Neglected Tropical Disease
PATH	Program for Alternative Technology in Health
RBM	Roll Back Malaria Program
RDT	Rapid Diagnostic Test
SNNPR	Southern Nations, Nationalities and People's Region
TCC	The Carter Center
ZPC	Zone Project Coordinator (Ethiopia program)

EXECUTIVE SUMMARY

The Carter Center's Malaria Control Program (MCP) provides support to national malaria programs in Ethiopia and Nigeria, with a particular focus on delivering and monitoring activities at the grassroots level. MCP activities can be classified into three main categories: programmatic interventions, monitoring and evaluation, and operational research (See Annex 1 for a history and more detailed overview of the MCP). The MCP works to develop better strategies for distributing and encouraging the use of long-lasting insecticidal nets (LLINs), and is exploring ways that malaria interventions can be coordinated with mass drug administration (MDA) for neglected tropical diseases (NTDs) (See Annex 2), with added benefits for all disease programs working in an integrated manner. These strategies capitalize on The Carter Center's (TCC) established expertise in helping governments to mobilize community volunteers for large-scale community-based drug distribution campaigns to control and eliminate NTDs. The MCP strives to produce the highest quality data to inform decision-making and to advance the global malaria elimination objective by testing the potential to interrupt transmission when existing tools are implemented at scale, and in new ways.

In keeping with its principle of starting with the most difficult places first, the MCP focuses on Nigeria and Ethiopia. These nations are critical to the success of the global program to control and eliminate malaria given that approximately 20-30% of all African malaria cases occur in these two countries alone. Each country presents different challenges for malaria control. For example, Ethiopia has unstable seasonal malaria and is prone to periodic epidemics. *Plasmodium vivax* infections, which are difficult to cure, account for at least 40% of all malaria cases in Ethiopia. Ethiopia has made great progress in the scale-up of coverage with LLINs, indoor residual spraying (IRS), and malaria treatments: the national program distributed a total of over 41 million LLINs between 2004 and 2011, achieved nearly 60% coverage of targeted households with IRS in 2011, and provided 11 million doses of malaria treatments to health facilities in the public health system. The Ethiopian national plan envisions subnational transmission interruption ('elimination in select areas'). In Ethiopia, the MCP assists the following regional states: Amhara, Oromia, Southern Nations Nationalities and People's Region (SNNPR), Gambella, and Beneshangul Gumuz. Nigeria experiences stable year-round transmission with seasonal peaks each year, and is just beginning to scale-up interventions. Here, nearly all malaria infections are caused by *Plasmodium falciparum*. Accordingly, the MCP focus in Nigeria remains on LLIN distribution and encouraging LLIN use in the nine states supported by TCC: Abia, Anambra, Delta, Ebonyi, Edo, Enugu, Imo, Nasarawa and Plateau. In both countries, TCC provides support to the national program for planning and implementing key malaria interventions, and evaluating progress towards national targets.

The third annual review of the MCP was convened on February 24, 2012, at TCC headquarters in Atlanta. Participants in the meeting joined staff from TCC and the Ethiopia and Nigeria Ministries of Health (MOH) to discuss the successes and challenges experienced by the Malaria Control Programs in each country during the 2011 calendar year, and to recommend concrete actions and measurable objectives for 2012. The review focused on Nigeria and Ethiopia country-specific progress reports from the Center's field offices and MOH partners. The country presentations illustrated ways that TCC is applying its experience with integrated grass-roots health programs to strengthen malaria control efforts in both countries. They also demonstrated The Center's work to develop and model innovative strategies for malaria control, both in routine programmatic activities and in smaller operational research and pilot

projects. Additional special sessions highlighted unique activities (current or upcoming) in each country.

Among those present were General Yakubu Gowon, former head of state of Nigeria, and his wife Mrs. Victoria Gowon, who both have a long history of collaborating with TCC in health advocacy efforts. The Bill & Melinda Gates Foundation, Malaria Control and Evaluation Partnership in Africa (PATH/MACEPA), the Centers for Disease Control and Prevention (CDC), Emory University, the Institute for Global Health of Barcelona, Vestergaard-Frandsen, Chevron, Council of State and Territorial Epidemiologists, the Saudi Fund for Development, Sightsavers, and the Task Force for Global Health were also represented. Dr. Frank Richards (Director of TCC's Malaria, Onchocerciasis, Lymphatic Filariasis and Schistosomiasis Control Programs) and Dr. Paul Emerson (Director of TCC's Trachoma Control Program and Co-Director of the MCP) co-chaired the meeting.

In 2011, the MCP surpassed the milestone of 10 million insecticide-treated nets and long-lasting insecticidal nets (ITN/LLIN) distributed with support from TCC since 2004 (Figure 1); by the end of 2011, the total LLINs distributed with MCP assistance was 10,254,242. Participants at the program review meeting all received a colorful commemorative lapel pin (see Frontispiece) to celebrate the occasion.

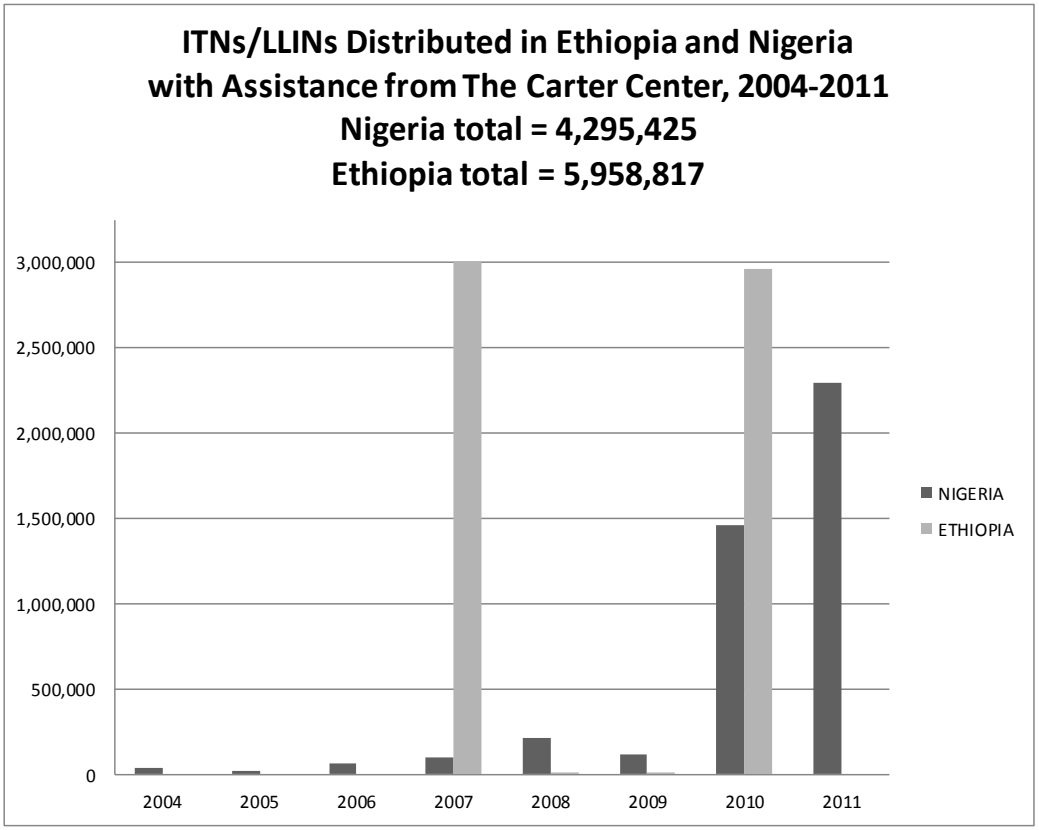

Figure 1. Annual number of ITNs/LLINs distributed in Ethiopia and Nigeria with assistance from The Carter Center, 2004-2011.

Malaria elimination

The MCP is committed to demonstrating the potential to interrupt malaria transmission in even the most challenging situations when current (imperfect) tools are implemented at scale. Rather than waiting for the development of new technologies to address this goal, we are working to find new ways to use existing technologies in a more aggressive manner and with a focus on stopping transmission altogether, rather than only reducing morbidity and mortality.

During this year's review meeting, discussions were framed by presentations that focused on the current global interest in malaria elimination, highlighting the challenges and potential strategies for achieving malaria elimination and establishing the context for the Center's malaria activities. Dr. Larry Slutsker (CDC) highlighted some of the key recommendations outlined in the malaria Eradication Research Agenda (malERA). His talk emphasized the need for improved surveillance, diagnostic tools, and strategies when shifting from malaria control (identifying and treating *cases*) to elimination (identifying and treating *infections*, including asymptomatic, latent and imported ones) (See Annex 3). Dr. Rick Steketee (PATH/MACEPA) gave an overview of current available strategies for reducing both mosquito-to-human and human-to-mosquito transmission of malaria, and emphasized the importance of developing improved methods for tracking transmission and its reduction. He presented a detailed example of a malaria transmission reduction and tracking strategy that PATH/MACEPA has employed in Zambia, and made recommendations for modifying this strategy for use in Ethiopia. Mr. Asefaw Getachew (PATH/MACEPA Ethiopia) described a proposed collaboration between the Ethiopian MOH,TCC and PATH/MACEPA to interrupt transmission in selected districts in Amhara region. Results and lessons learned from this project could inform future efforts to advance the goal of sub-national malaria elimination (see Annex 4).

SUMMARY OF PROGRAM REVIEW COUNTRY PRESENTATIONS

Nigeria

The presentation on the Nigerian National Malaria Control Program (NMCP) was given by Mrs. Chioma Amajoh, Director of the NMCP. The Nigerian malaria control strategy focuses on four primary interventions: LLINs, IRS, effective case management, and malaria prevention in pregnancy. The strategy also involves a number of cross-cutting strategies including: advocacy, communication and social mobilization (ACSM); procurement and supply chain management; monitoring and evaluation (M&E); program management; and intersectoral collaboration. The key accomplishment of 2011 was the completion of LLIN distribution campaigns in 12 states plus the Federal Capital Territory (FCT). As of the date of the program review meeting in February 2012, campaigns had been conducted in 28 of the 36 states, plus FCT, and a total of 45.7 million LLINs had been distributed, representing 71% of the target initially set for December 2010. Other major accomplishments included: the provision of IRS to 63,000 households in 13 states; the revision of national policy guidelines for the diagnosis and treatment of malaria; the launch of the Affordable Medicines Facility - malaria (AMFm) program in Nigeria; the introduction of a national strategy for ACSM; the analysis of data from the 2010 National Malaria Indicator Survey (MIS); and the establishment of a framework for coordinating malaria activities at all levels, with attention to each component of the strategic plan.

Mr. Adamu Sallau, malaria coordinator for the Carter Center's Nigeria office, reported on TCC's 2011 activities in Nigeria. In early 2011, 2.3 million LLINs were distributed in Enugu and Ebonyi

states, bringing the total number of nets distributed in Nigeria with TCC-assistance to nearly 4.3 million. Mr. Sallau described advocacy by General Gowon to accelerate the distribution of 6.5 million nets in the four TCC-assisted states that had not yet begun mass campaigns. To encourage the consistent and appropriate use and care of bed nets where LLINs have been distributed, TCC Nigeria assisted Ebonyi state's Roll Back Malaria (RBM) team with the design and implementation of a community-based behavior change communications (BCC) strategy. At baseline, 74.3% of household owned at least one net, 83.8% of nets were hanging, 83.0% of nets were used the previous night, and 65.6% of people reported sleeping under a net the previous night. After six months of intervention, 100% of households owned at least one net, 95% of LLINs were observed to be hanging, 98% of LLINs were used the previous night, and 97% of people reported sleeping under a net the previous night– all significant improvements from baseline.

Mr. Sallau also presented results from surveys conducted in Plateau and Abia states which showed the highest malaria prevalence among children 5-14 years of age, a group not traditionally targeted by malaria interventions. Net ownership prior to the mass campaigns was 7.2% in Abia and 35.1% in Plateau. A separate coverage survey conducted by the Center in Plateau state in January 2011 indicated that 82% of households owned at least one net after the campaign. Data were also presented from a study conducted in Southeast Nigeria on the effects of insecticide treated nets on both lymphatic filariasis (LF) and malaria transmission using insecticide treated nets (without MDA). The study demonstrated, using entomological (mosquito dissection) data, that LF transmission can be interrupted by LLINs alone. Comparisons of data from different local government areas revealed localized differences in the trends in malaria and anemia prevalence over time.

Dr. Emmanuel Miri, the country representative for The Carter Center in Nigeria, announced a meeting jointly organized by TCC and the Nigeria FMOH to encourage collaboration between malaria and LF programs for the accelerated scale-up of both programs. The meeting, co-hosted by the Nigeria MOH and TCC, was held in Abuja, Nigeria on March 27-28, 2012. A summary of this meeting is provided in Annex 5.

Ethiopia

The 2011 progress report on the malaria activities of the Ethiopia FMOH was presented by Ms. Hiwot Solomon, the national malaria program focal point. The goals of the Ethiopia National Strategic Plan for Malaria are to achieve by 2015: 1) Malaria elimination within specific geographical areas with historically low malaria transmission, and 2) Near zero malaria transmission in the remaining malarious areas of the country. Ms. Solomon described the specific strategies that Ethiopia is employing to reach these goals: community empowerment and mobilization through the health extension worker (HEW) program and a recently introduced "Health Development Army," diagnosis and case management (including the provision of free ACTs and RDTs at the community health post level), surveillance, health systems strengthening, and capacity building. Some key accomplishments of 2011 include trainings on RDTs and integrated community case management of malaria for health extension workers and their supervisors; the distribution of 11 million doses of ACTs and 20 million RDTs to Ethiopian health facilities; the provision of indoor residual spraying to nearly 6 million households (57.2% of target); the revision of national Epidemic Preparedness Guidelines; and the distribution of 20,000 epidemic monitoring charts to HEWs in rural health posts. In 2011, approximately 2.6

million cases of malaria (both confirmed and clinically diagnosed) were reported in Ethiopia, down from approximately 4 million cases in 2010.

Mr. Solomon Kibret summarized TCC-supported malaria control activities in Ethiopia. The MCP in Ethiopia provided support to the FMOH and the Regional Health Bureaus for malaria control in Amhara, Oromia, Southern Nations Nationalities and People's Region (SNNPR), Gambella, and Beneshangul-Gumuz regions. This support consisted of routine monitoring of LLIN ownership and use, supportive supervision to improve the quality of case management and epidemic monitoring at a total of 662 health facilities, training of health workers on malaria diagnostics and treatment and, in Amhara region, mass screening and treatment of fever cases in the context of MDA campaigns for trachoma (MalTra weeks). Including training for MalTra week campaigns, an estimated 7,801 health workers received malaria training in 2011. A total of 48,715 cases of malaria were treated through MalTra weeks VI (East Amhara, May 2011) and VII (West Amhara, November 2011). These campaigns reach an estimated 98% of Amhara's population annually.

In addition, TCC provided support for Ethiopia's 2011 Malaria Indicator Survey (MIS)—a standardized nationwide survey to measure: access to, coverage and use of key malaria control interventions; prevalence of malaria-related fever, parasitemia and anemia; and malaria knowledge, attitudes and practices of women of reproductive age. TCC staff from headquarters and from the Ethiopia office assisted with survey design and training of survey teams (more than 300 personnel), provided financial, logistical (vehicles), and supervisory support for the Amhara phase of the survey, and continue to provide technical assistance for summary, analysis, and writing. The survey targeted an estimated 11,025 households, making it the largest MIS survey conducted in any country to date.

Dr. Gregory Noland presented a newly-developed malaria surveillance tool that was developed in partnership with the Amhara Regional Health Bureau to help monitor malaria data at the district level. Using weekly data reported by each district health office, this Excel-based system provides a central "dashboard" page displaying visual trends in reporting, malaria testing, total cases, incidence, and other relevant indictors in a customizable layout. This system was recently introduced (December 2011) across all 10 zones of Amhara, and Dr. Noland will continue to work with Ethiopia staff to refine the system and to promote utilization of the data by MOH colleagues and TCC staff.

Conclusions and Recommendations

Dr. Donald Hopkins, Vice President of Health Programs at TCC, led the final session during which recommendations were proposed for each of the countries and for the Center's MCP generally.

RECOMMENDATIONS

GENERAL

1. Apply lessons learned from other Carter Center-assisted elimination programs to malaria elimination.

2. Lead the way in testing innovative strategies that are not part of the current global approach to malaria elimination. These potentially include starting with the most challenging places first and conducting mass drug administration for malaria.

NIGERIA

1. The state MOHs should support distribution of the remaining 6.5 million nets in Imo, Abia, Edo and Delta states, with TCC providing assistance according to its ability.

