MALARIA FORUM:

COLLABORATION | INNOVATION | IMPACT

FINAL REPORT

October 16 – 18, 2007

BILL & MELINDA GATES *foundation*

Executive Summary

The Bill & Melinda Gates Foundation (BMGF) hosted a Malaria Forum in Seattle, Washington, October 16-18, 2007, to bring together grantees, partners, scientists, advocates, and leaders to review progress in malaria control, share challenges and successes, and think creatively about how to solve the malaria problem using what we have today and what is needed in the future. Over 300 people participated in the Forum, the theme of which was Collaboration, Innovation, and Impact.

Collaboration

Collaboration has been key to the successes countries are seeing in their implementation programs, and most countries actively scaling up malaria control are beginning to see impact. The scale-up effort includes the key components of the existing malaria control tool box: artemisinin-based combination therapies (ACTs), insecticide-treated nets (ITNs), indoor residual spraying (IRS), and new uses of old drugs, such as intermittent preventive treatment of malaria in pregnancy (IPTp). Implementation has advanced in the past two years largely with funding from the Global Fund to Fight AIDS, Tuberculosis, and Malaria (the Global Fund), the U.S. President's Malaria Initiative (PMI), and the World Bank Booster Program for Malaria Control. New funding is or will be coming from UNITAID and charitable organizations that have taken on malaria. National Malaria Control Programs (NMCPs) are leading the development of coordinated country programs with the support and participation of development partners and the Roll Back Malaria (RBM) Partnership. Collaboration is the foundation of malaria research and development (R&D) progress, with partnerships between nonprofits, pharmaceutical and biotech companies, academia, and government reaching record levels and seeing unprecedented successes in the number of products in advanced development. Many difficult challenges remain, and new ones will arise. Effective, meaningful collaboration will be essential to meeting them.

Innovation

Malaria has plagued humankind for millennia. Every time malaria has been managed by a drug or insecticide, it has evolved to survive and even thrive. Getting and staying ahead of malaria will require innovation: new tools, new ways of thinking about the problem, and new strategies. With even larger control goals, the problems to be solved may lead to prioritization of additional approaches to ensure that in the long term malaria will not be a public health threat.

Achieving and sustaining high-level malaria control in endemic countries will require innovation in all areas. It is likely, if not inevitable, that the parasite will develop resistance to currently used drugs, even to combination treatments that are designed to avoid or slow the occurrence of resistance. That will require the continuous innovation of new drugs and drug classes. The same is true of insecticides used for vector control. While we have one promising malaria vaccine that may be licensed in the next few years, better vaccines targeting different stages of the malaria parasite will undoubtedly be needed. Even with effective drugs, insecticides, and vaccines, finding optimal combinations of interventions and better ways to deliver them will require innovation. Finally, the world is spending less than one-third of what will be needed to achieve and sustain high level malaria control, so innovative financing mechanisms will be essential if we are to take full advantage of existing and new tools.

The long-term goal of malaria eradication poses its own challenges that will require innovation as we move toward the target. Many experts believe that eradication cannot be achieved in areas of

intense transmission without new tools, for example, genetically modified mosquitoes that would be resistant to malaria and could replace the current susceptible vector population. One of the major challenges for any program targeting eradication is sustaining the effort when low levels of disease have been achieved and commitment is often replaced by complacency and complaints. Having tools that rely less on human behavior and cooperation may be invaluable and even necessary. As the target of eradication is approached, the level of investment required to sustain the effort relative to the number of cases will increase, and innovative ways to maintain political, financial, and community commitment will be needed if the ultimate goal is to be achieved.

Impact

Forum participants agreed that collaboration and innovation—and any efforts against malaria—are meaningless unless they result in negative impact on the disease and positive impact on the people most affected by it. The degree of impact became a major focus of the meeting. Bill and Melinda Gates called for the eradication of malaria as the long term goal toward which all efforts should be directed. They reasoned that the only way to end the risk of deaths and the need for sustainable control for malaria is to eradicate it—completely stop its transmission—since when the parasite has a chance to return, it returns with a vengeance to populations that have lost naturally acquired immunity by not being regularly exposed to it. They spoke of the human and financial cost of malaria, the inequity in allowing malaria to continue, and the need to capitalize on current successes, political will, and scientific advances. They understand that eradication will be very difficult, will likely take decades and tools that have not yet been invented, and will require a well-considered collaborative plan of action and sustained political will and commitment. They pledged their own. Some Forum participants embraced eradication as a reasonable goal, while others expressed the need for great caution and less ambitious goals. World Health Organization (WHO) Director General Margaret Chan committed WHO to the goal of eradicating malaria and challenged the rest of the world to join.

After three days of energetic discussion and debate, the President of the Global Health Program, BMGF, Dr. Tadataka Yamada, remarked on the significant progress being made with imperfect tools imperfectly applied, often under very difficult operational circumstances. He ended the Forum with a call for participants to commit to a common vision; combine their intellect and resources to develop, implement, and monitor a comprehensive and adaptive plan; be willing to innovate, fail, overcome barriers, and stay committed; and become an enterprise to defeat malaria once and for all.

Each session of the Forum is summarized below.

Introduction

Dr. Regina Rabinovich provided an overview of the Forum's goals, status of malaria control, the foundation's commitments, grantee accomplishments, and what it will take to have serious and sustained impact against this disease. She identified this as a unique time in history—one that never will be repeated. The world is seeing the largest confluence of scientific, financial, and political resources ever aimed at malaria. The malaria R&D pipeline is stronger than ever. This will probably be the best year so far for malaria funding through the Global Fund. And countries are acquiring and distributing millions of insecticide-treated nets. We are making progress, but many are still dying and otherwise impacted. Given what is known about this disease, slow and steady progress will not be sufficient to make the difference needed. Rapid scale-up can translate to more rapid impact.

In malaria, the BMGF focuses its resources on R&D of drugs, vaccines and vector tools; translation of innovation into impact in the field; and advocacy for sustained financial and political support. The hope is that increased commitment will accelerate progress and make the most of the current momentum. Dr. Rabinovich asked if our aspirations are based on the tools we have now, or the tools we believe are needed. Explaining the thinking behind the Forum's theme—Collaboration, Innovation, Impact—she pointed to collaboration as crucial for success within and across specialties; said that innovation for new products, new approaches, and new processes requires taking risks and aiming high; and stressed that translating these into impact is the only reason for a global malaria effort—breakthroughs that do not benefit the people that need them are useless.

Collaboration, innovation, and impact are the principles to which we must hold ourselves accountable, she said, and she took a moment to remember Brian Sharpe, whose legacy is both saving many lives in southern Africa and teaching other leaders who will carry on with the fight.

Grantee Spotlights

Brief spotlights on the progress of three major programs illustrated the types of activity the foundation is supporting.

- Janet Hemingway, Professor of Insect Molecular Biology and Director, Liverpool School of Tropical Medicine (LSTM); CEO, Innovative Vector Control Consortium (IVCC)
- Christopher Hentschel, President and CEO, Medicines for Malaria Venture (MMV)
- Christian Loucq, Director, PATH Malaria Vaccine Initiative (MVI)

IVCC received funding in 2005 to develop insecticides and other tools to improve vector control and monitor vector control program effectiveness. This collaboration among LSTM, the London School of Hygiene and Tropical Medicine (LSHTM), Colorado State University, the University of California (UC) at Davis, and the Medical Research Council (MRC) of South Africa seeks to shift the paradigm of vector control through industry partnerships to ensure sustainable impact on malaria transmission. Highlighted were the development of a system that allows communities instead of entomologists to collect mosquitoes for further study and two interventions that have successfully decreased the mosquito population in one area.

MMV was launched in 1999 to discover, develop, and deliver safe, effective, and affordable antimalarials in the developing world. MMV partners with over 80 organizations and has activities in 34 countries. Its portfolio currently contains approximately 20 high-value new classes of drugs, and four MMV-supported products are in Phase 3 trials and could enter the market within the next two years: Coartem dispersible tablets (Novartis), the first malaria drug formulated for children in the developing world, Dihydroartemisinin-piperaquine (Sigma-Tau Industrie Farmaceutiche Riunite, Chongqing Holley Holding Co. Ltd, and Oxford University), Pyronaridine-artesunate (Shin Poong Pharm. Inc.), and Chlorproguanil-dapsone (Lapdap™)-artesunate (CDA) (GlaxoSmithKline UK, LSTM, LSHTM, and TDR). Emphasis was placed on the need for both new artemisinin combinations as well as non-artemisinin-based products to stay ahead of parasite resistance.

MVI was established in 1999 to accelerate the development of promising malaria vaccines and ensure their availability in the developing world. MVI currently has eight candidate vaccines in its portfolio, including the most advanced candidate, RTS,S (GlaxoSmithKline Biologicals-GSK Bio) and a live, attenuated sporozoite vaccine (Sanaria, Inc.). Collaboration is critical to MVI partnerships, as is the need to identify new antigens, platforms, adjuvants, and methods for down-selection. In addition, MVI focuses on simplifying regulatory pathways for malaria vaccines, defining manufacturing strategies that increase access and potential for combination vaccines, developing

data for decision-making around malaria vaccine introduction, and preparing to make the case for resources to implement a malaria vaccine once approved.

State of Malaria Today

Review of new data that highlights progress.

- Tedros Adhanom Ghebreyesus, Minister of Health, Ethiopia; Chair, RBM Partnership Board
- Ann Veneman, Executive Director, UNICEF
- Brian Chituwo, Minister of Health, Zambia

Progress, optimism, and meeting challenges were the main themes of this session. While malaria continues to take a terrible toll in lives, health, and economic development, progress in critical areas gives countries and the malaria community reasons to be hopeful. Several countries, including Ethiopia, Tanzania, and Zambia, are using national-level partnerships to successfully scale up malaria control with tools available today—ITNs, effective drugs, and IRS. UNICEF's newly-released report "Malaria and Children: Progress in Intervention Coverage" notes that in 16 of 20 sub-Saharan African countries with data available, ITN use increased at least three-fold in two years. Ethiopia, as one example, distributed 18 million nets in two years. Most countries have adopted ACTs as first-line treatment for malaria, and many are using IPTp to protect pregnant women and their unborn children. In Zambia, IRS began in five districts and expanded to 18 this year with the expectation of protecting 3.2 million people – one-third of its population – in the coming peak transmission season. Worldwide, political will, commitment, and funding are at levels never before seen in malaria. Global spending on malaria control and prevention has reached approximately $1 billion per year—a ten-fold increase in ten years—and continues to grow, as does funding for R&D. This growth is fueled by increasing advocacy and growing commitment from national governments, multinational organizations, foundations, and other charitable organizations. Nonetheless, key challenges to accelerating progress against malaria are far from trivial. ITN distribution and use must become routine. ACT use must dramatically expand. Human resources to carry out interventions are currently insufficient, as are the technical support countries need and the ability to monitor and react to drug and insecticide resistance. There is also widespread recognition that new tools and strategies will be needed to keep up with and eventually overcome the malaria parasite. Despite these formidable challenges, current progress and commitment show that malaria can be defeated with bold thinking, collective will and wisdom, coordinated planning, and very serious effort.

Connecting Implementation with R&D

Key success factors for one of the big challenges in malaria today: moving from research to delivery.
Brian Greenwood, Professor of Tropical Medicine, LSHTM

A disconnect between malaria research and program implementation has impeded progress against malaria for decades, with, for example, a 20-year gap between the time scientists knew that ITNs worked to the time when even half of Gambian children were sleeping under one – even though the trials had been done in that country. Several observations help explain this gap: lack of an effective system for getting information to policy-makers and other decision-makers, the fact that malaria's most obvious impact is on those who have little or no political voice, and the cost and perceived difficulty of implementation. Better connecting R&D and implementation is crucial for the development and quick implementation of appropriate solutions, whether they be new strategies, new tools, or new ways to use existing tools. Shortening the discovery-to-implementation gap will require reducing the distance between those who innovate through R&D and those who implement

and decide what should be implemented. This distance is both physical and one of focus. Researchers need to gain a better understanding of the on-the-ground reality where solutions are implemented. Implementers need to better understand what goes into R&D and commercialization. There need to be effective means of getting data for decision-making to policy-makers and for raising the priority of those data and the problem(s) they address. Decision-makers need to know how and when to implement new tools and approaches. There also should be more forums in which players in all these arenas can interact with one another.

Town Hall: State of Malaria Today

Where are we today in controlling malaria? What is the meaning behind the reports you just heard? What are the implications of new data?