2. Introduce community-based behavior change communications (BCC), LLIN monitoring and LLIN replacement activities in Plateau state using CDDs and other community volunteers. These activities should employ a modified version of the strategy employed in Ebonyi state in 2010 that is less costly and more sustainable.

3. Develop and pilot strategy for strengthening malaria surveillance in Plateau and Enugu states.

4. Complete analysis of data from surveys conducted in Plateau, Abia, Imo and Ebonyi, and prepare manuscripts for publication.

5. Disseminate summary of the proceedings of the March 2012 Abuja conference widely to encourage collaboration between the malaria control and lymphatic filariasis elimination programs. (See Annex 5)

6. Increase efforts to share information about malaria activities in Nigeria with the global malaria community.

7. Launch surveys in Enugu as funds permit.

ETHIOPIA

1. Implement elimination strategy in selected woredas of Amhara Region, in collaboration with the Amhara Regional Health Bureau and PATH/MACEPA.

2. Develop systematic guidelines for responding to alerts provided by enhanced surveillance reporting system, and demonstrate that the system promotes rapid response to malaria case build-ups, outbreaks and epidemics.

3. Utilize results from 2011 Malaria Indicator Survey to direct program activities in Amhara.

Nigeria National Malaria Control Program Report

Presentation by Mrs. Chioma Amajoh, National Coordinator, National Malaria Control Program, Federal Ministry of Health

Background

Nigeria alone accounts for a quarter of the malaria burden in Africa. Malaria is endemic in Nigeria, with seasonal peaks during the rainy season. Almost 100% of the population is at risk for malaria infection and approximately 50% of the population will experience at least one episode each year. Malaria accounts for an estimated 66% of all health facility attendance and is responsible for 30% of deaths among children and 11% of maternal mortality in Nigeria. The social and economic burdens of malaria are also significant: malaria reduces the GDP of Nigeria by approximately 1% annually and is the leading cause of absenteeism.

The vision of the Nigerian National Malaria Control Program (NMCP) is a malaria-free Nigeria. The 2009-2013 NMCP Strategic Plan set ambitious targets of 80% of households owning at least two insecticide-treated nets (ITN), 80% of children under-five and pregnant women sleeping under an ITN, 100% of pregnant women attending antenatal care (ANC) receiving at least two doses of intermittent-preventive therapy (IPTp) and a 50% reduction in malaria morbidity and mortality.

Baseline data for evaluating progress towards the goal of reducing malaria-related morbidity and mortality by 50% were collected during a 2010 National Malaria Indicator Survey (MIS). This was the first national survey to assess malaria prevalence using rapid diagnostic tests and microscopy; previous demographic and health surveys had used fever in the past two weeks as a proxy for malaria. The final weighted results of the survey have not been released, but preliminary analyses suggest that prevalence of malaria is approximately 50% in children six months to five years of age and that insecticide-treated household net ownership is still well below the national target of 80%.

Though Nigeria did not meet its goals and targets for 2010, the country has made considerable progress in scaling up coverage with key interventions outlined in the national strategic plan. However, a number of challenges must still be addressed before Nigeria can achieve the aim of "getting to zero." Primary among these is addressing barriers to the completion of national long-lasting insecticidal net (LLIN) distribution campaigns. Until all of the LLINs have been distributed, the completion of the mass campaigns in the remaining states of Nigeria will remain the top priority of the NMCP. To achieve this goal, it will be necessary to apply the lessons of previous campaigns, as well as to "look inwards" to find additional financial resources.

Once the mass distribution campaigns have been completed, Nigeria will be able to turn more attention to the additional components of the strategic plan. Important next steps will involve introducing improved strategies to increase LLIN use; developing a robust national malaria surveillance system; introducing routine mechanisms to maintain high coverage with LLINs; and increasing access to prompt, effective and affordable treatment.

Nigerian National Malaria Control Strategy: Progress update

The Nigerian NMCP strategic plan focuses on four primary interventions: long-lasting insecticidal nets (LLINs), indoor residual spraying (IRS), effective case management, and malaria prevention in pregnancy. The plan also focuses on a number of cross-cutting strategies including: advocacy, communication and social mobilization (ACSM); procurement and supply chain management; monitoring and evaluation; program management; and intersectoral collaboration.

Long-lasting Insecticidal Net Distribution: Scaling up for Impact (SUFI)
In 2011, NMCP activities focused primarily on the continuation of the nationwide scale-up of LLIN distribution that began in 2009. The target is the distribution of 64 million LLINs in approximately 32 million households across 36 states plus the Federal Capital Territory (FCT). The NMCP strategy calls for the distribution of two LLINs per household through stand-alone mass campaigns designed to saturate states with LLINs as rapidly as possible. The campaigns are conducted by a variety of different partner organizations, in collaboration with the state Ministries of Health, using a standard implementation guide and toolkit, and with oversight by the NMCP.

Mass campaigns were conducted in nine states in 2009, an additional seven states in 2010, and 12 states plus FCT in 2011. As of February 2012, campaigns had been conducted in 28 of the 36 states, plus FCT (Figure 2). A total of 45.7 million LLINs had been distributed, representing 71% of the target initially set for December 2010. A total of nearly 13.9 million LLINs remained to be distributed in the following states: **Abia**[1], **Delta**, **Edo**, **Imo**, Kogi, Ondo[2], Osun, and Oyo. The delays in completing mass campaigns have been attributed to challenges associated with funding, coordination and the mobilization and engagement of the states.

Lessons learned during the campaigns that have been completed to date can be applied to future LLIN distribution and replacement campaigns in Nigeria. The experiences during the training process highlighted a need for increased planning, longer training, improved supervision and implementation of cascade training, smaller-sized training sessions and more practical exercises. The criteria for personnel selection were not always respected, due to political interference. With respect to funding, the NMCP found that it was difficult to mobilize sufficient financial contributions from the states to fill the budget gaps, and also that greater resources were needed for operational expenses and the management of waste generated during the campaign (discarded plastic bags). During the distribution itself, there were problems related to the production of appropriate numbers of net distribution cards (vouchers) in a timely fashion, and confusion regarding the definition of a household. Additionally, some households and communities were missed entirely. There is a need for greater state and local government area (LGA)-level engagement in the future, as well as for development of materials designed to create demand for malaria commodities, improved health education, and increased involvement of community leaders and the media. Supervision and monitoring must be strengthened to ensure sufficient data quality and the timely resolution of problems.

[1] *Note: **Bold** font is used to indicate states that are assisted by The Carter Center.*
[2] *Since February, the campaign has been completed in Ondo state (1,021,324 LLIN).*

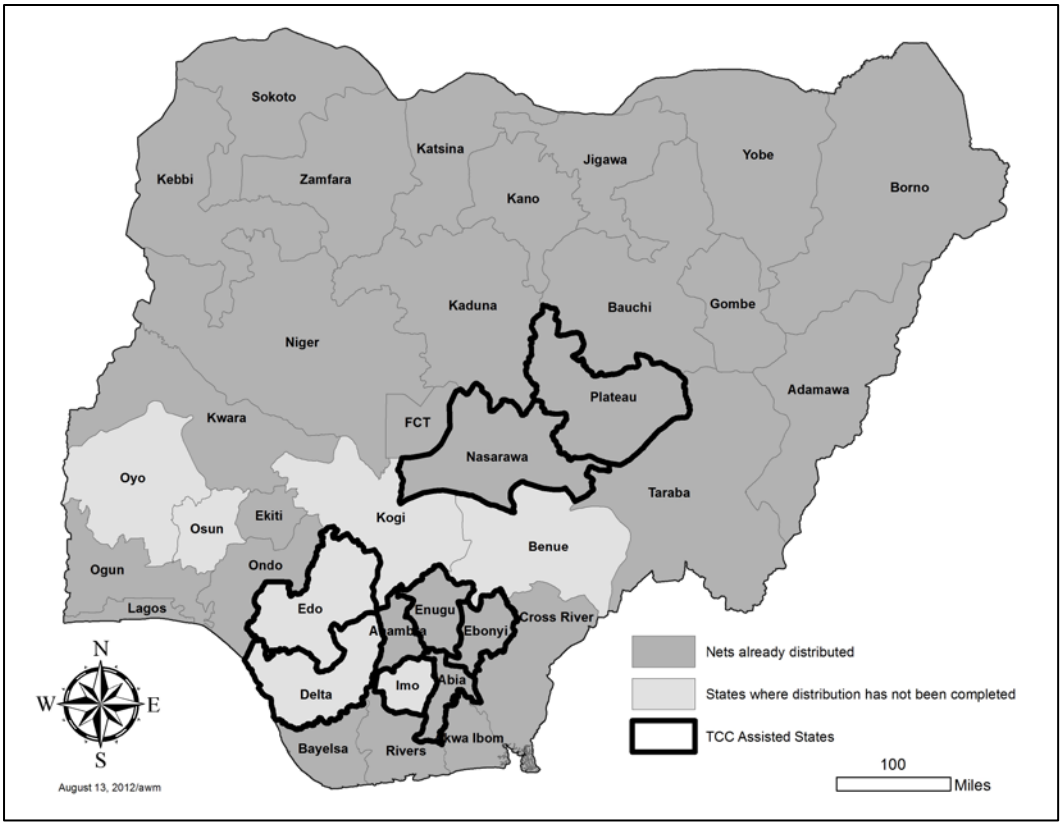

Figure 2. Status of national LLIN distribution campaigns as of February 2012.

While work remains to be done and a number of challenges must still be addressed, the successful LLIN campaigns conducted thus far reflect strong partnerships at all levels of the health system: the federal ministry and its partner NGOs, the state ministries, the local governments, communities, and individual volunteers. Nigerians have gone to great lengths to bring nets to even the most remote and hard to access communities.

In the states where mass campaigns have been completed, the NMCP plans to initiate routine distribution through immunization and ANC clinics, as well as child health days, in order to fill remaining gaps and maintain coverage rates. Additional components of the mixed method distribution system developed to achieve and sustain high coverage with LLINs include free or subsidized community-based "mop-up" campaigns and the sale of subsidized or at-cost LLINs through retailers, institutions, and local manufacturers.

Indoor Residual Spraying (IRS), Larviciding, and Environmental Management

The Nigerian target for IRS coverage is to spray 20% of households in the country (about 6 million) by 2013. IRS was implemented on a pilot basis in **Plateau**, Borno, Lagos, Adamawa, and Ogun states, and scaled up in one LGA in each of the seven states supported by the World Bank (Akwa Ibom, **Anambra**, Bauchi, Gombe, Jigawa, Kano, and Rivers). Lagos state has scaled-up IRS in a total of 8 LGAs. Select villages in Ondo state have also received IRS with support from the United Nations Development Project (UNDP). States supported by the Millennium Village project are scheduled to scale-up IRS in 2012, as is the President's Malaria Initiative-supported state of **Nasarawa**. A total of 63,000 households had been sprayed at the time of the program review meeting. In preparation for the gradual scale-up of IRS nationwide, trainings on malaria entomology have been conducted for the following people:

entomology technicians in two LGAs of **Nasarawa** state; state RBM vector control officers in **Nasarawa**, Niger, **Abia**, Borno, Katsina, and Bayelsa; and principal investigators in World Bank-supported states (listed above).

Larviciding activities have been piloted in four states: Rivers, Lagos, Jigawa, and **Nasarawa**. A strategic plan to guide the scale-up of larviciding nationwide has been prepared.

The responsibility for environmental management is shared between the Federal Ministries of Health, Environment, Water Resources, Agriculture, and Education. A training on waste management for malaria control was convened on July 19-22, 2011. A waste management plan for the seven World Bank-supported states is currently being prepared.

Case Management and Intermittent Preventive Therapy in Pregnancy (IPTp)

The Nigerian NMCP has recently updated national policy and guidelines for the diagnosis and treatment of malaria. Importantly, new guidelines have been developed for parasite-based diagnosis and the use of RDTs to complement microscopy.

On March 31, 2011 the First Lady of Nigeria officially launched Phase 1 of the Affordable Medicines Facility–malaria (AMFm) program in Nigeria. AMFm enables countries to purchase first-line malaria treatments at significantly reduced costs and to pass those cost savings on to patients at both public and private sector facilities. In Nigeria, artemisinin-based combination therapies (ACTs) will be provided at no cost at public health facilities.

In 2011, 39.4 million treatment courses were received through the AMFm program, 31 million fewer than the total 70.4 million approved. The balance of treatments should be delivered in 2012. Other procurements of malaria supplies for 2011 included 7,350,000 doses of sulphadoxine pyrimethamine (SP) for the treatment of pregnant women during ANC; 5,186,753 rapid diagnostic tests (RDT) for malaria; and 811 microscopes for secondary and tertiary health facilities.

Advocacy, Communication, and Social Mobilization

The national Advocacy, Communication, and Social Mobilization (ACSM) strategic framework and implementation plan was introduced in the spring of 2011. As part of this strategic plan, journalists from all zones have been trained to conduct in-depth reporting on malaria, and radio and television broadcasts have been prepared and disseminated nationwide. In addition, feature articles on malaria have been published in the leading Nigerian newspapers, a radio documentary on malaria has been produced, a quarterly newsletter entitled “Malaria News” is being published, and the NMCP is collaborating with the Nigeria Inter-Faith Action Association to mobilize religious leaders in the fight against malaria. The NMCP has reviewed its own information, education and communication (IEC) materials and is working to harmonize the malaria messages disseminated by various partners nationally.

Procurement and Supply Chain Management

A new malaria commodity logistics system has been developed and, in six World Bank-supported states, MOH staff at the state (n=148), LGA (n=1548) and health facility (n=6809) levels have received training on the new system.

Monitoring and Evaluation

A National Malaria Indicator Survey was conducted at the end of 2010 and the data entry and analyses were completed in 2011. This survey provided baseline data that will be used to evaluate subsequent malaria control activities in Nigeria. Additional baseline information was obtained through a Lot Quality Assurance Sampling Survey (LQAS), and a Malaria and Anthropomorphic Baseline Assessment. The national monitoring and evaluation forms and tools have been revised and distributed nationwide, and health service providers have been trained in their use.

Drug quality assurance and adverse event monitoring are ongoing. Drug therapeutic efficacy is being monitored in seven sentinel sites throughout the country. These sites are located in the following states: Oyo, Borno, **Plateau**, **Enugu**, Lagos, Kaduna,and Cross Rivers. An additional seven sites will be included in 2012 (Kano, Sokoto, Yobe, Kwara, Bayelsa, **Anambra,** and **Imo**).

Program Management and Intersectoral Collaboration

The Nigerian NMCP has developed a framework for the effective coordination of malaria activities at all levels, with attention to each component of the strategic plan. A partner's profile showing the location and activities of each partner has been developed. The proposal and budget have been prepared for a comprehensive malaria program review.

The Carter Center Malaria Control Program: Nigeria Progress Report

Presentation by Mr. Adamu Sallau, Malaria Program Officer,
The Carter Center, Nigeria

The Carter Center-Assisted Malaria Control Program in Nigeria: Priorities and Activities

The priorities of the Carter Center's Malaria Control Program (MCP) in Nigeria are to provide assistance to the federal and state Ministries of Health for their malaria activities and to demonstrate the effectiveness of innovative approaches to malaria control in order to reduce and eventually eliminate malaria transmission in nine states assisted by The Carter Center (TCC): Abia, Anambra, Delta, Ebonyi, Edo, Enugu, Imo, Nasarawa, and Plateau (Figure 3). Malaria control activities in Nigeria have been integrated with TCC's other disease control and elimination programs since 2004 when the Center began distributing insecticide treated bed nets (ITNs) in the context of mass drug administration (MDA) in Plateau and Nasarawa states. Integration has continued to be a defining characteristic of the Center's malaria activities, with particular emphasis on the effectiveness of LLINs for both malaria control and lymphatic filariasis (LF) elimination.