- Brian Chituwo, Minister of Health, Zambia
- Tedros Adhanom Ghebreyesus, Minister of Health, Ethiopia; Chair, RBM Partnership Board
- Brian Greenwood, Professor of Tropical Medicine, LSHTM
- Regina Rabinovich, Director of Infectious Diseases Development, BMGF
- Ann Veneman, Executive Director, UNICEF

Moderator: Kent Campbell, Program Director, PATH Malaria Control & Evaluation Partnership in Africa (MACEPA)

This was a lively discussion that, after raising the need for monitoring and evaluation (M&E) to determine impact, resource-appropriate diagnostics, and surveillance (especially with regard to resistance), quickly became a discussion over what the goal of malaria control efforts should be—control, elimination, or eradication? Speakers and participants pointed out that:

- Control might not be a big enough goal;
- The malaria community's ambitions have already increased over the past several years;
- Bigger goals can lead to bigger accomplishments;
- New tools, approaches, and capacities will be needed if the goal is more than just control;
- Caution is required, given the biology and history of malaria;
- The goal among southern African countries is already elimination;
- Previous attempts to eradicate malaria did not altogether fail, eliminating malaria in some areas;
- No child should die from malaria; and
- Consensus, political will, and phase-by-phase planning are essential to reach any big goal.

Foundation's Vision for Malaria

Co-chairs Bill and Melinda Gates shared their vision on the global fight against malaria. They began by expressing their appreciation of the persistence and dedication of Forum participants in the effort to understand and control malaria. Noting the rise and decline of malaria efforts and the consequent decline and resurgence of the disease, the Gates' challenged the Forum to make eradication the long-term goal for ethical (equal value of every life), financial (just controlling malaria would be more expensive in money and lives, perhaps in perpetuity), and epidemiological (the need to continually adapt methods as the parasite adapts) reasons. They also noted that, given current progress in implementation, R&D, fundraising, and generating political will, the time is right for charting a long-term course to eradication, knowing that it will take several decades, sustained commitment, and an array of new tools to reach such an ambitious goal—but that not seeking to eradicate malaria will mean that it will always be there, fighting for its survival at a very high cost to families, nations, and the world. They recognized that eradicating malaria will require ending transmission, which will

require dramatically reducing the number of cases with existing tools and introducing new tools able to break the cycle and prevent it from re-establishing itself. Citing examples of new interest and commitment (donors, multilaterals, companies), successful coordination at country level to get partially effective interventions in place (Zambia, Ethiopia, Tanzania, Mozambique), the breadth of research underway (vaccines, drugs, insecticides, diagnostics, methodologies), and successful efforts to create a market for antimalarial products, they called on citizens, governments, leaders, advocates, and scientists to do what it takes to end deaths from malaria. And they committed themselves until the finish line is reached.

In the subsequent discussion, Dr. Margaret Chan, WHO Director General, embraced the goal of eradicating malaria: "We have to make it work in the interest of humanity. I, for one, pledge WHO's commitment to move forward with all of you. And I dare you to come along with us."

Collaboration on Implementation Today

How can the malaria burden be reduced with steps that can be taken now? How will the community better coordinate resources to address these specific problems? What are leaders doing to improve collaboration?

- Paulo Ivo Garrido, Minister of Health, Mozambique
- Michel D. Kazatchkine, Executive Director, The Global Fund
- Michael O. Leavitt, U.S. Secretary of Health and Human Services
- Joy Phumaphi, Vice President, Human Development Network, The World Bank

Moderator: Awa Marie Coll-Seck, Executive Director, RBM Partnership

Given the excitement and intense questions generated by the previous session, this session focused on rethinking expectations and plans in order to do more with what is available today. Speakers emphasized that coordination and collaboration are paramount, that countries and development partners should look at country plans and see how to make them more ambitious yet attainable, and that obstacles (especially commodity costs and non-financial barriers such as procurement, improved diagnosis, human resources, and interaction among donors) and sustainability issues must be addressed. To further improve collaboration, the U.S. said it can keep its current commitments, contribute in the future, and be more ambitious regarding coordination. The World Bank offered that it can become even more engaged with countries, show benefits of investment, support a fully integrated approach (research, operations, technology, logistics, engaging communities and private sector partners), support harmonization of reporting mechanisms and data collection, contribute to development of financing mechanisms, work for sufficient International Development Association (IDA) replenishment, and encourage countries to request and plan for sustained funding. In order to better coordinate resources, recommendations were for NGOs, governments, communities, and individuals to become part of a network, clearly define roles so there is less overlap, and harmonize along robust country plans. Suggestions for next steps included increasing and maintaining global commitment long-term, showing results, defining phases with milestones to measure success and reflect this in national plans, and collaborating to lower commodity prices and set a uniform quality assurance standard. Other suggestions for improving implementation of current tools included building capacity for and systematizing M&E, ensuring there is a next generation of leaders ready to take over, combining research with implementation, and increasing endemic country funding of malaria control and research. The final call of this session was for everyone to contribute both funding and intellectual capacity.

Grantee Spotlights

Five-minute spotlights on innovations in R&D.

- Pedro Alonso, Director, Barcelona Center for International Health Research, Hospital Clinic of the University of Barcelona
- Susan Charman, Associate Professor, Victorian College of Pharmacy, Monash University
- Jay Keasling, Professor of Chemical Engineering and Bioengineering, UC-Berkeley
- Stephen J. Russell, Chair of Textile Materials and Technology, University of Leeds
- Marcel Tanner, Professor and Director, Swiss Tropical Institute (STI)
- Dyann Wirth, Professor of Immunology and Infectious Diseases and Director, Harvard Malaria Initiative, Harvard School of Public Health

Dr. Alonso shared the results of a recently completed Phase 1/2 safety and immunogenicity trial of GSK Bio's RTS,S vaccine in infants—they had been presented that morning to the Mozambican community where the trial took place. The vaccine was found to be safe, with a reactogenicity profile similar to that of EPI vaccines, and reduced the risk of new infections over a three-month follow-up period by 65%—the first proof of concept of efficacy against new infections in infants.

Dr. Charman presented progress toward a fully synthetic peroxide antimalarial drug. After modifications based on studies of the 1st generation candidate, the 2nd generation candidate will be selected in 2008. The 2nd generation candidates have a better prevention profile than the test drug, mefloquine, in animal studies. The drug, which is projected to be very affordable, even provides a single-dose cure in animal models.