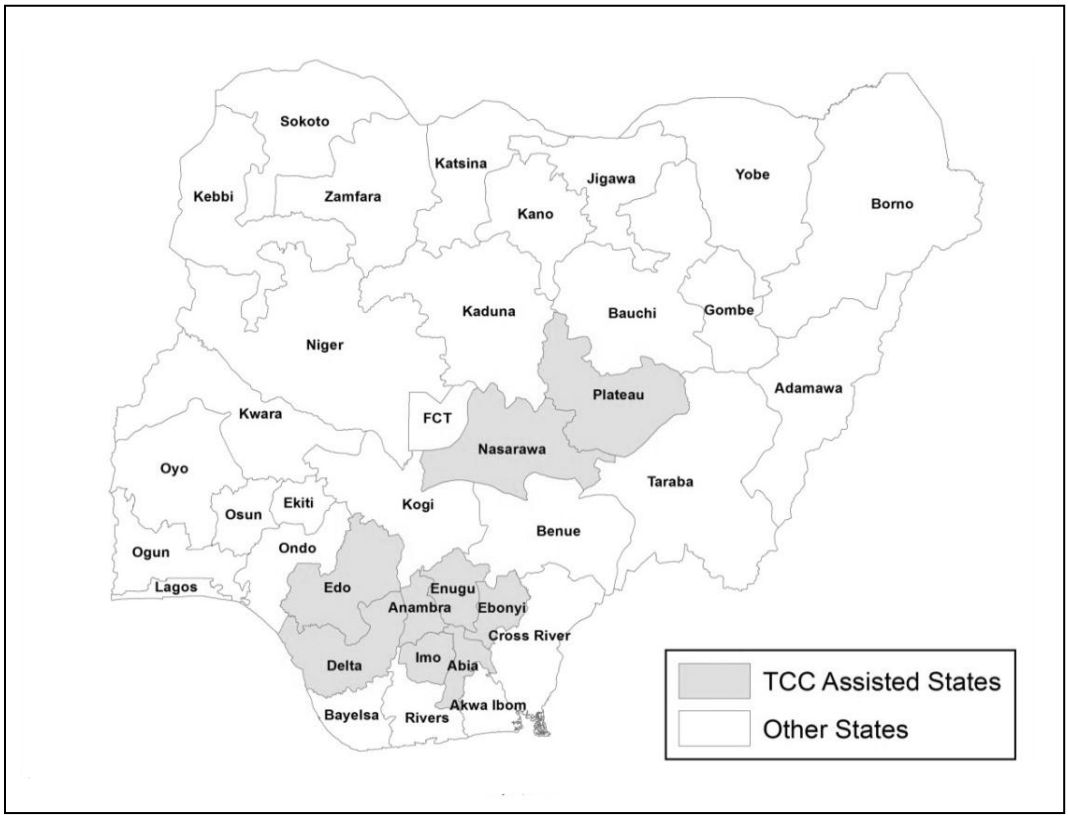

Figure 3. The nine Carter Center-assisted states in Nigeria.

TCC began assisting with the distribution of nets in the context of other integrated disease programs in Nigeria as early as 2004, and in 2010 formally launched its Nigeria malaria control program. To date, programmatic interventions in Nigeria have focused on the distribution of LLINs in the context of both routine on-going distribution and nationwide campaigns, as well as on behavior change communications

interventions to encourage the use and appropriate care of LLINs. Monitoring and evaluation activities include routine process evaluations as well as large-scale surveys to assess malaria and anemia prevalence, net ownership, and net use. TCC Nigeria has also provided assistance with post-campaign evaluations of LLIN distributions and provided support for a National Malaria Indicator Survey conducted in 2010. Innovative pilot projects and operational research activities conducted in Nigeria include a Gates-funded study of the effectiveness of different net distribution strategies on malaria and LF transmission, a study on the cost-effectiveness of integration, and a pilot demonstration of a community-based behavior change communications intervention. The specific activities conducted in 2011 in each of the categories described above are presented in detail here.

Programmatic Interventions

LLIN Distribution

Between 2004 and 2011, TCC Nigeria provided support (technical and financial) for the distribution of 4,295,425 insecticide-treated nets[3] in six states of Nigeria. Of these, 2,294,021 were distributed in 2011 (in Ebonyi and Enugu States), the largest number TCC has ever assisted in distributing in a single year in Nigeria (Figure 4) to date. In February, 926,005 LLIN were distributed to 462,966 households as part of a mass campaign in Ebonyi State. The following month, 1,367,506 LLIN were distributed to 733,224 households in Enugu State. The remaining 510 nets were distributed in the context of routine distribution activities in the Jos South local government area of Plateau State.

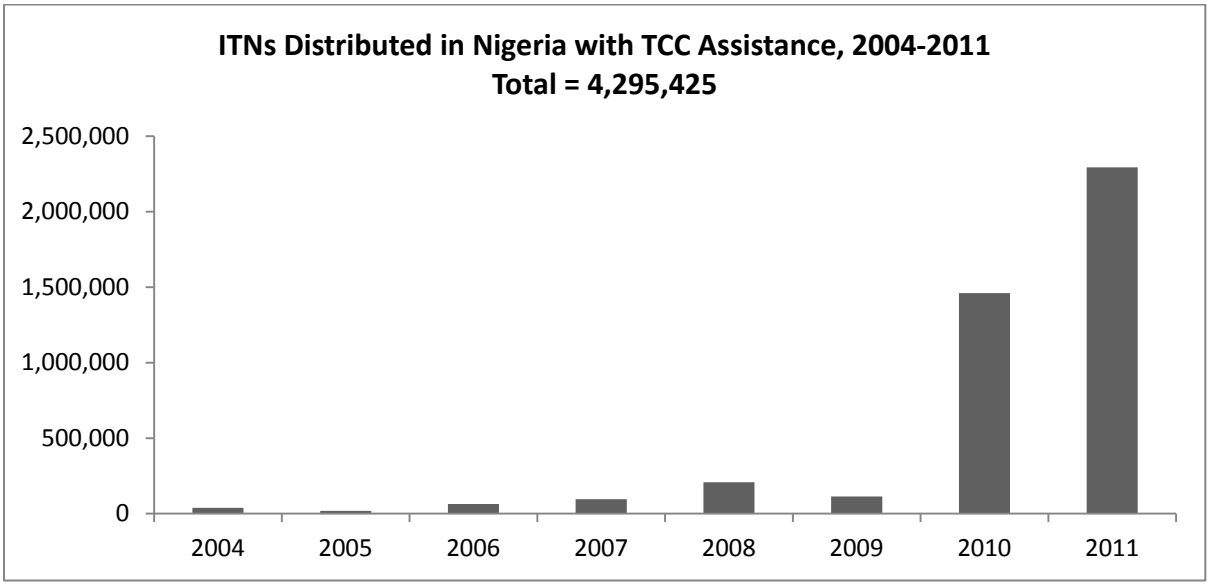

Figure 4. Insecticide treated nets (ITNs) distributed in Nigeria with support from The Carter Center between 2004 and 2011.

Of the 5,369,921 LLINs targeted for distribution in the four states of Ebonyi, Enugu, Imo, and Abia in 2011, 2,293,511 (42.7%) LLINs were successfully distributed during mass campaigns in the first two states. Primarily due to challenges associated with funding, net distribution campaigns in Imo and Abia states were not completed as planned during 2011 and are scheduled for 2012. TCC-supported states of

[3] All nets distributed since 2006 have been LLINs. However, the nets distributed prior to 2006 were insecticide-treated nets that required periodic re-treatment.

Edo and Delta are also targeted for distribution in 2012. The Center is working to ensure that 6,588,719 LLINs are distributed in these four remaining states before the end of 2012.

The continued delay of net distribution in these four states is currently the greatest challenge facing the Center's MCP in Nigeria. In order to address barriers to distribution, the Center's Nigerian staff worked with the state and local MOH in Abia and Imo states to revise the campaign strategy in order to reduce the amount of funding required. In addition, TCC organized advocacy visits by General Yakubu Gowon to both states. The former head of state has a long history of partnering with TCC for advocacy efforts, with a total of 322 field visits (beginning in 1998) in 23 states that were conducted in the context of the successful Guinea Worm Eradication Program. In December 2011, the General, accompanied by representatives of the Federal Ministry of Health, WHO, UNICEF and The Carter Center Nigeria, met with the governors of both Imo and Abia states, as well as with other representatives of the state and local governments. The purpose of the visits was to mobilize support and encourage the release of state funds for LLIN distribution. As the result of these visits, the state and local governments agreed to support the distribution of over 3 million LLINs to the two states in 2012.

Behavior Change Communications (BCC)

In 2011, TCC assisted the Ebonyi State Roll Back Malaria (RBM) program with the implementation of a new community-based behavior change communication strategy that was designed to increase rates of consistent and appropriate bed net use and care following the completion of the mass LLIN distribution campaign. The strategy, which was piloted in 6 sentinel villages of Ebonyi State, was informed by social behavioral theory and addressed a wide range of the possible determinants of net use.

Representatives of TCC and the state RBM team worked together to train a total of 87 volunteer community health promoters (CHPs) and 18 Nigerian supervisors in June 2011, and the project was launched in early July. The CHPs visited households on a monthly basis. During these visits, they assessed the household's current net ownership and maintenance behaviors, checking to see if the household owned enough nets, if the nets were hanging, if they were hanging at the appropriate height, and if they needed mending or washing. The CHPs also collected data on household net use. Subsequent interventions were tailored to fit the household's current behaviors. The CHPs engaged in conversations with household members to identify the specific barriers preventing them from adopting any recommended behaviors not yet practiced and then selected appropriate activities and messages to address those barriers. Specific targeted determinants of net use and appropriate care included access to nets, knowledge, attitudes, skills, self-efficacy, social support, structural barriers (e.g. not having a place to hang the net), and perceived social norms.

Figure 5. CHPs showing community members how to build portable frame for hanging bed nets over any sleeping space in Ebonyi State (photo by Adamu Sallau).

In addition to the monthly home visits, the CHPs organized community events, including community net mending and washing days, theatrical performances, net hanging

demonstrations, and workshops to show people how to use inexpensive, locally-available materials to build portable net-hanging frames. These frames can be used to hang a net over any sleeping space and can be easily moved out of the way during the day (Figure 5). The CHPs also organized meetings with community leaders to mobilize them in efforts to increase net use and appropriate net care.

The messages employed in the context of this project emphasized the effectiveness of bed nets for preventing the manifestations of lymphatic filariasis (LF) as well as malaria. Nigerian adults who consider malaria episodes as a minor illness (due to their having developed a degree of immunity to the infection) may have greater fear of developing "big legs" or enlarged testicles. Thus it is possible that messages linking bed nets to LF prevention will be more effective at encouraging universal net use by all members of the population, especially adult men.

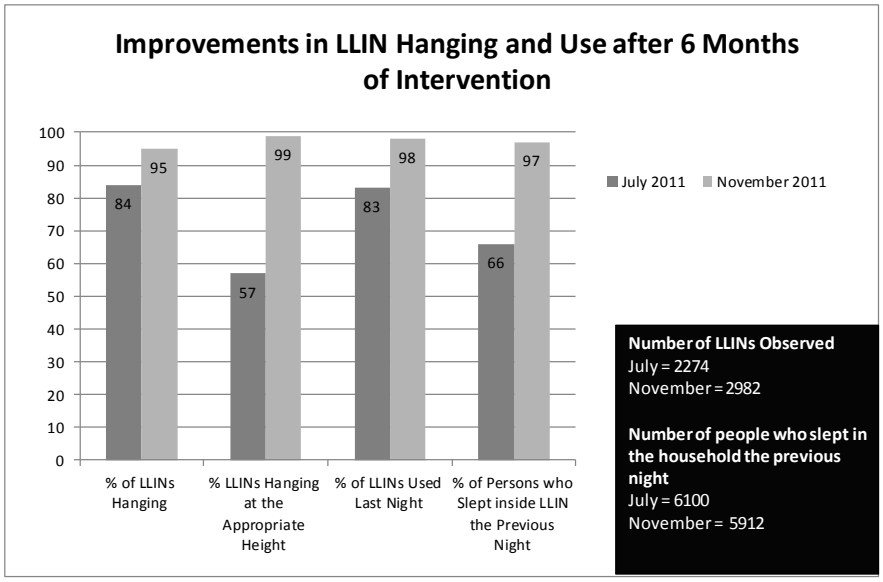

Figure 6. Changes in LLIN hanging and use indicators after 6 months of intervention in six villages of Ebonyi state, Nigeria.

The net ownership data collected during monthly home visits motivated the Ebonyi state RBM program to conduct a "mop-up" campaign during which 1,094 LLINs were distributed to 554 households. By the end of the second month of the BCC intervention (August), 100% of the 1284 households in these six villages owned at least one LLIN (compared to 79.4% in July), and 93.4% owned at least two LLINs (up from 64.4% in July). After six months of intervention, there were significant improvements in all indicators related to net hanging and net use (Figure 6).

Efforts are underway to apply the lessons learned during this pilot in the scale-up of BCC activities conducted by community drug distributors (CDDs) in Plateau State. Other partners, including state and federal ministries of health, have contacted The Carter Center to learn more about this project and to see if they may adapt it for their own contexts and needs.

Monitoring and Evaluation

Routine Monitoring of Program Activities

In addition to continuous routine monitoring of the inputs and outputs associated with the Center's programmatic activities, TCC's Nigeria offices conduct periodic surveys to evaluate the malaria

program's effects on intermediate outcomes such as malaria knowledge and attitudes, bed net ownership and use, and bed net maintenance, as well as its ultimate impact on malaria prevalence and anemia.

In 2010, household cluster surveys were conducted in Plateau and Abia States. In each state, 60 clusters of approximately 25 households were systematically selected for participation, resulting in a sample of 5,754 persons in 1,305 households in Abia state and 8,312 persons in 1,337 households in Plateau state. All children less than 10 years of age were tested for malaria and anemia, and persons of all ages in every third household were tested for malaria. Data entry, cleaning and preliminary analysis were completed in 2011 and the results were presented during the program review meeting.

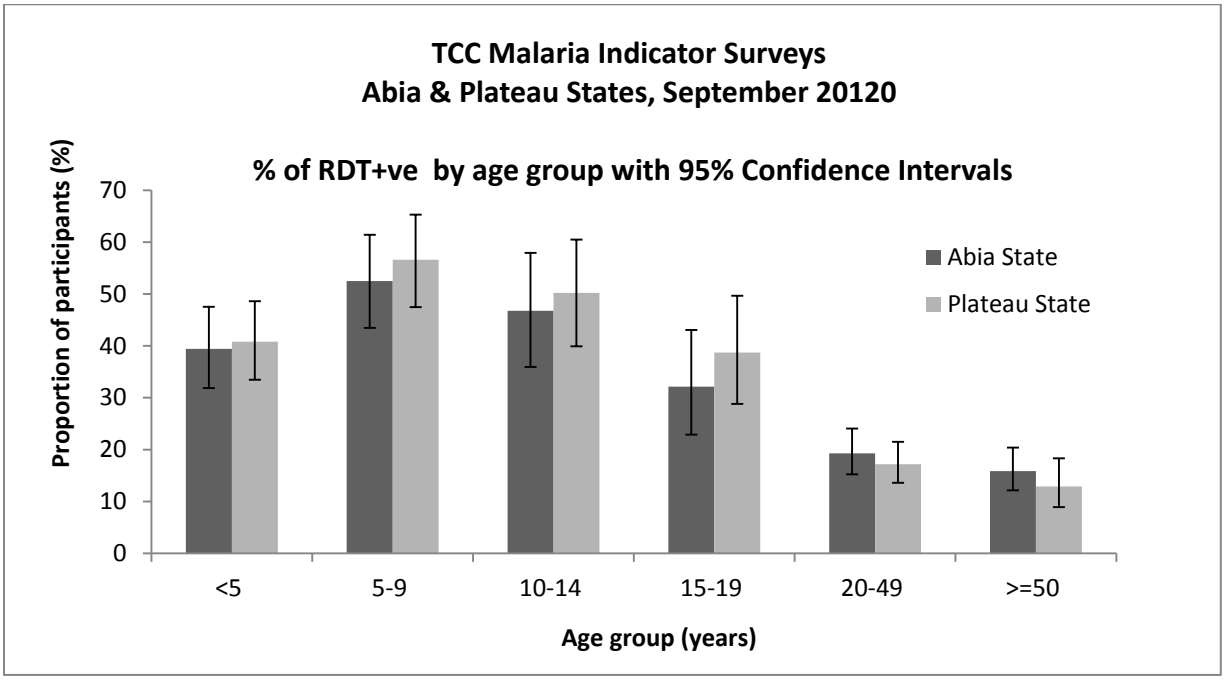

Figure 7. Malaria prevalence by rapid diagnostic test (RDT) in Plateau and Abia States, September 2010 with bars indicating 95% Confidence Intervals.

Age-adjusted malaria prevalence by Carestart© PAN/PF rapid diagnostic test (RDT) did not differ significantly between the two states: 30.4% in Abia (95% CI 25.7-35.4, N=2,619) and 32.4% in Plateau (95% CI 26.6-38.9, N=4,242). As shown in Figure 7, age-specific prevalence peaked in the five to nine year age group at 52.5% in Abia (95% CI 43.5-61.4) and 56.6% in Plateau (95% CI 47.5-65.3), with second highest prevalence among 10-14 year-olds (Abia 46.7%, 95% CI 35.9-57.9; Plateau 50.2%, 95% CI 39.9-60.5). These findings are important to note, given that previous malaria efforts have focused on children under-five and pregnant women, and not on children five to fourteen years of age. The data suggest a need for increased emphasis on the importance of net use among older children in health communications about malaria.

The percentage of children under 10 years of age with hemoglobin < 8 g/dl was significantly higher in Abia (13.2%, 95% CI 10.3-16.8%, N=1,556) than Plateau (5.1%, 95% CI 3.9-6.5%, N=2,835).

Net ownership was low in both states prior to the mass distribution campaigns, but was much higher in Plateau State where TCC has been assisting the state with bed net distribution since 2004 and has provided malaria health education during integrated MDA: the percentage of households owning at least one net was 35.1% in Plateau, compared to 7.2% in Abia. In Plateau, 14.7% of people reported sleeping under a net the previous night (19.1% of children under-five and 21% of pregnant women). In Abia, only 3.4% of people reported net use the previous night (6.0% of children under-five and 5.7% of pregnant women).

Comparisons of this baseline data for Plateau State (N=1337 households) with data collected by TCC during an integrated trachoma and LLIN coverage survey conducted the month after the distribution campaign (N=365 households) suggest improvements across all key indicators (Figure 8). While the pre-campaign survey was designed to produce state-level estimates (1337 households in 60 census enumeration areas), the post-campaign integrated survey was conducted in 365 households (24 census enumeration areas) in three local government areas where mass-drug administration for trachoma had begun at the same time. Figure 8 presents pre- and post-campaign data for the three local government areas for which we have data from both time points. The data indicate that, following the mass campaign, rates of net use were still well below the national target of 80% use by pregnant women and children under-five. This may be partly due to the fact that the follow-up survey was not conducted during the rainy season, but it still suggests a need for enhanced behavior change interventions to ensure that people are using nets now that mass campaigns have increased ownership.

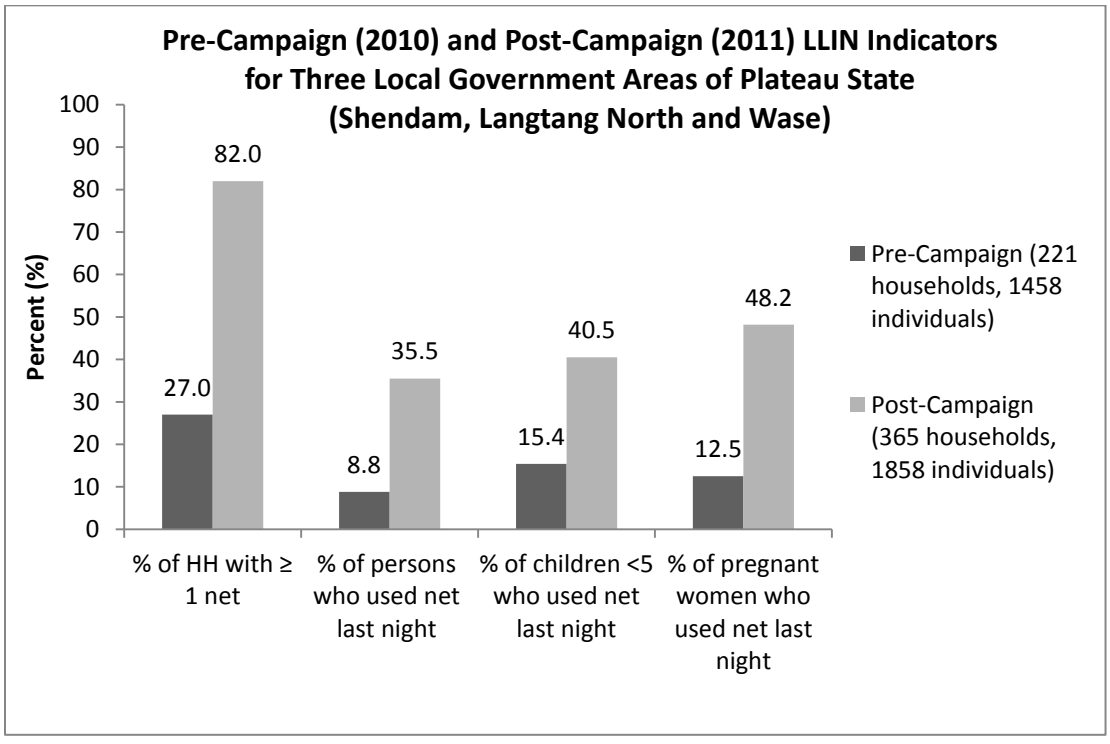

Figure 8. Bed net ownership and use before and after the mass distribution campaign in three LGAs of Plateau State.

Assistance for evaluations conducted by FMOH and State Ministries

TCC provided support for a nationwide malaria indicator survey (MIS) in 2010. In 2011, monitoring and evaluation support provided to the MOH included financial assistance for the routine malaria

surveillance system in Plateau State. The funds provided by TCC were used to facilitate the collection of malaria diagnosis and treatment data from 255 sentinel health facilities on a monthly basis.

Operational Research

Gates-funded LF/Loa loa/Malaria Project

The final follow-up survey for a five year Gates-funded operational research project was completed in 2011 in 4 LGAs of Ebonyi and Imo States in Southeast Nigeria. The aim of this longitudinal study was to evaluate the effectiveness of LLINs for reducing or interrupting lymphatic filariasis transmission in areas where MDA for LF is not an option due to the presence of *Loa loa* and the associated risks of severe outcomes when infected individuals are treated for LF. Initially, the project was designed to compare the effectiveness of two different LLIN distribution strategies on LLIN ownership, LLIN use, LF prevalence in mosquitoes and humans, and anemia and malaria prevalence in children. The two strategies were "full-coverage" in two LGAs where a certain number of nets was distributed to each household based on the number of people in the household, and "vulnerable groups only" in two different LGAs where LLINs were only distributed to pregnant women and children (the national distribution policy when the study began). The federal ministry adopted a full-coverage (universal coverage) policy before the end of the study. The vulnerable group arm in Ebonyi State was converted to full coverage in 2011. However, Imo State has yet to conduct mass LLIN distribution.

The entomological results of this study (data not shown) demonstrate that full coverage with LLINs, even in the absence of MDA, can interrupt LF transmission. There was an 84% reduction in the number of mosquitoes infected with LF (all stages) and in 2011, for the first time, no infective mosquitoes (those with L3 stage LF larvae) were caught.

The preliminary findings related to malaria control are less straightforward. Data are still being analyzed according to the two study arms.

Key Challenges for Malaria Control in Nigeria

- Delays in the release of funds to complete LLIN distribution
- Low rates of LLIN use
- Insufficient community involvement in changing malaria prevention and treatment behaviors
- Insufficient baseline information on malaria prevalence and other key indicators
- Weak national surveillance system
- Limited availability of ACTs and RDTs in the public health systems
- Low capacity of health workers to use RDTs and microscopy for malaria diagnosis
- High rates of treatment seeking in the private sector (pharmacies, drug vendors, shops)

Ethiopia National Malaria Control Program

Presented by Ms. Hiwot Solomon, National Malaria Programme Focal Person, Federal Ministry of Health, Ethiopia

Malaria is a leading public health problem in Ethiopia. An estimated 55.7 million people (68% of the population) are at risk for malaria and around 80% of the 736 districts (*woredas*) in Ethiopia are considered "malarious." Malaria transmission is generally seasonal and unstable, though patterns and intensity of transmission vary throughout the country due to differences in altitude, rainfall and population movement. Protective immunity in Ethiopian populations is relatively low due to unstable transmission and, unlike large parts of sub-Saharan Africa, all age groups are at risk of infection and disease. *P. falciparum* accounts for 60-70% of infections, while *P. vivax* accounts for the remaining 30-40%. Owing to decentralization, key components of malaria control program are implemented by different units in the Federal Ministry.

The goals of the 2010-2015 National Strategic Plan for Malaria Prevention, Control and Elimination in Ethiopia are:

1. By 2015, achieve malaria elimination within specific geographical areas with historically low malaria transmission.
2. By 2015, achieve near zero malaria transmission in the remaining malarious areas of the country.

These goals are to be achieved through the specific strategies summarized below.

Community Empowerment and Mobilization. Community empowerment relies upon the Health Extension Program (HEP), which was created in 1993 to address the primary health care needs of Ethiopians and to establish effective and responsive health delivery systems in rural areas. This is supported through deployment of two community-selected Health Extension Workers (HEWs) in each rural health post. The program emphasizes an integrated approach, including health promotion and preventive and referral health services through HEWs, with the support of community volunteers and model family households (volunteer households that incorporate health behaviors and practices in their daily lives and "model" these actions to their neighbors through example and training). A recently introduced Health Development Army will help augment and support these activities. The objectives of this component are: 1) 100% of people living in malarious areas will recognize the importance of using an LLIN, have their houses sprayed, implement environmental control interventions where appropriate and seek treatment within 24 hours of fever onset for the prevention of malaria and 2) 100% of health posts in malarious *kebeles* will provide the full health extension package including outreach services, social communication and mobilization, and model family households.

In 2011, HEWs received training for multi-species rapid diagnostic tests (RDTs), integrated refresher training (IRT) including a 4-day dedicated malaria module, and integrated community case management (ICCM) training for 625 trainers and 3,454 HEWs. Additionally, posters and brochures promoting use of long-lasting insecticidal nets (LLINs) and indoor residual spraying (IRS), adherence to treatment, and the importance of early treatment-seeking behavior were developed and distributed.

Diagnosis and Case Management. The Federal Ministry of Health (FMOH) now promotes a policy of universal confirmatory diagnosis using multi-species RDT at health posts and microscopy at health centers and hospitals. In 2011, nearly 20 million RDTs were procured and distributed in Ethiopia (Table 2). Artemisinin-based combination therapies (ACTs - specifically Artemether-Lumefantrine [Coartem ®]) have been the first-line treatment for uncomplicated *P. falciparum* malaria since 2004, with more than

11 million doses distributed in 2011 for use in health facilities (Table 1). Chloroquine remains the first line drug for treatment of *P. vivax* malaria and is used with Primaquine to achieve a radical cure. Access to treatment has significantly increased with the introduction and rapid scale-up of the HEP, as 93% of the population now have access to health care services according to recent health related indicators report (2010). Diagnosis and case management of malaria with RDTs and ACTs at the health post level is free of charge.

Table 1. Quantities of artemisinin-based combination therapy (ACT) and rapid diagnostic tests (RDT) distributed in Ethiopia, by year.

	ACTs Distributed	RDTs Distributed
2009	8,100,000	2,900,000
2010	10,400,000	8,000,000
2011	11,000,000	20,000,000
Total	**29,500,000**	**30,900,000**

Prevention. The main major vector control activities implemented in the country include LLINs, IRS, and environmental control. The objectives related to LLINs are to ensure that 100% of households in malarious areas own at least one LLIN per sleeping space, and that at least 80% of people at risk of malaria use LLINs. Figure 9 illustrates the massive scale-up of LLIN distribution in Ethiopia in recent years. Multiple mechanisms are used to ensure all malaria affected families areas can protect themselves from malaria including: free mass distribution of LLINs to all households in malarious areas still in need of LLINs (catch-up); replacement of old ineffective LLINs with new free LLINs through the HEP and campaigns (keep-up); free distribution of LLINs during emergencies; subsidized nets for other households, especially in urban areas through market priming/social marketing.

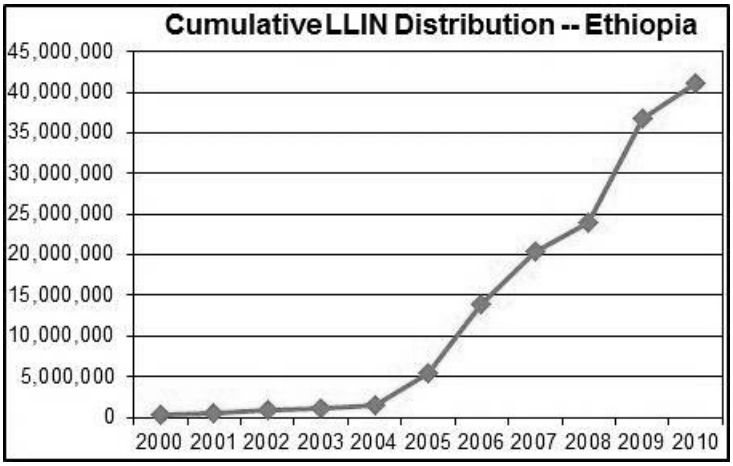

Figure 9. Long lasting insecticidal net (LLIN) distribution in Ethiopia by year.

IRS is currently targeted to cover epidemic-prone areas and malaria-affected communities with low access to the health care system. In 2011, a total of 5,819,013 households (or 57.2% of targeted households) were sprayed with IRS. The goal was to reach 70% of targeted households by 2011 and 90% by 2013. In addition, studies are underway to monitor mosquito resistance to the current front-line insecticide (DDT), evaluate other classes of alternative insecticides, and ensure IRS acceptance in targeted villages through HEP-mediated health education.

Surveillance. A high quality surveillance system with reach into all communities is an essential intervention strategy to achieve the goals and objectives in this malaria strategic plan in Ethiopia. As Ethiopia takes the next steps to achieve universal coverage, sustain malaria control, and seek elimination, there will remain a need for early outbreak or epidemic detection and response. To that end, Epidemic Preparedness Guidelines were revised in 2011, and 20,000 epidemic monitoring charts

were printed and distributed to health posts. The objectives are that 100% of health facilities in epidemic prone areas adhere to the national epidemic and response plan; and 100% of health facilities and *woreda (district)* health offices use epidemic monitoring charts, based on confirmed cases.

In 2011, approximately 2.6 million cases of malaria (both confirmed and clinically diagnosed) were reported. Figure 10 illustrates the trends in annual malaria cases over the past decade. When compared to other FMOH data sources that are available for a greater period of time, it appears as if the 6-10 year periodicity of malaria in Ethiopia continues, though the drop in reported cases in 2011 suggests that the magnitude of peak transmission may be reduced from previous peaks (Figure 11).

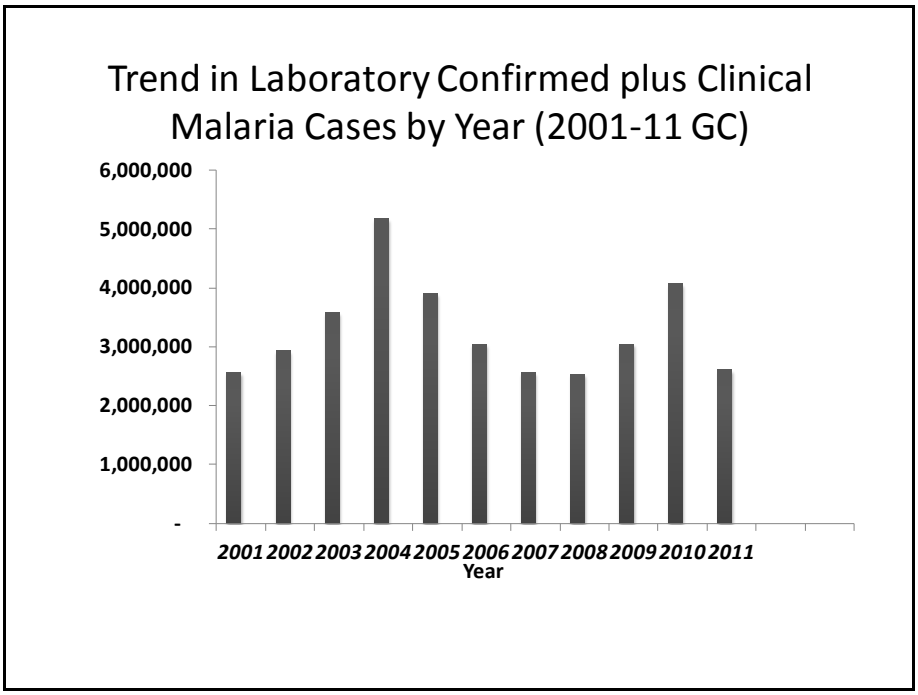

Figure 10. Annual number of malaria cases (confirmed and clinically diagnosed) in Ethiopia by Gregorian Calendar (GC) year, 2001-2011.