Dr. Keasling discussed an alternative approach to creating affordable antimalarials: the biosynthetic, microbial production of artemisinin using a three-step process. The process yields substantial amounts of artemisinic acid that are chemically converted into artemisinin, which can then be transformed into several well known artemisinin derivatives. They are transitioning to a large-scale manufacturer and are hopeful that a product will be available in new artemisinin-containing combination antimalarials by 2010.

Prof. Russell's team is working on chemical-free insecticidal fabrics for nets. Their innovative fabric is produced using nanotechnology (mostly from sustainable materials), can be washed, and is not susceptible to ultraviolet light. It avoids the downside to chemically treated nets: resistance, washing nets, and environmental issues. They are beginning to plan field trials.

The Intermittent Preventive Treatment for infants (IPTi) Consortium was established after the original Tanzanian study found that a single dose of sulfadoxine pyrimethamine (SP) reduced clinical malaria by 50% and severe anemia by 60% when administered to infants in conjunction with their routine vaccines given at 2, 3, and 9 months of age. Representing the Consortium, Prof. Tanner summarized the studies that have examined efficacy, safety, delivery, effectiveness, and acceptability. In six trials, IPTi with SP was found to be safe, reduced malaria episodes by 30%, reduced all-cause hospital admissions by 23%, had no adverse impact on EPI, and was highly cost-effective. Acceptability studies have shown IPTi to be well-accepted and feasible (using the existing EPI system). Two of the trials showed an increase in anemia following IPTi with SP, but rebound was not significant in the overall analysis. Conservative estimates are that IPTi with SP, where applicable, could prevent 1 million episodes and 10,000 deaths per year. WHO is evaluating whether it will recommend IPTi with SP.

Dr. Wirth's program is applying approaches developed for the human genome project to begin to understand the genetic diversity of the malaria parasite and associate it with drug resistance and other important phenotypes, which should help in drug and vaccine development. The collaboration has identified a set of DNA polymorphisms that can be used to create a "barcode" – effectively a molecular fingerprint of the parasite – for characterization of parasites from clinical studies. This should have immediate applications in current drug and vaccine trials (e.g. to define re-infection vs. recrudescence and explore vaccine efficacy at the level of specific variants in the parasite population) and ultimately be deployable at low cost in peripheral health systems globally.

Global Collaborations on R&D – Solutions for the Future

How does the malaria community improve the speed of delivery of new accomplishments from R&D to the field?

- Daniel Carucci, Director, Grand Challenges in Global Health Initiative; Director of Science, Foundation for the National Institutes of Health (FNIH)
- Margaret Chan, Director-General, WHO
- Anthony Fauci, Director, National Institute of Allergy and Infectious Diseases (NIAID)
- Philippe Monteyne, Vice President, Head of Global Vaccine Development, GSK Bio
- David Mwakyusa, Minister of Health, Tanzania

Moderator: Sir Richard Feachem, Professor of Global Health, UC-San Francisco

Translation of new technologies and products to developing-country contexts traditionally has been slow. Learning from the past, new product development partnerships (PDPs) are working to ensure rapid translation and access. This wide-ranging discussion generated several suggestions for ensuring rapid translation of new products, techniques, and evidence to the front line.

- Ensure the right products are developed by understanding cultural considerations and what the problems and challenges are at field level;
- Build capacity to conduct research where the products are needed;
- Conduct implementation research to understand what works and does not work in specific countries and settings;
- Consult, inform, and prepare implementers before the product is ready for implementation so that appropriate thinking, planning, investment, and (re)organization of resources can take place;
- Gather political and financial support well prior to implementation;
- Ensure affordability and implementation capacity, including strengthening health systems so they are prepared for uptake;
- Transfer technology to developing-country manufacturers that can prioritize developing-country needs and reduce production, packaging, and distribution costs; and
- Create or improve systems for advising governments on what to adopt.

The moderator closed by noting that the biggest pull factor for industry will be the day when 40-70 countries in the world have well-planned, well-managed, well-executed, large-scale malaria control programs underway. That volume of effective work across many countries at large scale will draw interest and articulate what is needed and how it will be delivered.

Resource Needs Projections

The foundation commissioned an analysis and projection of resource needs for the global malaria effort, including control and R&D. This session included a presentation of this analysis and response.

Rajat Kumar Gupta, Chairman, The Global Fund; Senior Partner Worldwide, McKinsey & Co.

- Dean Jamison, Professor of Development Economics, UC-San Francisco
- Daniel Kress, Deputy Director for Policy and Finance, BMGF
- Anne Mills, Professor of Health Economics and Policy, LSHTM
- Wendy Woods, Partner and Managing Director, The Boston Consulting Group
- Mary Carmichael, General Editor, Newsweek

Ms. Woods, representing the Boston Consulting Group (BCG) project team, has been working with data from a number of groups in the malaria community, to complete a preliminary modeling study that estimates what it will cost to reach 80% coverage with existing malaria interventions: $7 billion annually for global malaria control including implementation in 107 countries covering 3.2 billion people for treatment and prevention of both vivax and falciparum malaria. Of that, about $6 billion would fund implementation—such as commodities and monitoring support for tailoring and improving efforts. Up to $800 million annually would be for R&D of products required to stay ahead of resistance threats and improve cost effectiveness.

Donor funding for all malaria implementation programs today is almost $1billion per year. Endemic-country governments spend about an additional $300 million, and individuals spend – out of pocket – approximately $300 million. In addition, global donors spend about $400 million on R&D. Clearly more funds need to be devoted to close the significant gap between current and needed spending. In addition, costs can be decreased by improving the tools we have today, for example, so that one spraying per year is sufficient instead of the current three, and by successfully eliminating malaria in certain regions – in effect "shrinking the malaria map" – and thus facilitating the transition from full-blown prevention to a more targeted and lower cost monitoring and response strategy.

This work was done to provide data for donors and advocates, to supply a baseline to track progress against objectives, and to enable the community to assess different control options and make appropriate trade-offs. Panelists and participants supported the magnitude of the financing required. Discussion centered on the need to know the difference between the cost of eradication and the cost of control, who needs to pay for what, the need for evaluation and surveillance, financing mechanisms, and how best to use the funds. The advocacy community requested assistance in translating the detailed data for advocacy purposes.

Measuring Health Impact

In light of the challenges related to data on the impact of malaria and the community's fight against the disease, this panel discussed several different approaches for measurement of various malaria efforts.