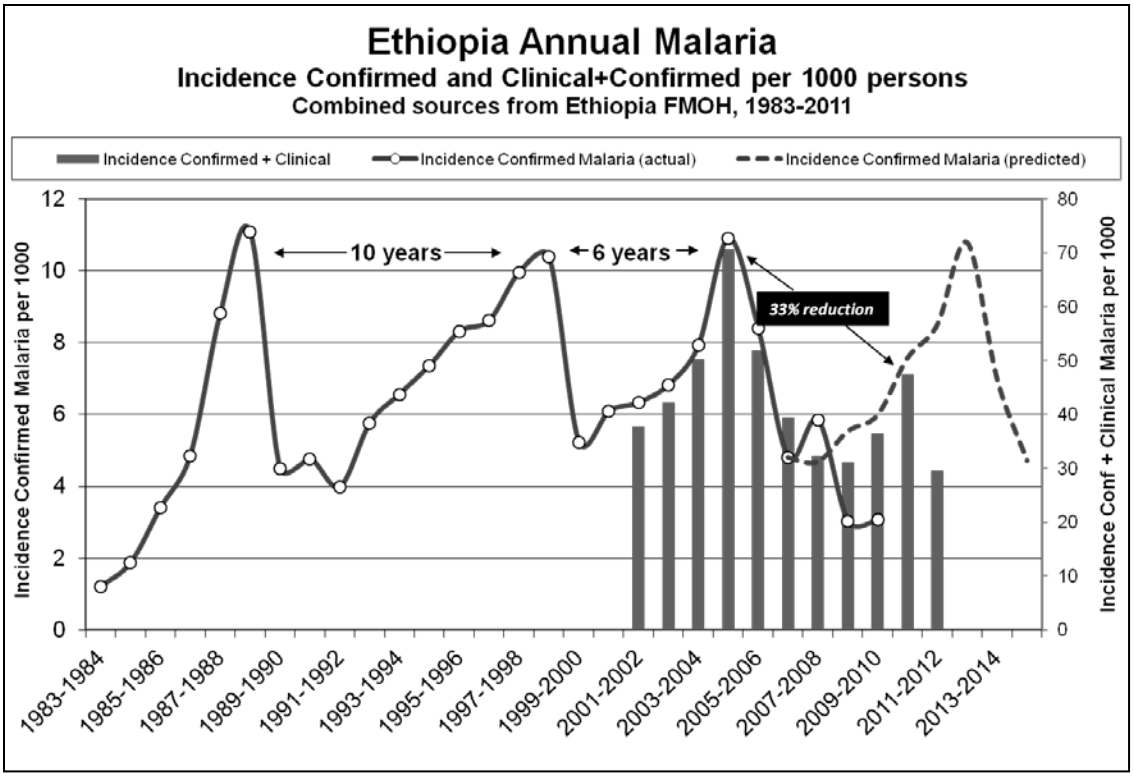

Figure 11. Annual incidence of confirmed malaria (actual and predicted) and confirmed plus clinical malaria in Ethiopia, 1983-2011.

Health systems strengthening and capacity building. The aforementioned strategies for malaria control, prevention, and elimination in Ethiopia will be supported by additional cross-cutting measures that include: monitoring and evaluation, human resource development, financial management and linkages with overall development strategy, procurement and supply chain management, and operational research.

The Carter Center Malaria Control Program: Ethiopia Progress Report

Presented by Mr. Solomon Kibret, Malaria Program Officer, The Carter Center Ethiopia

In Ethiopia, The Carter Center (TCC) Malaria Control Program provides assistance for malaria control and elimination activities to the Ministry of Health of Ethiopia and the Regional Health Bureaus of Amhara, Oromia, SNNPR, Gambella, and Beneshangul Gumuz (Figure 12).

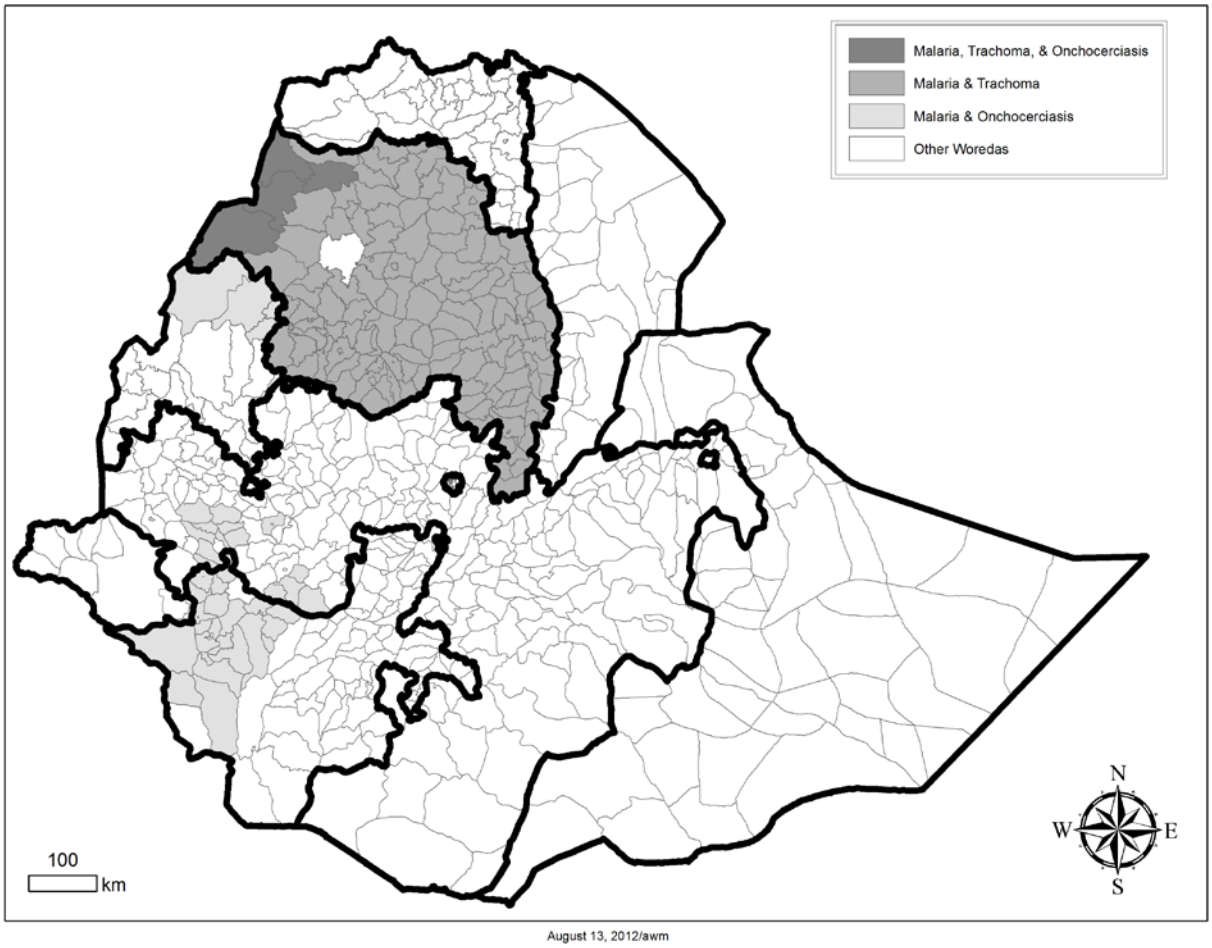

Figure 12. Map of Ethiopia showing The Carter Center-assisted areas for malaria, trachoma, and onchocerciasis support, by region and woreda (district).

The Carter Center's support for malaria control and elimination in Ethiopia is provided through the following activities:

LLIN distribution. Since 2007, TCC has assisted with the distribution of 5,959,097 LLINs in Ethiopia. Three million of these were purchased by The Center for the first country-wide mass distribution campaign in 2007, during which 20 million LLINs were provided to households nationwide. No large-scale distribution activities were conducted in areas supported by TCC in 2011.

Information, education and communication (IEC). Malaria health education is provided before and during MalTra Weeks, a campaign that targets malarious areas in Amhara Region (population 18 million)

for mass testing and treatment for malaria along with mass distribution of azithromycin[4] for trachoma control. In 2011, a total of 1,936 villages (100% of target) were exposed to malaria education during these campaigns. In portions of Amhara, Oromia, SNNPR, Gambella, and Beneshangul Gumuz regions, 298,832 households (98% of target) received malaria education during the distribution of ivermectin[5] for onchocerciasis control. An additional 6,675 households received education on LLIN care and use, as well as on malaria-treatment-seeking-behavior, during separate household LLIN assessments. A total of 19,021 children received similar messages during school-based assessments. TCC disseminated 22,087 posters, flyers, and banners with malaria education messages in 2011.

Malaria diagnosis and treatment. In 2011, 12 million people were screened for fever in the context of MalTra Weeks in Amhara Region (Table 2). Of the 88,655 persons presenting with fever (0.7%) over the two campaigns, the vast majority (90%) were tested for malaria by RDT, of whom 50.9% were positive for malaria. This equates to 0.3% prevalence of RDT confirmed malaria among the entire MalTra-attending population. Overall prevalence of confirmed and clinically diagnosed malaria was 0.4%. A total of 48,775 persons were treated for malaria in 2011, either with ACT for *P. falciparum* infection (35,160) or chloroquine for *P. vivax* (12,615). Since 2009, a cumulative total of 191,974 persons have been treated for malaria during MalTra Weeks. A total of 494,285 RDTs, 624,330 doses of ACTs and 58,900 doses of chloroquine were supplied to the health facilities throughout Amhara through MalTra Week campaigns in 2011.

Table 2. Summary of MalTra Week VI and MalTra Week VII results, 2011.

	MalTra Week VI (May 2011)—East Amhara (% of persons attending MalTra)	**MalTra Week VII (November 2011)—West Amhara** (% of persons attending MalTra)	**TOTAL FOR 2011** (% of persons attending MalTra)
Number of people attending	2,594,153	9,436,476	12,030,629
Number with fever	10,075 (0.4%)	78,580 (0.8%)	88,655 (0.7%)
Number of fever cases tested by RDT	5,638 (56%)*	74,368 (95%)*	80,006 (90%)*
Number RDT-positive	1,248 (0.1%)	39,451 (0.4%)	40,699 (0.3%)
Number of malaria cases (clinical and confirmed)	2,910 (0.1%)	39,575 (0.4%)	42,485 (0.4%)
Number treated with ACT for *P. falciparum*	2,695	33,465	35,160
Number treated with chloroquine for *P. vivax*	372	12,243	12,615

*% fever cases tested for malaria with an RDT

Strengthen health worker capacity. In 2011, the Carter Center's zone project coordinators, in collaboration with MOH officials, conducted monthly supportive supervision activities at 454 health posts, 208 health centers, and 183 district health offices in all TCC-assisted regions of Ethiopia. During supervision visits, the zone project coordinators examined remaining stock of ACTs and RDTs and

[4] *Azithromycin (Zithromax®) is donated by Pfizer, Inc.*
[5] *Ivermectin (Mectizan®) is donated by Merck.*

developed health worker capacity in epidemic monitoring and malaria case management. In addition, a total of 7,801 health workers were trained in RDT use and malaria case management in 2011.

Monitoring and evaluation. TCC conducts ongoing assessment of LLIN ownership, use, and care at the community level. Evaluation teams are comprised of the Carter Center's zone project coordinators, *woreda* health officers, and health extensions workers, all of whom are Ethiopian nationals. In 2011, a total of 7,018 households were assessed in Amhara, SNNPR, Oromia, Gambella, and Beneshangul-Gumuz regions of Ethiopia. As shown in Table 3, household net ownership was high (≥92%) in all surveyed regions except Oromia (74%). However, less than 50% of all household members slept under a net the previous night in all regions except Beneshangul-Gumuz (where the reported figure was 60%). There was considerable variation between regions in the proportion of households in which all nets were hanging at an appropriate height (range, 13%-60%) and the proportion of households with nets in need of repair (range, 19%-91%).

Table 3. Routine household (HH) surveys results in The Carter Center-assisted regions of Ethiopia, 2011.

	% HH owning at least 1 LLIN	% HH where all members slept under LLINs the previous night	% HH in which all LLINs were hanging at appropriate height	% HH with some or all LLINs needing repair
Amhara (n=5,665)	92%	35%	35%	62%
SNNPR (n=533)	96%	45%	57%	19%
Oromia (n=477)	74%	34%	39%	37%
Gambella (n=207)	96%	50%	60%	40%
Beneshangul-Gumuz (n=136)	94%	60%	13%	91%

School-based assessments evaluated net ownership and utilization in 19,021 students in 175 schools in Amhara. While 78% of students reported that their household owned at least one LLIN, only 37% of students reported sleeping under an LLIN the previous night.

The Ethiopia MCP provided assistance to the FMOH for the 2011 national Malaria Indicator Survey (MIS). The 2011 MIS was conducted to measure the progress of malaria prevention and control efforts undertaken since 2007 and to see whether the goals set forth in the FMOH National Strategic Plan for Malaria Prevention, Control, and Elimination 2005-2010 were achieved. TCC assisted with survey design, training, field supervision, and data analysis. The Center provided financial support for oversampling in Amhara region to enable comparison with previous MIS and Carter Center surveys in Amhara. The Center also supported training of trainers, participated in training of data collectors, and supported the distribution of survey materials for fieldwork. In addition, TCC conducted field supervision in three zones of Amhara, and provided vehicles for the survey. An estimated 11,025 households were surveyed, making it the largest MIS conducted in any country to date.

Support for malaria data management. In July 2011, a workshop was conducted for the Carter Center's zone project coordinators in two zones of Amhara (West Gojjam and North Gondar) for a pilot deployment of an enhanced malaria surveillance reporting system (the system is described in further detail in Dr. Gregory Noland's presentation). In December 2011, the system was expanded to all 10

zones of Amhara, and workshops were held in East Amhara and West Amhara to train all zone project coordinators on the new system.

Support to FMOH and Regional Health Bureaus. TCC regularly participates in national-level committees and meetings such as the Malaria Control Support Team and Technical Advisory Committee, the 2011 MIS Technical Advisory Committee, the Global Fund Round 11 Proposal Writing Committee, and ad-hoc committees to revise the National Strategic Plan for Malaria Prevention, Control and Elimination. TCC regularly provides vehicles for FMOH activities and for emergency response to reported malaria outbreaks, and also provides financial support for training and meetings at the regional levels.

Enhanced System for Malaria Surveillance in Ethiopia

Presented by Dr. Gregory Noland, Malaria Epidemiologist, The Carter Center

Ethiopia has a strong history of routine surveillance systems for public health. Ethiopia has the further advantage of a high proportion of services being provided through the public sector. This is particularly important for Ethiopia where malaria is highly variable and characterized by an unstable transmission pattern in both space and time. In such an epidemiological context, routine health facility-based surveillance offers several advantages over cross-sectional surveys such as malaria indicator surveys (MIS) for collecting and analyzing malaria data because:

- It permits detailed information at community-level resolution
- It allows for monitoring of seasonal and interannual variations in indicators
- It allows tailored responses to case buildups or epidemics if there are no delays in reporting and analysis

However, issues such as under-reporting, lack of uniformity in reports, ambiguous interpretation of indicators, lack of information on reporting fraction (the % of health facilities reporting), and discrepancies between weekly reports and monthly summaries currently complicate the collection and analysis of malaria surveillance data in Ethiopia.

In order to address these needs, The Carter Center has developed an Excel-based "Enhanced Surveillance System" tool to record and monitor routinely collected MOH malaria data in Amhara Region—though the framework can be easily adapted to other locations. This platform was developed with unity in mind such that there is consistency in indicators and formatting across all TCC-assisted zones of Amhara. Importantly, it was also developed to allow harmonization with the Amhara Regional Health Bureau (RHB) malaria reporting systems, so that TCC zone project coordinators (ZPCs) can copy directly from data reported to FMOH Zonal Health Departments.

The system consists of a template file for recording weekly summary health facility data by district for each of the 10 zones within Amhara. In addition, a composite summary file is used to store and analyze data at for the entire region. An interactive "dashboard" page in the summary file allows the visualization of multiple malaria-related indicators on a single worksheet at district, zone, or regional level detail (Figure 13).

Following a 6-month pilot in two zones of Amhara (West Gojjam and North Gondar), the Enhanced Surveillance System was deployed to all 10 zones of Amhara in December 2011.
The advantages of this system include:

- A format that allows easy entry of existing FMOH data—avoiding the introduction of an additional reporting form to already over-burdened health workers.
- Automatic visual representation of data for multiple malaria indicators.
- Prompt access by zone-level ZPCs, who can immediately interpret and react to results.

We plan to continue developing and improving the system in partnership with TCC Ethiopia personnel and Amhara RHB colleagues; to potentially expand to other TCC-assisted malaria zones outside of Amhara; and also to adapt it to malaria surveillance in Nigeria in 2012.

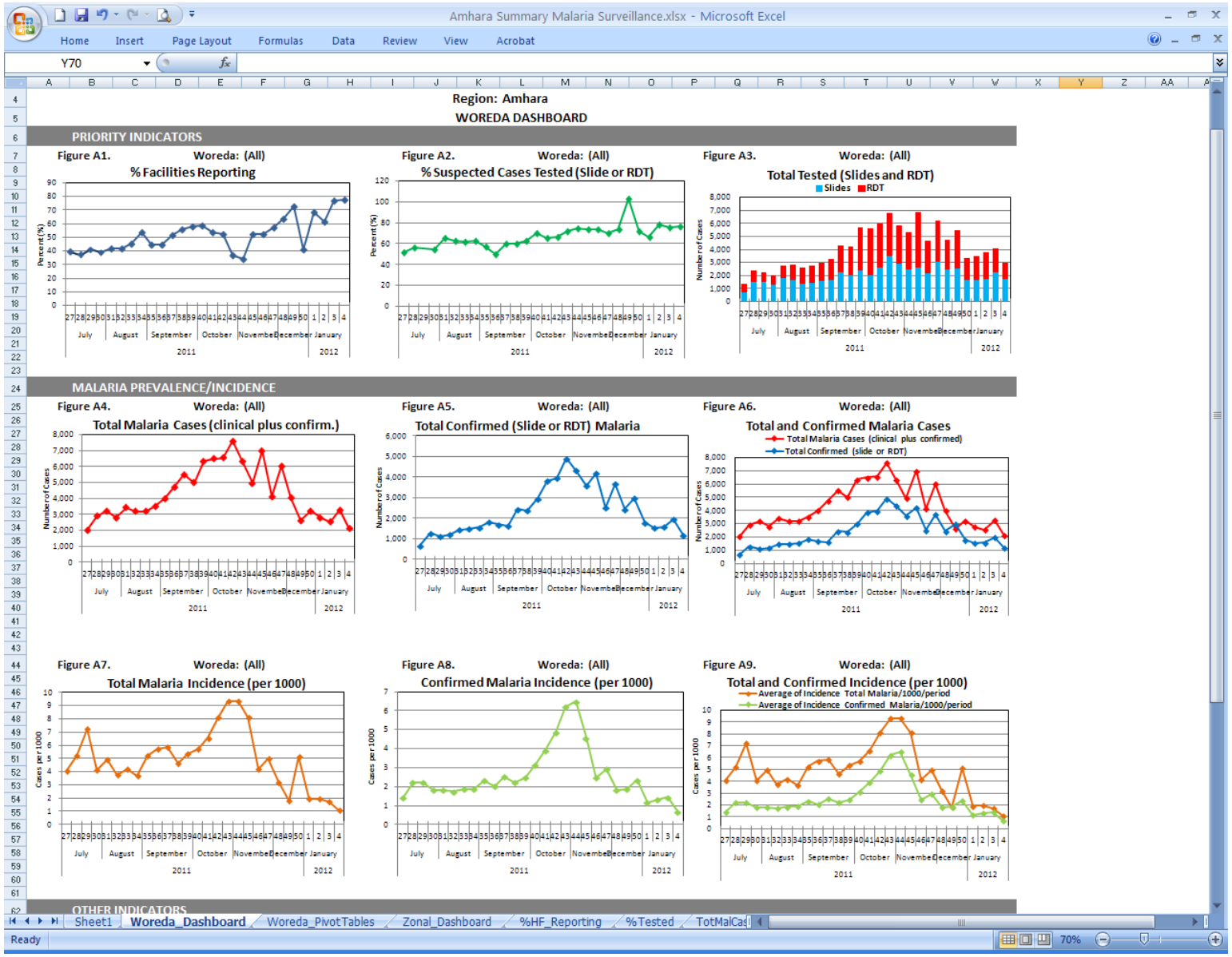

Figure 13. Screen-shot of the enhanced surveillance system "dashboard" page

Annex 1: Overview of Malaria Disease, the History of The Carter Center Malaria Control Program, and Malaria Program Priorities

The Disease

Malaria is a parasitic disease caused by the single-celled organism *Plasmodium,* which infects the human liver and red blood cells. It is transmitted from person to person by the bite of the *Anopheles* mosquito, which bites only at night. Of the species of malaria that affect humans (*P. falciparum, P. vivax, P. malariae and P. ovale*), the most severe disease and highest mortality are caused by *P. falciparum*. The typical intermittent fevers of malaria are caused by the repeated cycles of parasite replication inside red blood cells, which ultimately result in the rupture of the red blood cells, releasing parasites into the blood stream to then invade other cells. Repeated malaria infections lead to severe anemia, especially in children and pregnant women. Malaria is preventable and treatable; there is no reason that anyone should die from malaria.

Approximately 90% of the estimated 655,000 deaths caused by malaria each year occur in Africa. Twenty percent of all deaths in African children less than five years of age are thought to be due to malaria. Overall, malaria constitutes 10% of the continent's disease burden. Malaria infection in adults is not usually fatal because the patient has some acquired immunity, but fever and anemia resulting from malaria place an enormous economic burden on families, communities, and countries. Pregnant women are also at great risk. Serious illness from malaria typically takes place during the late rainy season, which coincides with peak agricultural productivity and therefore leads to reduced agricultural output. Malaria is also responsible for high rates of school and work absences, which have important short- and long-term social and economic impacts. Highly malarious countries are among the very poorest in the world, and typically have very low rates of economic growth.

History of the Carter Center's Involvement in Malaria Control

The Carter Center's (TCC) involvement in malaria control grew from the idea of integrating control of malaria with lymphatic filariasis (LF) elimination in Nigeria[6], and from a review of malaria by the International Task Force for Disease Eradication[7]. In Africa, the same anopheline mosquitoes that transmit LF also transmit malaria. Insecticide treated bed nets are one of the most important prevention tools for malaria and are also effective as a complement to annual mass drug administration in the filariasis elimination program. TCC's early interest in insecticidal net distribution was based on the theory that shared resources would result in cost reductions and that protection from the mosquito vectors would reduce transmission of both diseases simultaneously, hastening elimination of LF. Given this, the Center began integrating insecticidal net distribution with mass drug administration in the context of its lymphatic filariasis and onchocerciasis programs in Nigeria in 2004. In June 2010, The Carter Center Malaria Control Program (MCP) in Nigeria was formally established and began to expand its assistance to the national program in malaria control. Since the official launching of the MCP, The Carter Center has assisted the Ministry of Health (MOH) and its other partners in the planned nation-

[6] Blackburn et al., Successful integration of insecticide-treated bed net distribution with mass drug administration in Central Nigeria (2006), *Am J Trop Med Hyg*, 75(4): 650-655.

[7] World Health Organization, 2007. Meeting of the International Task Force for Disease Eradication — 12 May 2006. *Weekly Epidemiol Rec* 82(4): 25—30.

wide scale-up of malaria control activities, with a focus on the mass distribution of long-lasting insecticidal nets (LLINs).

A dedicated Carter Center MCP was launched in Ethiopia in February 2006. The Ethiopian Minister of Health, Dr. Tedros Adhanom, requested that TCC join his country's national effort to provide protection to all 50 million Ethiopians at risk for malaria through an ambitious plan to distribute long lasting insecticidal nets in all malarious areas by the end of 2007. The Center was also asked to help in national efforts to monitor and evaluate the progress and effectiveness of the national control program. Since 2006, the program has built on TCC's existing programmatic networks in parts of Ethiopia while working closely with the MOH Malaria Control Program at national, regional, and local levels.

The Carter Center Focus on Malaria Control

The Carter Center's efforts in malaria control can be grouped into three focal areas:

1) Program Implementation and Interventions (treatment, net distribution and behavior change communications),
2) Monitoring and Evaluation, and
3) Operational Research.

Program Implementation

To date, implementation has focused primarily on insecticidal bed net distribution, behavior change communications (BCC), and case detection and treatment (in Ethiopia).

LLIN Provision

Between 2004 and 2011, TCC assisted with the distribution of a total of 10,254,242 LLINs in Nigeria and Ethiopia (see Figure 1, page 7).

In Nigeria, between 2004 and 2011, 4,295,425 LLINs were distributed with the Center's assistance. Of these, 3,739,265 were distributed through mass campaigns conducted in three states: Plateau (December 2010), Ebonyi (February 2011), and Enugu (March 2011). An additional 255,000 LLINs were distributed in four Local Government Areas (LGAs) of southeast Nigeria from 2008 to 2010 as part of an operational research project funded by the Bill & Melinda Gates Foundation. The remainder was distributed in Plateau and Nasarawa states in collaboration with the state Ministries of Health through small-scale routine distributions between 2004 and 2011.

In Ethiopia, TCC purchased and assisted with the distribution of three million LLINs in 2007 as part of the Ethiopian national campaign to provide 20 million LLINs by August 2007. In 2010, Ethiopia began a series of LLIN campaigns to replace worn out nets and provide LLINs to households that had not received any during the first campaign. The TCC Ethiopia MCP provided technical and financial assistance for the LLIN distribution and replacement campaigns in East Amhara, where 1,156,345 LLINs were distributed, and in the Southern Nations, Nationalities and People's Region (SNNPR), where 1,802,472 LLINs were distributed. An additional 1,220 LLINs were distributed by TCC in Ethiopia to replace those collected in the context of operational research concerning net durability.

Behavior Change Communication

In both Ethiopia and Nigeria, TCC has helped to develop a set of key behavior change communication messages that attempt to promote existing positive behavior; address common misperceptions about malaria or malaria control measures; and provide clear, action-oriented prompts to encourage the

adoption of recommended behaviors. In Ethiopia, these messages have been disseminated using a number of different channels, including radio and television spots, films, posters, brochures/pamphlets, theater, t-shirts and caps, and mass education sessions. Malaria health education is provided during azithromycin[8] distribution for trachoma and mass testing and treatment of malaria cases (MalTra Weeks). Malaria messages are also highlighted during the distribution of ivermectin for onchocerciasis control. In Nigeria, health education for malaria has been provided in association with the distribution of insecticide treated bed nets, as well as in the context of an intensive, community-based behavior change intervention in Ebonyi state. This intervention is currently being modified for scale-up in Plateau state, using community drug distributors. Malaria messages in Nigeria emphasize the fact that bed nets can protect people from both lymphatic filariasis and malaria since the two diseases are transmitted by the same vector there.

Malaria Case Detection and Treatment

Provision of malaria treatment takes place in Ethiopia in the context of Malaria and Trachoma (MalTra) Week Campaigns. All community members who present for azithromycin treatment for trachoma are asked if they have had a fever in the past few days. Those with fever are subsequently tested for malaria using a rapid diagnostic test (RDT), and offered free treatment according to the national treatment guidelines. Between 2008 and 2011, 191,974 cases of malaria were treated in the context of MalTra Weeks.

Monitoring and Evaluation

Monitoring and Evaluation (M&E) conducted by the MCP focuses primarily on two types of activities:

1) Routine monitoring and evaluation of specific Center-supported interventions, and
2) Providing assistance to National Malaria Control Programs and Ministries of Health for the evaluation of malaria control activities at the national or state/regional levels through large-scale surveys and routine surveillance.

Monitoring and Evaluation in Ethiopia

TCC provides support to the MOH of Ethiopia to help assess progress towards target malaria control goals. Periodic large-scale household surveys play an important role in evaluating the effectiveness of the scale-up of malaria control activities in Ethiopia. Since the initiation of the Malaria Control Program in Ethiopia, TCC has managed two representative household surveys to estimate changes in malaria prevalence, as well as LLIN ownership and use. One of these was the first national Malaria Indicator Survey (MIS) conducted in 2007. In 2011, The Center provided technical and financial support for the second national MIS.

In 2009, TCC conducted a review of the Integrated Disease Surveillance and Response (IDSR) data from mid-2004 to mid-2009 to assess the control program's effectiveness, as well as to inform decisions about stratification of data for analysis and targeting of interventions. The Center has played an active role in the development of new standardized guidelines for epidemic monitoring in Ethiopia and is currently engaged in efforts to enhance the quality of malaria surveillance data in Amhara Region.

TCC also engages in supervision and training activities designed to strengthen the M&E capacity of health workers at all levels of the health system. In 2010, TCC assisted the Federal Ministry of Health of Ethiopia with a series of systematic supportive supervision activities in the regions we support. The

[8] *Azithromycin (Zithromax®) is donated by Pfizer, Inc.*

Center's staff members have facilitated trainings in data management and epidemic recognition for regional and zonal level health staff.

TCC also collects information on malaria in the context of routine activities conducted by its malaria, trachoma, and onchocerciasis programs. When zone project coordinators are alerted about potential increases in reported malaria cases or stock outages of malaria treatments and diagnostic tests, they communicate this information to MOH officials at the district, zone, and regional levels. Malaria indicators have been integrated with mass drug administration coverage surveys conducted by the trachoma program, and the MalTra Week reports provide estimates of malaria prevalence, at two points of time each year. The Ethiopia office has also introduced a series of routine LLIN assessments, conducted both in schools and at the household level, which are conducted by the Center's zone project coordinators on a monthly basis in order to obtain routine data on net use and care. In areas served by the Carter Center's River Blindness Control Program, community-directed distributors of ivermectin collect household LLIN ownership information in order to identify gaps in net delivery and determine net replacement needs. Additionally, ongoing community assessments conducted in these areas include information on net use and malaria knowledge.

Monitoring and Evaluation in Nigeria

In Nigeria, TCC provided assistance for a national Malaria Indicator Survey (MIS) conducted in late 2010 and also participated in monitoring and evaluation activities associated with mass LLIN distribution campaigns in Plateau, Nasarawa, Ebonyi and Enugu states in 2010 and early 2011. TCC conducted additional large-scale baseline household surveys in two of the nine Carter Center-supported states (Plateau and Abia) in 2010 in order to obtain state-level data that could be used to evaluate the scale-up of malaria control activities in those states. The Center provides financial and technical support for routine surveillance activities in Plateau State and is currently working to adapt the enhanced surveillance system introduced in Ethiopia in 2011 for use in Nigeria. TCC has initiated conversations with the MOH to learn how the Center can best further assist the federal and state governments with monitoring and evaluation activities.

Operational Research

TCC has been involved in three operational research projects in Nigeria and Ethiopia. Two studies are on-going, both in Ethiopia. The third, conducted in Southeast Nigeria, was completed in 2011.

LLIN studies

In Ethiopia, we are concluding a series of multi-year LLIN durability studies, with both *Permanet*® (Vestergaard Frandsen) and *Duranet*® (Clarke Mosquito Control), to review the retention of insecticide, insecticidal activity and the physical deterioration of LLINs.

In Nigeria, with the support of the Bill & Melinda Gates Foundation, TCC completed a study designed to compare the effectiveness of two different net distribution strategies (universal distribution and distribution to vulnerable groups only) on both malaria and LF.

Diagnostic studies

We have evaluated different rapid tests for the diagnosis of malaria in Ethiopia by comparing them with the results of microscopy conducted in health facilities as well as the results obtained by expert microscopists.

Annex 2: Neglected Tropical Diseases (Trachoma, Onchocerchiasis and Lymphatic Filariasis)

TRACHOMA and its control

Trachoma is the world's leading infectious cause of preventable blindness. The World Health Organization estimates that 6 million people are blind due to trachoma, most of whom are women, and another 540 million are at risk of blindness or severe visual impairment. Blinding trachoma is caused by repeated infections of the conjunctiva (lining of the eye and eyelid) by the bacterium *Chlamydia trachomatis.*

Trachoma is transmitted from person to person through discharge from the eyes and nose of infected individuals, which may be passed to others on hands, towels or clothing, or by flies which are attracted to ocular and nasal discharge. Repeated infections lead to scarring of the conjunctiva which deforms the eyelid margin, causing eyelashes to turn inward and rub against the cornea. This condition, called *trichiasis*, causes severe pain and abrades the cornea, leading to other infections, opacity, and frequently to blindness.

Effective control of trachoma can be achieved using the SAFE strategy which consists of the following four components:

1) **S**urgery on eyelids to correct advanced stages of the disease;
2) **A**ntibiotics to treat active eye infection (predominantly oral azithromycin in the form of Zithromax®, donated by Pfizer, Inc), which are given once per year during mass distributions;
3) **F**acial cleanliness, achieved through face washing, to prevent disease transmission; and
4) **E**nvironmental improvements to increase access to clean water and improved sanitation (building latrines to reduce fly breeding on feces).

ONCHOCERCIASIS and its control

Human onchocerciasis is an infection caused by the parasitic worm *Onchocerca volvulus* that causes chronic skin and eye lesions. The worms live under the skin in nodules. The female adult worms release microfilariae (mf), which are tiny embryonic worms that exit the nodules and swim under the skin, where they cause inflammation. The mf can also enter the eye and cause visual damage or even blindness. Onchocerciasis is transmitted by *Simulium* black flies that breed in fast-flowing rivers and streams, hence its common name, "river blindness". The black flies ingest the mf, which then develop over several days into infectious larvae and are then able to be transmitted to another person when the fly bites again. The World Health Organization estimates that approximately 37.2 million people are infected and 770,000 are blinded or severely visually impaired in the endemic countries, where 123 million (99% in Africa) live at risk of the disease.