- Christopher J. L. Murray, Director, Institute for Health Metrics and Evaluation, University of Washington
- Bernard Nahlen, Deputy Coordinator, PMI, USAID
- Richard Steketee, Director of Science, MACEPA

Moderator: Steven Phillips, Medical Director, Global Issues and Projects, Exxon Mobil Corporation

This panel highlighted the dearth of specific outcome data regarding malaria, progress being made in standardization of M&E tools, and different M&E approaches being used or considered. Key issues included the need:

- For standardized, streamlined, and linked M&E indicators and systems that work for countries and all donors and allow for trends and causality to be determined;
- For reliable, credible, relevant, and timely data;
- For ways to analyze and apply data to serve different purposes;
- To better understand and respond to the information needs of all the key players, including but not limited to policy makers, program managers, advocates, finance ministries, donors, district-level decision-makers, and researchers;
- To make facility-based data more relevant and understand what they represent, even in areas with minimal facility usage;
- To increase local, district, and national capacity to collect, disseminate, and use M&E data; and
- To assess the impact of malaria control/eradication efforts on the rest of the health system.

Approaches discussed included:
- Different ways to measure rate of transmission, particularly at low levels;
- Using sentinel and national surveillance to measure parasitemia and anemia in children;
- Improving tools for understanding cause of death;
- One Mexican study that allows trends in cause-specific mortality to be predicted by trends in causes of hospital deaths; and
- An RBM-developed tool to provide a standard format for malaria, TB, and HIV (in draft).

It was noted that everything discussed underscored the need for good M&E—practical programs, advocacy, maintaining momentum, ensuring sustainable financing, and other considerations. We need as much innovation in M&E as we need in technology and product development, and we must learn to make data understandable and usable.

Concurrent Breakouts I

Knowledge Sharing in Research

Discussion of the challenging questions around the sharing of data and knowledge within the malaria community.
- Frank Collins, Professor and George & Winifred Clark Chair in Biological Sciences, University of Notre Dame
- Alan Cowman, Chairperson – ICOPA XII Organizing Committee, The Walter and Eliza Hall Institute of Medical Research
- Michael Gottlieb, Associate Director for Science, FNIH
- Seth Owuso-Agyei, Director, Kintampo Health Research Centre

Moderator: Douglas Holtzman, Senior Program Officer, Infectious Diseases Development, BMGF

Speakers highlighted capacity building in Africa and a culture of limiting access to information (especially before publication) as the key challenges to sharing knowledge in malaria research. They noted that developing skills and capacity in the African research community is essential, both to facilitate communication and knowledge sharing (for example, in standardizing data collection formats and accessing existing resources) and to strengthen partnerships with the "Northern" research community. While efforts are underway to bring more Africans into the research community, much more must happen. They also noted that highly successful fields have a culture of sharing. Results should be published in open format journals, and data and reagents should be shared freely. (It was noted that some materials are in limited supply or expensive to prepare.) Negative results should be disseminated when they can inform decision making on other projects,

especially if they are obtained in clinical studies or late in the development cycle. Several lessons were drawn from the human genome project: over time, the human genome project developed a culture of collaboration, albeit with robust project plans and agreements respecting data and intellectual property. Institutional ownership of data and intellectual property must also be addressed in combating malaria. Finally, it was recognized that current research incentives foster competition, not collaboration, between investigators. Changes in funding structure, as when NIAID supported sequencing efforts under contracts rather than grants, can help build collaboration. Within universities and the broader research community, the cultural norms, rewards, and funding must expand to acknowledge contributions to translational research and product development.

Health Care Workers

Leaders have found innovative solutions that begin to address the challenges of the shortfall in qualified local health care workers.

- Oumar Gaye, Head, Medical Parasitology Department, Faculty of Medicine, University Cheikh Anta Diop, Dakar
- Anne Martin-Staple, Founder and President, Health Strategies International, LLC and Senior Research Scholar, Sanford Institute of Public Policy, Duke University
- Simon Miti, Secretary of the Ministry of Health, Zambia

Moderator: Abdi D. Mohamed, Country Coordinator, MACEPA

Key messages here were the dire need to recruit, retain, train, and motivate health workers; the key role community health workers (CHWs) play; the importance of collaboration, partnership, and coordination; and the need for endemic countries to lead the effort and ensure they can do what needs to be done to defeat malaria. Speakers emphasized that interventions cannot work without health workers and community engagement. They pointed to health system reform and the resulting brain drain as likely contributing to increases in malaria morbidity and mortality. To address these issues, countries are:

- Increasing their health budgets (gradually, and by learning to speak the language of finance ministers);
- Assuming leadership in defining country needs and country plans;
- Adjusting health worker salaries;
- Improving and increasing pre-service and in-service training opportunities;
- Working with development partners to develop costed human resource development plans;
- Taking advantage of the Global Fund's Round 5 health system strengthening component;
- Increasing recruitment and retention of CHWs; and
- Linking the education and health care systems to improve NMCPs, get more trained health workers into rural areas, and bring insights from the field into classroom learning;

Still needed are better and simpler analytical models for assessing human resource needs.

Supply Chain Challenges

The ability to deliver scientific and technological advances depends on trustworthy and efficient supply chains. How can the incentives and accountability structures in private sector supply chains be utilized to ensure wider distribution of affordable effective antimalarials? How does the local context affect the supply chain solutions?

- James Banda, Senior Advisor, RBM Partnership
- Suprotik Basu, Public Health Specialist, Malaria Control Booster Program, The World Bank
- Desmond Chavasse, Global Director of Malaria Control, Population Services International

- Mark Grabowsky, Malaria Coordinator, The Global Fund

Moderator: Matthew Lynch, Malaria Program Director, Center for Communication Programs, Johns Hopkins University

Success has been achieved in scaling up coverage of key antimalarial interventions in some countries, principally ITNs and to some extent IRS, but the main challenge noted by all participants was procurement. Where scale up has occurred, it has taken place despite nearly insurmountable obstacles faced in procurement. All panelists noted that procurement took up an inordinate amount of time and effort (85% of effort noted by several). Concern was expressed that current procurement approaches could jeopardize our ability to scale up malaria interventions.

Mapping and Data Visualization

The ability to see data graphically provides the promise of increases in productivity and understanding, and, after a review of the state of mapping and GIS today, panelist will look into the future to see what applications and benefits to expect from this rapidly growing technology.