The disease is chronic and non-fatal, but causes a wide spectrum of skin lesions, from intense itching to gross changes in skin elasticity. This results in hanging groins, lizard-like skin appearance, and color changes, such as patchy depigmentation ("leopard skin"). The most severe manifestations are those associated with damaged eye tissues, leading to serious visual impairment and, ultimately, blindness.

Periodic mass treatment with ivermectin (Mectizan®, donated by Merck) kills the mf and prevents eye and skin disease caused by *O. volvulus* and may also be used to reduce or interrupt transmission of the disease. Delivery of ivermectin in Africa is done by community volunteers called Community Drug Distributors (CDDs). CDDs serve their own communities and kinship networks once per year by providing the ivermectin tablets. Applying this strategy enables the affected communities to have

shared responsibility in the planning, execution, monitoring, evaluation, and reporting processes of the disease control activities.

LYMPHATIC FILARIASIS and its control

Lymphatic filariasis (LF) in Africa is caused by *Wuchereria bancrofti*, a filarial worm that is transmitted in rural and urban areas by *Anopheles* and *Culex sp*. mosquitoes respectively. The adult worms live in the lymphatic vessels and cause dysfunction, often leading to poor lymphatic drainage. Clinical consequences include swelling of limbs and genital organs (lymphedema and "elephantiasis") and painful recurrent attacks of acute adenolymphangitis.

Transmission occurs when the female adult worms release microfilariae (mf), which are tiny embryonic worms that circulate in blood at night, when the vector mosquitoes bite. The mf are picked up by mosquitoes, develop over several days into infectious larvae, and are then able to be transmitted to other people when the mosquitoes bite again.

The mf are killed by annual, single-dose combination therapy, with either: Mectizan® (donated by Merck) and albendazole (donated by GlaxoSmithKline); or diethylcarbamazine (DEC) and albendazole. Annual mass drug administration (MDA) prevents mosquitoes from being infected and, when given for a period of time (estimated to be five to six years), can interrupt transmission of *W. bancrofti* (which has no animal reservoir, so the transmission cycle is dependent on infecting humans). Annual treatment is not possible in areas co-infected with the worm *Loa loa* since severe adverse events may take place if the *Loa loa* worms are killed and unmasked to the immune system. In *Loa loa* endemic areas, The Carter Center has demonstrated that long-lasting insecticidal bed nets (LLIN) can interrupt LF transmission in the absence of MDA.

In the regions of Nigeria supported by The Carter Center, *Anopheles* mosquitoes transmit both LF and malaria, making the two diseases prime candidates for integrated interventions, including LLIN distribution and health education activities.

Annex 3: Strategies to Achieve and Maintain Malaria Elimination/Eradication

Presentation by Dr. Larry Slutsker, Associate Director for Science, Center for Global Health, US Centers for Disease Control and Prevention, Atlanta, GA

The Global Malaria Action Plan, launched by Roll Back Malaria (RBM) in 2008, states that: "Eradication, or reducing the global incidence of malaria to zero, is the long-term goal for RBM and will be achieved through progressive elimination in countries where feasible". This goal of eradication was initially established by the World Health Organization in the 1950s and was never technically abandoned, but it received little attention for several decades following the disappointing results of the initial global eradication effort. In recent years, there has been renewed commitment to malaria eradication, largely initiated by The Bill & Melinda Gates Foundation, which declared a goal of eradication at its 2007 Global Malaria Forum.

There are a number of reasons that people have again begun to believe that eradication is possible, including the availability of increased funding for malaria, the development of new technologies and tools, and the successful scale-up of interventions in some places. In the past five years, four additional countries have achieved elimination: United Arab Emirates (2007), Morocco (2010), Turkmenistan (2010), and Armenia (2011).

New technologies, as well as better strategies for implementing existing technologies, will be required to achieve the goal and avoid repeating mistakes of the failed 1950s eradication campaign. To identify the specific needs, a group of over 200 malaria and public health experts engaged in a 2-year process that resulted in the development of the malaria Eradication Research Agenda (malERA). The needs identified by the malERA process included: new vaccines, new drugs (single radical cure with prophylactic effect), new vector control measures (new insecticides, outdoor biting prevention, modified vectors), new diagnostics (sensitive, cost-effective and field-ready), investment in basic science, new modeling (optimal intervention mix), improved health systems, and better surveillance/monitoring and evaluation.

The key difference between malaria *control* and malaria *elimination* is that control focuses on finding and treating active cases of disease, while elimination requires the detection and treatment of all infections, including asymptomatic, latent, and imported infections. The implications of this difference for surveillance, treatment, and diagnostics are clearly reflected in the malERA recommendations.

The malERA emphasizes the use of surveillance as an intervention, and not just as a tool for monitoring and evaluation. Surveillance systems in the context of elimination programs will require some form of active case detection to complement passive detection. While passive case detection (identification of cases at a reporting health facility) might be sufficient for malaria control, it has important limitations for detecting all new malaria infections. Not all malaria infections will result in symptomatic disease and not all individuals experiencing symptoms will seek care. Furthermore, diagnostic capabilities at health facilities are often limited, meaning that patients with clinical disease are not always tested. Even when patients are tested, diagnostic tests do not identify 100% of infections. While these limitations could be offset by interventions to encourage timely treatment-seeking, increase the availability of high quality diagnostic tests, and improve the capacity of first-line health workers to use these tests, such improvements would still not address the percentage of new infections that are asymptomatic. In order to achieve elimination, some form of active case detection will be needed to complement passive case detection.

Active case detection to identify additional cases and infections could include the *re-active* investigation of potential cases in households surrounding index cases that are identified through health facility surveillance. It also could include *pro-active* screening of communities based on epidemiological intelligence of at-risk areas, populations, or times of the year. A third option could be the use of mass "screen and treat" campaigns during which large segments of the population are tested and treated. There may also be a role for mass drug administration (MDA), though this is not currently part of the global malaria strategy recommended by WHO. Past experiences with MDA for malaria have shown rapid decreases in prevalence followed by a rapid rebound after stopping treatment. Effective MDA would require the development of new drugs that would be safe and effective against both sexual and dormant liver stages of the parasite in relapsing malaria.

New strategies and tools are required to facilitate the routine use of surveillance as an intervention to guide programmatic decisions and action at the local level. Table 4 illustrates potential areas for research and development related to the investigation, discovery and reporting of infections, as well as the targeting of responses to focus on transmission foci and coverage gaps.

Table 4. Research and Development (R&D) opportunities to promote surveillance as an intervention.

Activity	Tools	Possible Areas for R&D
Investigation: Active detection of new infections and response to decrease transmission	Epidemiologic response	Targeted mass screening; mass screen and treat
	Entomologic response	Focal spraying, community source reduction
Discovery: Diagnosis	Sensitive, cheap, field-ready diagnostic tool	Rapid diagnostic tests (RDTs), DNA-based tests, non-invasive tests
Timely reporting, analysis, and data dissemination	Communications and analysis technology	Cell phone reporting, internet
Identification of transmission foci and coverage gaps	Mapping	Real time display of vectors, intervention coverage, and cases

As malaria programs move from control to elimination phases of activity, and cases become less frequent and the proportion of low density infections increases, there is a growing need for new diagnostic tools and methods. These may include DNA-PCR, genotyping, or serology. There is also a need to strengthen entomological monitoring and vector control strategies, recognizing that "one size does not fit all".

Once elimination is obtained at the national level, strong surveillance and screening systems will be essential to prevent importation of new infections. Possible options include: active infection detection and treatment for migrants and travelers, border screening, cross-border and regional initiatives, and the use of cell phone technology to monitor importation risk.

Evidence-based elimination strategies will not be sufficient on their own; strong continued political and financial support are essential for the achievement of malaria elimination. Surveillance, health communications, diagnosis and treatment, and vector control interventions must all be supported by legal frameworks, community engagement, strong health systems, political stability, and strong program management (See Figure 14).

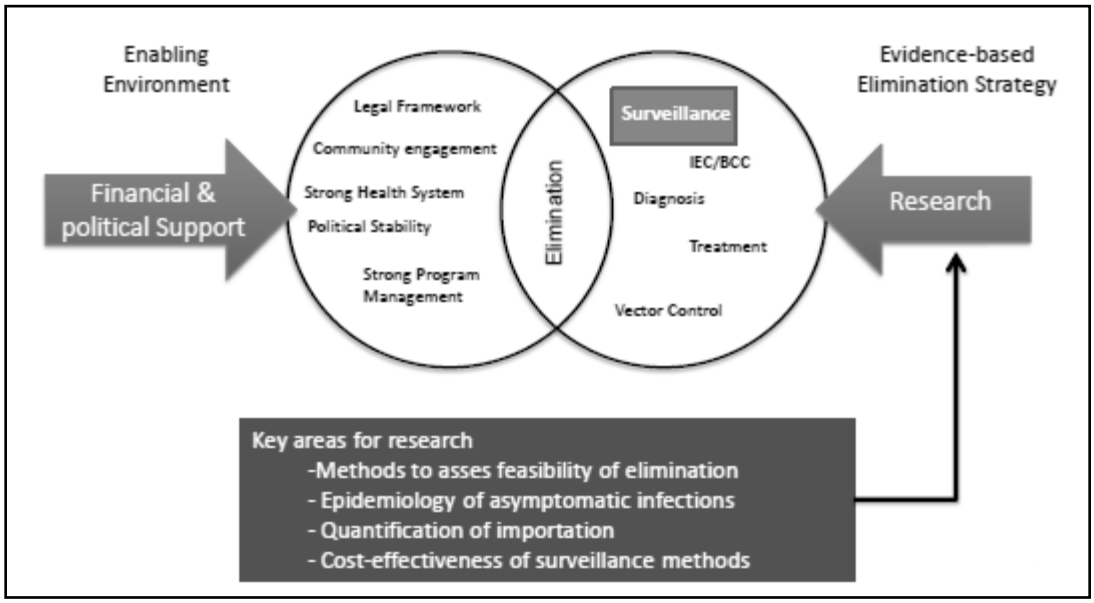

Figure 14. Elimination framework.

Annex 4: Proposed Malaria Elimination Demonstration Project in Amhara Regional State, Ethiopia

Presented by Mr. Asefaw Getachew, Senior Technical Advisor, PATH/MACEPA, Ethiopia.

Ethiopia has made great progress in the fight against malaria since 2005. The FMOH and its partners have been massively scaling-up malaria prevention and control interventions in order to significantly reduce disease morbidity and mortality. The key interventions include: mass distribution of free, long-lasting insecticide-treated nets (LLINs); indoor residual spraying (IRS) in selected *woredas* (districts), and nationwide availability of malaria diagnosis and artemisinin-based combination therapy (ACT).

The first goal of the 2010-2015 National Strategic Plan for Malaria Prevention, Control, and Elimination in Ethiopia is to "achieve malaria elimination within specific geographical areas with historically low malaria transmission" by 2015. While much has been accomplished to scale-up malaria interventionsit will be necessary to further increase coverage with existing interventions as the country shifts to a sustained control/pre-elimination phase (Figure 15).

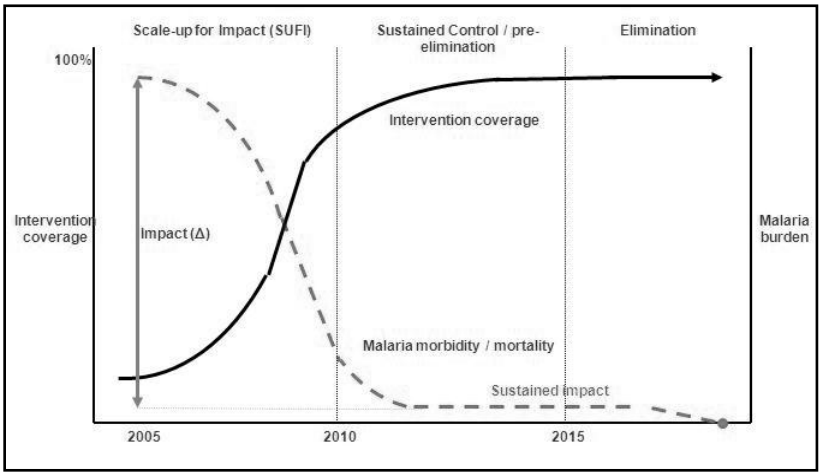

Figure 15. The path toward malaria elimination.

To support the Federal Ministry in achieving its elimination goals, The Carter Center (TCC) and Malaria Control and Evaluation Partnership in Africa (MACEPA) propose a collaborative project to eliminate malaria in Amhara Region in a select number of *woredas* representing different transmission intensities. This is important since the national goals set by the FMOH call for elimination work only in areas of lowest intensity of transmission. TCC and PATH/MACEPA are proposing to support elimination demonstration work in a range of transmission intensities (high, medium, and low transmission). This is in keeping with a principle shared by TCC and MACEPA: 'start in the hard places first.'

Other factors aside from transmission levels to be considered include:

- Logistical feasibility
- Availability of woreda-level surveillance data
- Opportunities to learn about the frequency of importation due to internal & external migration of migrant laborers and outbreaks that might result from importation
- Scale up potential from woreda to zone level.

The general project objective is to sustain and expand malaria intervention coverage in malaria elimination-designated districts, which will in turn result in the reduction of *P. falciparum* and *P. vivax* transmission to zero. Results and lessons learned from this project will pave the way ultimately achieving the goal of sub-national malaria elimination.

This proposed project will utilize TCC's long-standing experience working in Amhara through the deployment of zone project coordinators in each zone, as well as the continuation of widespread screen and treatment campaigns for malaria that are conducted during mass drug administration for trachoma and aim to reach every individual in Amhara Regional State.

Initial consultation has been sought from the FMOH and RHB, who are ready to engage in the collaborative effort. A working group of TCC, PATH/MACEPA and RHB representatives will be organized and charged with drawing up a full concept paper, MOU, and timeline of activities.

Annex 5: Editor's Report - National Conference on the Collaboration between the Lymphatic Filariasis Elimination and Malaria Control Programs, March 27-28, 2012

In March 2012, the Nigerian Federal Ministry of Health and The Carter Center co-hosted the first national conference to stop transmission of lymphatic filariasis (LF) and malaria in Nigeria. The meeting was held on March 27-28 at the Shehu Musa Yar'Adua Center in Abuja. The conference was chaired by General (Dr.) Yakubu Gowon (former Head of State of the Federal Republic of Nigeria). The Honorable Minister of Health was represented by the Permanent Secretary of Health, Mrs. Fatima Bamidele. Participants at the conference included representatives from the Federal Ministry of Health, The Carter Center (TCC) Atlanta and Nigeria offices, the Bill & Melinda Gates Foundation (BMGF), the World Health Organization (WHO), the African Program for Onchocerciasis Control (APOC), the Department for International Development (DFID), SightSavers, Vision 2020, Mission to Save the Helpless (MITOSATH), Helen Keller International (HKI), as well as the Nigerian Neglected Tropical Diseases (NTDs) steering committee chairperson, the Nigerian Non-Governmental Development Organization (NGDO) coalition chairman, and the state program managers for LF & malaria. The Nigerian press was also well-represented at the meeting.

The schedule of meeting sessions is presented in Table 5 below. The plenary sessions were moderated by Dr. Lance Gordon, Professor Adenike Abiose, Professor O. O. Kale, Dr. Y. J. Jiya, and Professor O. Akogun.

Table 5: List of Presentations and Presenters

Presentation Title	Presenter	Institutional Affiliation
The Imperative for the Integration of LF Elimination and Malaria Control Programmes	Dr. Frank Richards	TCC Atlanta
Global Overview of Malaria	Dr. Amy Patterson	TCC Atlanta
Global Overview of LF	Mr. Darin Evans	TCC Atlanta
National Overview of Malaria	Dr. Joel Akilah	National Malaria Control Programme
National Overview of LF	Mr. E. Davies	National LF Elimination Programme
The Carter Center Plateau Experience	Dr. Abel Eigege	TCC Nigeria
Behavior Change Communication	Mr. Adamu Sallau	TCC Nigeria
LF and Malaria: Strategies and Opportunities for Synergies	Dr. Lance Gorden	BMGF
Integrated Vector Management	Dr. Amy Patterson	TCC Atlanta
Effective implementation of LF Elimination in Endemic Countries: Monitoring and Evaluation	Professor O. Akogun	Federal University of Technology, Yola
Sustainable Management Training Center: Integration Experience	Dr. Abel Eigege	TCC Nigeria

On the second day of the meeting, participants broke out into small groups to develop recommendations pertaining to integration of malaria and LF activities in the following areas: monitoring and evaluation, policy and funding, behavior change communications, treatment scale-up and delivery, vector control scale-up and delivery, and community and community health workers.

At the end of the meeting, the following resolutions and recommendations were made:

1. As a follow up from the malaria (ML)/lymphatic filariasis (LF) conference in Abuja, Federal Ministry of Health (FMOH) is requested to urgently convene an integrated ML/Neglected Tropical Diseases (NTDs) stakeholders' meeting to articulate its policy on integration.
2. Both malaria and LF policies and strategic plans call for integration, therefore the FMOH should put in place specific activities that actualize this integration.
3. The policy makers should ensure that, for the purposes of integration, leadership at the disease control level is under a unit for effective coordination and implementation.
4. Ministries of Health should be strong advocates with donors in consonance with policies and strategic plan for integration.
5. Motivational issues regarding community volunteers should be addressed by Ministries of Health and local government areas (LGAs).
6. The RBM platform should be adopted at LGA level to report monthly on LF indicators, and the annual mass drug administration (MDA) exercise can be used to track the coverage and utilization of long lasting insecticide nets (LLINs). Also, LF and malaria sentinel sites should monitor both diseases.
7. Work towards and advocate for the integration of the Advocacy, Communication, and Social Mobilization (ACSM) plan at national and state levels. Communities should be involved at all stages of the development to ensure ownership and sustainability.
8. Capacity building for integration is necessary at National, State, LGA and community levels. Integrated training and monitoring should be conducted on a yearly basis for the program personnel at all levels.
9. For scale up of LF, there is an urgent need for States and partners to complete national mapping and baseline surveys in sentinel villages. Rapid Assessment for Loa loa (RAPLOA) should be conducted in LF endemic, non-CDTI areas in Loa-endemic zones. For scale up of the malaria program, the remaining states need to complete their LLIN distributions.
10. There should be a harmonized ML/LF work-plan at the National, State and LGA level. ML/LF programs should convene an integrated annual program review.
11. Supervisors should have a checklist that allows integrated supervision/monitoring for both LF and malaria.
12. Integrated vector control should be carried out at the community level for both LF and malaria.

Annex 6: Publications and Abstracts since 2007

Publications

1) Graves PM, Ngondi JM, Hwang J, Getachew A, Gebre T, Mosher AW, Patterson AE, et al. (2011). Factors associated with mosquito net use by individuals in households owning nets in Ethiopia. *Malaria Journal*. 10:354.

2) Ngondi JM, Graves PM, Gebre T, Mosher AW, Shargie EB, Emerson PM, and Richards FO. (2011). Which nets are being used: factors associated with mosquito net use in Amhara, Oromia and Southern Nations, Nationalities and Peoples' Regions of Ethiopia. *Malaria Journal*. 10:92

3) Shargie EB, Ngondi J, Graves PM, Getachew A, Hwang J, Gebre T, Mosher AW, Ceccato P, Endeshaw T, Jima D, Tadesse Z, Tenaw E, Reithinger R, Emerson PM, Richards FO, and Ghebreyesus TA. (2010). Rapid increase in ownership and use of long-lasting insecticidal nets and decrease in prevalence of malaria in three regional states of Ethiopia, 2006-2007. *Journal of Tropical Medicine.* Volume 2010, Article ID 750978, 12 pages doi:10.1155/2010/750978.

4) Endeshaw T, Graves PM**,** Shargie EB, Gebre T, Ayele B, Yohannes G, Zerihun M, Genet A, Melak B, Kebede A, Jima D, Tadesse Z, Ngondi J, Mosher AW, Richards FO, and Emerson PM. (2010). Comparison of Parascreen Pan/Pf, Paracheck Pf and light microscopy for detection of malaria among febrile patients, Northwest Ethiopia. *Trans Roy Soc Trop Med Hyg.* 104: 467-474.

5) Jima D, Getachew A, Bilak H, Steketee RW, Emerson PM, Graves PM, Gebre T, Reithinger R, Hwang J, and the Ethiopia Malaria Indicator Survey Working Group. (2010). Malaria Indicator Survey 2007, Ethiopia: coverage and use of major malaria prevention and control interventions. *Malaria J.* 9: 58.

6) Hwang J, Graves PM, Jima D, Reithinger R, Kachur SP, and the Ethiopia MIS working group. (2010). Knowledge of malaria and its association with malaria-related behaviors — Results from the Malaria Indicator Survey, Ethiopia, 2007. *PLoS One* 5(7): e11692.

7) Graves PM, Richards FO, Ngondi J, Emerson PM, Shargie EB, Endeshaw T, Ceccato P, Ejigsemahu Y, Mosher AW, Hailemariam A, Zerihun M, Teferi T, Ayele B, Mesele A, Yohannes G, Tilahun A, and Gebre T. (2009). Individual, household, and environmental risk factors for malaria infection in Amhara, Oromia and SNNP regions of Ethiopia. *Trans Roy Soc Trop Med Hyg.* 103(12):1211-20.

8) Shargie EB, Gebre T, Ngondi J, Graves PM, Mosher AW, Emerson P, Ejigsemahu Y, Endeshaw T, Olana D, WeldeMeskel A, Teferra A, Tadesse Z, Tilahun A, Yohannes G, Hopkins DR, and Richards FO. (2008). Malaria prevalence and mosquito net coverage in Oromia and SNNPR regions of Ethiopia. *BMC Public Health.* 8: 321.

9) Endeshaw T, Gebre T, Ngondi J, Graves PM, Shargie EB, Ejigsemahu Y, Ayele B , Yohannes G, Teferi T, Messele A, Zerihun M, Genet A, Mosher AW, Emerson PM, and Richards FO. (2008). Evaluation of microscopy and ParaScreen rapid diagnostic test for the detection of malaria under operational field conditions: a household survey in Amhara, Oromia and Southern Nations, Nationalities and Peoples' Regions of Ethiopia. *Malaria J.* 7:118.

10) Emerson PE, Ngondi J, Shargie EB, Graves PM, Ejigsemahu Y, Gebre T, Endeshaw T, Genet A, Mosher AW, Zerihun M, Messele A, and Richards FO. (2008). Integrating an NTD with one of "The Big Three": combined malaria and trachoma survey in Amhara Region of Ethiopia. *PLOS Neglected Tropical Diseases.* 2(3): e197.

Abstracts presented at ASTMH 2010

Patricia M. Graves, Emmanuel Emukah, Aryc W. Mosher, Jeremiah Ngondi, Emmanuel Miri, Obiezu Josephine, Okpala T. Njideka, Njoku Chidi, Nwordu Kenrick, Obasi Andrew, Frank O. Richards. *Reduction in anemia in children under ten years of age after distribution of long-lasting insecticidal nets (LLIN) for control of malaria and lymphatic filariasis in four local government areas (LGAs) in Southeast Nigeria.*

Stephen C. Smith, Aprielle Brackery, Gedeon Yohannes, Patricia M. Graves, Tekola Endeshaw, Estifanos B. Shargie, Aryc W. Mosher, Paul M. Emerson, Teshome Gebre. *Monitoring the durability of long-lasting insecticidal bednets in rural Ethiopia.*

Gedeon Yohannes Anshebo, Stephen C. Smith, Aprielle Brackery, Damtew Yadeta, Patricia M. Graves, Tekola Endeshaw, Teshome Gebre, Paul M. Emerson. *Bioassay testing with permanet-2 long lasting insecticidal net samples collected after 3 to 32 months of use in Ethiopia demonstrates persistence of insecticide on nets but reduced killing effect in wild type* Anopheles arabiensis*.*

Abstract presented at APHA 2010

Tamica Moon, Julie Gutman, Emmanuel Emukah, Patricia M. Graves, Nkwocha Omeni, Nwankwo Lawrence, Gift Opara, Adaku Echebima, Rita Otozi, Mgbodichi Onyia, Frank O. Richards. *Exploring factors that influence the use of bednets in southeastern Nigeria.*

Abstract presented at ASTMH 2009

Jimee Hwang, Patricia M. Graves , Richard Reithinger, Asefaw Getachew, Hana Bilak, Estifanos Biru Shargie, Jeremiah Ngondi, Aryc W. Mosher, Adam Wolkon, Eskindir Tenaw, S. Patrick Kachur, Daddi Jima. *Mother's knowledge of malaria predicts child's ITN use and fever treatment— Malaria Indicator Survey, Ethiopia, 2007.*

Abstract presented at MIM 2009 Nairobi.

Stephen C. Smith, Aprielle Brackery, Paul M. Emerson, Tekola Endeshaw, Patricia M. Graves, Estifinos Biru, Gedeon Yohannes, Teshome Gebre. *Physical and insecticidal deterioration of bednets after 3 - 6 months household use in rural Ethiopia.*

Abstracts presented at ASTMH 2008

Patricia M. Graves, Frank O. Richards, Jeremiah Ngondi, Paul M. Emerson, Estifanos Biru Shargie, Tekola Endeshaw, Pietro Ceccato, Yeshewamebrat Ejigsemahu, Aryc W. Mosher, Afework Hailemariam, Mulat Zerihun, Tesfaye Teferi, Berhan Ayele, Ayenew Mesele, Gideon Yohannes, Abate Tilahun, Teshome Gebre, Daddi Jima, Tedros Adhanom Ghebreyesus. *Individual, household, and environmental risk factors for malaria infection in Amhara, Oromia and SNNP regions of Ethiopia.*

Daddi Jima, Jimee Hwang, Asefaw Getachew, Hana Bilak, Estifanos Biru Shargie, Teshome Gebre, Gashu Fentie, Adam Wolkon, Scott Filler, Richard Reithinger, Paul M. Emerson, Tekola Endeshaw, Aryc W. Mosher, Frank O. Richards, Eskindir Tenaw, Ambachew Medhin, Khoti Gausi, John Miller, Judith Robb-

McCord, Richard Steketee, Patricia M. Graves, Zerihun Tadesse, Tedros Adhanom Ghebreyesus *Achievements in malaria control in Ethiopia— Results from Malaria Indicator Survey, 2007.*

Aryc W. Mosher, Moses Katabarwa, Teshome Gebre, Estifanos Biru Shargie, Abate Tilahun, Patricia M. Graves, Frank O. Richards. *Impact of increased numbers of community directed distributors on successful distribution of ivermectin in Ethiopia, 2007*.

Estifanos Biru Shargie, Patricia M. Graves, Asefaw Getachew, Jimee Hwang, Frank O. Richards, Paul M. Emerson, Teshome Gebre, Aryc W. Mosher, Tekola Endeshaw, Yeshewamebrat Ejigsemahu, Afework Hailemariam, Eskindir Tenaw, John Miller, Ambachew Medhin, Jeremiah Ngondi, Daddi Jima, Zerihun Tadesse, Tedros Adhanom Ghebreyesus. *Rapid increase in coverage with long-lasting insecticidal nets in Amhara, Oromia and SNNP regions of Ethiopia.*

Abstracts presented at ASTMH 2007

Paul M. Emerson, Yeshewamebrat Ejigsemahu, Estifanos Biru, Patricia Graves, Jeremiah Ngondi, Asrat Genet, Teshome Gebre, Tekola Endeshaw, Aryc W. Mosher, Frank O. Richards. *Integrating one of the NTDs with one of the big three. An integrated malaria indicator, parasite prevalence, trachoma indicator and trachoma prevalence survey in Amhara national regional state, Ethiopia.*

Patricia M. Graves, Yeshewamebrat Ejigsemahu, Estifanos Biru, Aryc W. Mosher, Jeremiah Ngondi, Teshome Gebre, Tekola Endeshaw, Paul M. Emerson , Afework Hailemariam, Frank O. Richards. *Can river blindness village workers improve the quality of LLIN distribution? A mosquito net coverage and malaria prevalence survey in Oromiya and SNNP regions of Ethiopia, 2006-2007.*

Annex 7: List of Participants

Bill & Melinda Gates Foundation
Erin Shutes, M.P.H.

Centers for Disease Control
Dr. Leo F. Weakland
Dr. Stephen Blount
Dr. Julie Gutman
Dr. Mark Eberhard
Dr. Kimberly Lindblade
Dr. Laurence (Larry) Slutsker
Dr. Gail Stennies

Council of State and Territorial Epidemiology
Ms. LaKesha Robinson

Department of Public Health and Primary Care
Dr. Jeremiah Ngondi

Emory University
Dr Peter Brown
Dr. Sita Ranchod-Nilsson
Dr. Deb McFarland

Ethiopia
Mr. Ayeligne Mulualem Tuafie - Amhara Regional Health Bureau
Mr. Asefaw Getachew
Mrs. Hiwot Solomon Taffese - Ministry of Health
Mr Solomon Kibret Birhanie - The Carter Center
Dr. Zerihun Tadesse Gebreselassie - The Carter Center
Mr. Aseged Taye Zeleke - The Carter Center
Mr. Mulat Zerihun Lemu - The Carter Center

ISGLOBAL - Institute for Global Health of Barcelona
Ms. Kate Whitfield

Lions International - Ethiopia
The Honorable Dr. Tebebe Y. Berhan

Yakubu Gowon Center
His Excellency, General Yakubu Gowon
Mrs. Victoria Gowon

Nigeria
Dr. Jaafar Mansur Kabir - Federal Ministry of Health
Mrs. Chioma Amajoh - National Malaria Control Programme, Federal Ministry of Health
Dr. Abel Eigege - The Carter Center
Dr. Emmanuel Emukah - The Carter Center
Dr. Emmanuel Miri - The Carter Center
Mr Adamu Sallau Keana - The Carter Center

Sightsavers
Mr. Dominic Haslam

The Carter Center Atlanta
Ms. Sarah Bartlett
Ms. Rebecca Brookshire
Ms. Kelly Callahan
Mr. Don Denard
Ms. Lisa Dickman
Dr. Paul Emerson
Mr. Darin Evans
Ms. Madelle Hatch
Ms. Alicia Higginbotham
Dr. Donald R. Hopkins
Ms. Lauri Hudson-Davis
Dr. Moses Katabarwa
Mr. Jonathan King
Ms. Nicole Kruse
Mr. Aryc Mosher
Dr. Gregory Noland
Ms. Stephanie Palmer
Ms. Amy Patterson
Ms. Lindsay Rakers
Dr. Frank Richards
Mr. Randy Slaven
Ms. Emily Staub
Mr. Adam J. Weiss
Mr. Craig Withers

Annex 8: Malaria Program Review Meeting Agenda

February 24, 2012		
8:00	**Shuttle pickup at hotel**	
8:30 – 9:00	**Continental breakfast**	
 9:00 – 9:05 9:05 – 9:15	**Morning session** Welcome and introductions Overview	Dr. Frank Richards (Chair) Dr. Donald Hopkins Dr. Frank Richards
9:15-9:30 9:30-9:45	Strategies for Achieving Malaria Elimination and Eradication *Discussion*	Dr. Larry Slutsker (CDC)
9:45– 10:15 10:15 – 10:30	Nigeria National Malaria Control Program *Discussion*	Mrs. Chioma Amajoh
10:30 – 10:45	**Coffee break**	
10:45 – 11:15 11:15 --11:30	The Carter Center Nigeria Malaria Program Progress Report *Discussion*	Mr. Adamu Sallau
11:30 – 11:40 11:40 – 11:50	Integrated Efforts to Interrupt LF and Malaria Transmission in Nigeria *Discussion*	Dr. Emmanuel Miri
11:50 –12:20	**Recommendations for Nigeria**	Dr. Frank Richards (Chair)
12:20 – 1:30	**Lunch**	
	Afternoon session	Dr. Paul Emerson (Chair)
1:30 – 2:00 2:00-2:15	Ethiopia National Malaria Control Program *Discussion*	Ms. Hiwot Solomon
2:15-2:45 2:45 – 3:00	The Carter Center Ethiopia Malaria Program Progress Report *Discussion*	Mr. Solomon Kibret
3:00 – 3: 30	**Photo and coffee break**	
3:30– 3:45 3:45 - 4:00	Strengthening Malaria Surveillance in Amhara *Discussion*	Dr. Gregory Noland
4:00– 4:15 4:15-- 4:30 4:30– 4:45	Selecting *Woredas* for Elimination Demonstration in Amhara Region Actions for Elimination *Discussion*	Mr. Asefaw Getachew Dr. Rick Steketee, PATHMACEPA
4:45-5:30	**Recommendations for Ethiopia**	Dr Paul Emerson (Chair)
5:30- 5:45	Summary and Closure	Dr. Donald Hopkins
5:45	**Session adjourned** **Shuttle departs for hotel**	