- John Corbett, Chief Executive Officer, AWhere, Inc.
- Thomas Smith, Professor and Head, Biostatistics and Epidemiology Unit, STI
- Andy Tatem, Spatial Ecology & Epidemiology Group, University of Oxford and Malaria Atlas Project (MAP)

Moderator: Kate Aultman, Senior Program Officer, Infectious Diseases Development, BMGF

Three different mapping exercises were described: MARA, MAP and AWhere. MARA is a map showing malaria risk, analogous to (and partly based upon) climate zones. MAP is a depiction of the current state of affairs with respect to malaria prevalence, analogous to a weather map. AWhere is a context, based on Virtual Earth, which is freely accessible and serves as the basis for analysis and visualization of one's own, local data. Additional data (e.g. road networks, demographic or census data, hydrology data and data about mosquito population distributions) can be overlaid. Immediate concrete activities resulted from the presentations, with new contacts being pursued among the audience and panelists. Maps of intervention coverage will be developed by PMI in conjunction with STI, and the AWhere representative will work with WHO, IVCC, and others to disseminate the idea of user-friendly map interfaces.

Regulatory Framework Reform

Over the next five to ten years, scientists anticipate an increase in new malaria interventions. What will have to change to allow for faster global regulatory approval? How can national regulators better prepare for diverse products emerging from the pipeline? Can knowledge sharing between local governments and global regulatory bodies streamline the regulatory process and speed up licensing?

- Norman Baylor, Director, Office of Vaccines Research and Review, Center for Biologics Evaluation and Research, U.S. Food and Drug Administration (FDA)
- Nina Russell, Senior Program Officer, Infectious Diseases Development, BMGF
- Morteza Zaim, Head Scientist, WHO Pesticide Evaluation Scheme

Moderator: W. Ripley Ballou, Vice President, Global Clinical Research and Development, GSK Bio

Infrastructure and resources are limited for regulation of vector control tools, particularly for public health pesticides, although industry, governments, and international organizations all have a role to play. Industry expertise often sits within the agricultural pesticides arena. Governments need to regulate the product life cycle, terms of use, and other aspects, so reform must happen at the country level. The international community needs to work with countries to sensitize them to issues

so we do not lose safe, effective public health pesticides to resistance. Good management is needed to extend the useful life of available products—this means developing guidelines and tools for monitoring.

The FDA has traditionally focused on products for the US population, but now is trying to have a global presence. A congressional amendment was just approved that includes a provision for FDA to focus on tropical diseases. Through this process, products for tropical diseases would merit priority review (on a six-month clock). A voucher provision seeks to encourage product development—companies that develop products for tropical diseases and get them licensed would receive a voucher enabling them to request priority review for another product that does not have to be focused on a tropical disease area. [NOTE: these may be negotiable]. As a WHO collaborating center, FDA helps developing-country regulatory agencies develop the capacity to evaluate their own products, and strengthening national – and where appropriate, regional – regulatory authorities is critical. Suggestions for improving the regulatory environment for products developed for endemic countries included the creation of a uniform dossier to speed review and approval, a global strategy to harmonize processes, and post-registration regulation processes to discourage counterfeit and sub-standard products. Also needed are an internationally accepted yardstick for evaluating products and more laboratories that can do quality assessment and control.

The HIV Vaccine Enterprise is an example of a useful framework through which donors and stakeholders can organize around common issues and accelerate activities, including activities that have regulatory implications such as preparing for vaccine efficacy trial results, defining endpoints, partnering with national regulatory agencies, and assessing innovative clinical trial designs.

Distributed Science Development Models

The development of science and technical products has undergone a revolutionary shift since the turn of the 21st century. By harnessing the power of the Internet, including collective intelligence and distributed workload, several projects have demonstrated fast development and collective wisdom beyond the expectations of traditional R&D efforts. This session reviewed the benefits of distributed science and other iterations on the traditional R&D model.

- John Clippinger, Senior Fellow, The Berkman Center for Internet and Society, Harvard Law School
- Richard Jefferson, Founder and CEO, CAMBIA BiOS Initiative
- Dominic Kwiatkowski, Director, MRC Centre for Genomics and Global Health, Oxford University; Principal Investigator, Wellcome Trust Sanger Institute, UK
- Thomas Venable, Executive Vice President of Sales and Marketing, InnoCentive Inc.

Moderator: Gary William Flake, Technical Fellow, Microsoft Corporation

Key themes were that:

- The human genome project was successful because it brought together completely different minds to create innovative solutions, and these participants realized that giving away something gained them something. Other key aspects included (1) many people coming together to create a digital artifact, (2) open access, and (3) repurposing the tool for many to use.
- Open source collaborations reward people who are good across fields instead of highly specialized in a single field.
- The internet is creating reliable social networks that can be used to facilitate collaboration.
- The main question should be how problems can be solved faster with less money.
- The community solving the problem should be inclusive—not encumbered by rights, responsibilities, and fears, and there should be a balance between competition and collaboration. Acceleration is best achieved via cooperation.

- Open source is the philosophy that software should be free and encourage cooperation even with a license. It recognizes covenants of behavior and allows people to share data in highly technical, scientifically and socially organized ways. Ideally the result is research that is independent and free but also aligned with related efforts.
- Patent law can be extended to redefine what can be done—in exchange for sharing your process, you get the right to benefit exclusively for several years. The U.S. patent system, however, did not anticipate the integrated work needed to solve malaria. The need for integration across systems forces collaborations that require an evolving framework.

Inspiring Innovation

J. Craig Venter, President, J. Craig Venter Institute

Dr. Venter spoke about what led him to innovation and how innovation can completely change paradigms. His desire to innovate grew from three things: (1) a healthy dose of curiosity, (2) the need to solve problems, and (3) being willing to experiment. These were brought to bear in the global effort to map the human genome, as well as other experiences in his life. He suggested that, now that the human, anopheles, and Plasmodium genomes have been mapped, finding malaria drug and vaccine targets should become easier. He also noted that, due to even more innovation, completing genome maps now requires less time and money. In response to audience questions, he observed that:

- To manage innovation, hire the best scientists and let them do what they do, allow innovation to happen, and think about the problem and solution in new ways.
- To deal with skepticism, believe in what you are doing, keep in view the array of known things needed to solve the problem, and have a step-by-step plan.
- To find a new paradigm when the path is not clear, ask naïve questions.
- To translate from concept to product, see the goal as reachable, and plan for success.

He then asked the malaria field to be and remain innovative, which he felt was not done in earlier efforts to eradicate malaria.

Bringing New Partners to the Fight Against Malaria

In the past two years, malaria has engaged new champions and received additional funding pledges. How do we ensure this trend continues and engage new people and organizations that have not historically been part of the community?

- Diego Gutierrez, Midfielder, Chicago Fire, Major League Soccer; Spokesperson, Nothing but Nets
- Rev. Larry Hollon, General Secretary, United Methodist Communications
- Andrea Lewis, Project Director and Producer, Idol Gives Back.
- Stephen O'Brien, MP for Eddisbury and Shadow Health Minister, UK; Chairman, Malaria Consortium

Moderator**:** Elizabeth McKee Gore, Director of Campaign Partnerships & Nothing but Nets, United Nations Foundation

Panelists represented a variety of constituencies and lengths of time in malaria advocacy, but their core approaches were very similar:

- People want to help, so make it easy for them with clear messages, poignant stories and images, and easy/doable actions;
- Keep above the political fray;

- Engage with basic information before trying to explain nuances and complexities;
- Articulate life-sustaining messages;
- Provide honest, credible information and milestones—avoid offering timelines unless it is certain they will be met;
- Provide opportunities to see problems and solutions first-hand, especially for influential donors and policy makers;
- Reinvent messages to maintain interest and keep up with progress;
- Report on how funds were spent and the progress being made; and
- Replicate and build on what works, and help others do the same.

Industry Leadership

What makes it easier for industry to engage the malaria community? What have industry leaders learned from recent partnerships with NGOs and academia, and how does it change their strategy?

- Alex Matter, Director, Novartis Institute for Tropical Diseases
- Shigehiro Oba, Director and Senior Managing Executive Officer, Sumitomo Chemical Co., Ltd.
- Robert Sebbag, Vice President, Access to Medicines, Sanofi-Aventis
- John Thomas, Global Marketing Manager of Global Health Products, BASF Corporation

Moderator: Christopher Elias, President, PATH

Panelists gave similar reasons for their companies' being involved in malaria. All cited the importance of corporate social responsibility and their employees wanting to be involved in activities that benefit others. They also agreed on the importance of the public and nonprofit sectors ensuring a viable market for products as well as good forecasting data. While all cited a profit motive, companies for which malaria is not a core business wanted just to break even on their malaria activities. To bring other companies into malaria, panelists suggested partnering to reduce company risk, changing public sector perceptions and portrayals of industry, and facilitating collaboration between companies. They expressed surprise at the lack of awareness of how industry works and the many things they must take into consideration, such as shareholders, worker protection, and anti-trust laws. Each expected his company to be active partners in malaria for some time to come.

Concurrent Breakouts II

Resistance Prevention and Monitoring

If drug and insecticide resistance is not inevitable, what can the malaria community do about it? What results have come from the resistance monitoring network activities that are ongoing? What technology tools are available?

- Pierre Guillet, Vector Control Specialist, Vector Control & Prevention Unit, Global Malaria Program, WHO
- Ramanan Laxminarayan, Senior Fellow, Resources for the Future
- Pascal Ringwald, Medical Officer, Global Malaria Program, WHO
- Carol Sibley, Professor of Genome Sciences, University of Washington

Moderator: Nick White, Chairman, Wellcome Trust Southeast Asian Tropical Medicine Research Programs

This panel sought to answer four important questions about drug and insecticide resistance:
What are the gaps in resistance monitoring for anti-malarial drugs?

- Good molecular markers or monitoring tools for new ACT drugs;
- In vivo efficacy tests easy enough to be used for routine surveillance;

- Pharmacological experiments with ACTs to determine if a patient did not respond due to a drug failure or because not enough drug got into the bloodstream;
- A solid phenotype of a parasite that is definitely resistant to artemisinin; and
- Findings from resistance monitoring communicated effectively to country policymakers.

How can the community delay the emergence of resistance to new anti-malarial drugs?
- Reduce demand for mono-therapies and substandard drugs by making ACTs more competitive.
- Use drugs in combination.
- Use multiple first line treatments (ACTs and non-ACTs) so that different drugs are used in different areas to maximize the diversity of drugs used. Investigation will be needed to determine on what spatial scale this diversity should be implemented.
- Stop the use of chloroquine entirely, wait until resistance fades, and then re-introduce it in a combination therapy. (Resistance may linger in the parasite population for a long time, however.)

What are the gaps in resistance monitoring for pesticides?
- A common definition of resistance and agreement on what needs to be monitored;
- Well-standardized surveillance methods;
- Strengthening and support of regional and national monitoring networks;
- Understanding how much resistance is due to agricultural use vs. public health use; and
- Country capacity to interpret resistance data and make decisions based on them.

How can the community delay or deal with the development of resistance to pesticides?
- Develop new pesticides with new modes of action—ideally pesticides for public health use only.
- Rotate use of pesticides for both public health and agriculture.
- Deploy mosaics of pesticides, for example a combination of pesticides on ITNs.
- Use more transgenic crops that are tolerant of pests to decrease the use of insecticides in agriculture and, therefore, the selective pressure on mosquitoes for developing resistance.

Clinical Trials

How do leaders overcome challenges in developing and maintaining field sites and running successful clinical trials? How do they ensure good community relations at the national and local level? What logistics are often overlooked, but critical for success?
- Clara Menendez, Research Professor, Barcelona Center for International Health Research, Hospital Clinic of the University of Barcelona
- Salim Abdullah, Ifakara Health Research and Development Centre
- Theonest Mutabingwa, Associate Member, International, Seattle Biomedical Research Institute
- Barbara Savarese, Head of Clinical Operations, MVI

Moderator: Fred Binka, Project Manager, Malaria Clinical Trials Alliance, INDEPTH Network

Site sustainability depends on interaction or integration with local public health systems and government—they need to collaborate from the beginning. It is also essential to forge a good relationship with the community—community advisory boards are useful. Social anthropologists can play a critical role but generally are not funded or available at most sites. Human resource issues at sites are a limitation for many sites, both for senior staff and field workers. Training programs are needed at all levels, from degree programs to on-the-job training, as are career development pathways and opportunities. Human resources are often built one person at a time, requiring significant investment. Sites should build capacity not just for clinical trials, but also for R&D,

preclinical and laboratory studies, and other needed research. In addition, they need sufficient core funding because the overhead from research projects is insufficient and financial management, project management, and infrastructure are often under-funded. Finally, few sites have the knowledge or ability to access liability and trial insurance.

New Partnerships for Delivery

What is the critical path for new technology uptake? How far can or should product development organizations go in the delivery of their products? What is their unique role? What new partnerships are needed? What successful initiatives in delivery can inform this inquiry?

- Dianna Bowles, Professor, CNAP, University of York
- Alan Brooks, Director, Policy and Access, MVI
- Penny Grewal Daumerie, Director, Global Access, MMV
- Nina Grove, Vice President, Commercial Planning and Malaria Program Director, Institute for OneWorld Health
- Oliver Sabot, Director, Malaria Control Team, Clinton Foundation HIV/AIDS Initiative

Moderator: Girindre Beeharry, Interim Director, Delivery Team, BMGF

This session focused on the increasing involvement of PDPs in the 'delivery' or 'access' areas. They vary in how their access teams interact with their product development teams, but all realize that access thinking needs to begin as part of the development process, not subsequent to it. They also increasingly feel that 'handing over their products' to a willing set of implementers (policymakers, donors, distributors, or others) will not happen automatically—one PDP phrased it: "there is no one there". While there is no consistent manner in which PDPs enter the delivery arena, all said there is a gap that they seek to fill. Participants did not discuss what "new partnerships in delivery" look like, but the discussion did point to the need to increase private sector participation and business models to solve some of the delivery challenges.

Innovative Financing Mechanisms

Short briefings presented important new financing mechanisms [Advanced Market Commitments (AMCs), UNITAID, Affordable Medicines Facility for malaria (AMFm)], followed by a discussion on how these can benefit existing and future products.

- Olusoji Adeyi, Coordinator, Public Health Programs, The World Bank
- Jorge Bermudez, Executive-Secretary, UNITAID
- Melinda Moree, Consultant

Moderator: Daniel Kress, Deputy Director for Policy and Finance, BMGF

This session sought to update participants on recent developments in innovative financing that have a potential impact on malaria. AMCs are binding agreements meant to guarantee a purchase price to manufacturers of vaccines against specific diseases predominant in the developing world for which R&D investment is extremely limited. Described were the first AMC – for pneumococcal vaccines – and the applicability of this model for malaria vaccines. UNITAID was created to provide a new source of sustainable and predictable financing for commodities to fight HIV/AIDS, TB, and malaria. It is funded through a new tax on air travel tickets in participating countries (and by budgetary contributions in select countries that have not implemented the tax). Through collaborations with the Global Fund, UNICEF, and WHO, UNITAID is supporting ACT procurement and delivery to several countries. The proposed AMFm is intended to increase the public- and private-sector use of effective antimalarial drugs at the expense of monotherapies and

now ineffective treatments by greatly reducing their cost. The general discussion was wide ranging, and questions were raised on all three initiatives, with all participants in agreement on the critical role innovative finance can play in mobilizing the resources necessary to fight malaria.

Modeling of Epidemiological Transmission

Complex modeling provides a tool to understand and predict epidemiological transmission. What lessons can be learned from the predictive modeling process? What are the policy implications and the impact of these tools? How can accessibility and availability be maximized? What issues can be addressed by these models?

- David L. Smith, Associate Professor, Department of Zoology and Emerging Pathogens Institute, University of Florida
- Marcel Tanner, Professor and Director, STI

Panelists described two types of models: one that focuses on the relationship between impact and the target product profile of an intervention or tool, and a second that focuses on malaria prevalence and its reduction, elimination, or eradication. The need for and availability of epidemiological data to populate and test these models was emphasized, and access to the outputs of the modeling activities was discussed. A first draft of a model that depicts the feasibility of spatially progressive elimination or eradication was described. Given the importance of computer modeling as a tool for developing and implementing a rational plan to eliminate or eradicate malaria, effort should be made to further develop this area and link it more strongly to others.

Town Hall

How will we bridge the gap on key challenges that have been highlighted this week? How will we significantly reduce the burden of malaria around the world? What questions remain?

- Baroness Lynda Chalker, Founder and Chairman, Africa Matters Limited
- Arata Kochi, Director, Global Malaria Program, WHO
- Abdi Mohammed, Country Coordinator, MACEPA
- Robert Sinden, Professor, Dept. of Biological Sciences, Imperial College of London
- Jimmy Whitworth, Head of International Activities, The Wellcome Trust
- Admiral Timothy Ziemer, Coordinator, PMI, USAID

Moderator: William Foege, Senior Fellow, BMGF

The final Town Hall explored how to meet the key challenges raised:

- Delivery will be the difference between life and death for small children. It will require basic training of health workers and the use of private-sector know-how and distribution channels.
- Malaria control and eradication will require the best science, tools, money, advocacy, political support, research to know what new tools are needed and to develop them, and collaboration.
- We must learn from the past, improve utilization rates, and maintain momentum in order to eliminate malaria.
- Eradication will require new strategies for attacking the parasite, the ability to make hard decisions, redirection, and new vigor.
- Political commitment, careful strategy, tools based on the chosen strategy, and belief that eradication is attainable must follow the enthusiasm generated by the idea of such a bold goal.
- The key to the future lies in staying focused, increasing commitment, embracing a common plan adjusted to context and geography, adhering to set policies on quality, engaging new players, and changing behavior in our community to facilitate rather than impede progress.

Vision for Malaria's Future

Tadataka Yamada, President, Global Health Program, BMGF

Dr. Yamada noted that despite the sad facts of malaria, impressive progress has been made over the past few years in the scientific realm as well as in on-the-ground implementation. Imperfect solutions are being implemented under difficult circumstances and appear to be having an impact. New solutions are on the horizon, and beyond that even better solutions not yet thought of. He asked participants not to accept deaths from malaria but rather to imagine a world without malaria and focus their efforts and creative thinking on that vision. He admitted that this would be risky and difficult and take a very long time. He recommended building on successes, new science, new funding, national plans, industry engagement, and lessons learned. He emphasized the need to create demand and tailor products to the needs of consumers—whoever the consumers are. He also spoke of the need to combine tools and techniques—and create an environment where that is easier to do. He challenged participants to think in new ways about malaria to increase the chances of defeating it. Dr. Yamada ended the Forum with a call for participants to commit to a common vision; combine their intellect and resources to develop, implement, and monitor a comprehensive and adaptive plan; be willing to innovate, fail, overcome barriers, and stay committed; and become an enterprise to defeat malaria once and for all. He pledged that the foundation would do its part.