

## Focus on Mainland Tanzania





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**Enquiries** | Roll Back Malaria Partnership Secretariat | Hosted by the World Health Organization | Avenue Appia 20 | 1211 Geneva 27 | Switzerland | Tel: +41 22 791 5869 | Fax: +41 22 791 1587 | E-mail: [inforbm@who.int](mailto:inforbm@who.int)

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# ABBREVIATIONS

ACT	Artemisinin-based combination therapy
ADDO	Accredited drug-dispensing outlet
ALMA	African Leaders Malaria Alliance
AMFm	Affordable Medicines Facility – malaria
ANC	Antenatal care
BCC	Behaviour change communication
CDC	(United States) Centers for Disease Control and Prevention
COMMIT	Communication and Malaria Initiative in Tanzania
DDT	Dichlorodiphenyltrichloroethane
DFID	Department for International Development (United Kingdom)
DHS	Demographic and Health Survey
DSS	Demographic Surveillance System
Global Fund	Global Fund to Fight AIDS, Tuberculosis, and Malaria
IEC	Information, education, and communication
IHI	Ifakara Health Institute
IPTp	Intermittent preventive treatment during pregnancy
IRS	Indoor residual spraying
ITN	Insecticide-treated mosquito net
JICA	Japan International Cooperation Agency
LiST	Lives Saved Tool
LLIN	Long-lasting insecticide-treated net
M&E	Monitoring and Evaluation
MACEPA	Malaria Control and Evaluation Partnership in Africa
MIS	Malaria Indicator Survey
NGO	Non-governmental organisation
NIMR	National Institute for Medical Research
NMCP	National Malaria Control Programme
PSI	Population Services International
RBM	Roll Back Malaria
RDT	Rapid diagnostic test
SP	Sulfadoxine-pyrimethamine
THMIS	Tanzania HIV and Malaria Indicator Survey
THT	Tanzania House of Talent
TNVS	Tanzania National Voucher Scheme
UNICEF	United Nations Children’s Fund
USAID	United States Agency for International Development
US-PMI	United States President’s Malaria Initiative
WHO	World Health Organization



*Tanzania's National Malaria Control Programme team*

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Contributors included Rob Ainslie (COMMIT), Achuyt Bhattarai (US-PMI, Atlanta), Nick Brown (National Malaria Control Programme [NMCP], Tanzania), Beatrice Divine (US-PMI, Atlanta), Christie Hershey (US-PMI, Washington), Renata Mandike (NMCP, Tanzania), Peter McElroy (US-PMI, Tanzania), Audrey Mitchell (US-PMI, Atlanta), Ally Mohamed (NMCP, Tanzania), Fabrizio Molteni (RTI International), Eric Mouzin (RBM Partnership Secretariat, Geneva), Alex Mwita (Ministry of Health and Social Welfare, Tanzania), Ritha Njau (World Health Organization, Tanzania), Rene Salgado (US-PMI, Washington), Christina Souther (US-PMI, Atlanta) and Rebecca Young (Malaria No More).

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## FOREWORD

For many centuries, malaria has been common among the people of Africa, and untold suffering has resulted from it. Malaria affects productivity and slows development. In Tanzania, we have put in place the right Health Policy, 2007 Strategies (HSSP III – 2008) and Programmes (MMAM – 2007), we have fought malaria valiantly throughout the history and we have made many inroads. However, Tanzania has the most aggressive strain of the malaria parasite, the most effective mosquito to transmit it, and ecological conditions that favour its expansion. At times, it has seemed like Tanzania was losing battle. But over the last ten years, working with the national and international partners and with the leadership of the national institutions, Tanzania has mounted an unprecedented campaign to control malaria.

Over the years, Tanzania has had many technical and financial resources at its disposal to fight this dreaded disease. This report shows that those resources have been put to good use and malaria in Tanzania is on the decline. This report is one of the first attempts to assess the nationwide impact of malaria control interventions on under-five mortality, and provides a thorough analysis of changes in malaria intervention coverage, changes in anaemia and parasitaemia, and changes in mortality. This analysis points to a major reduction in under-five mortality due to malaria control.

From 2000 through 2010, Tanzania provided approximately 20.7 million bed nets and 71.6 million treatments for malaria to the population of 43.2 million.

In addition, spraying was done in the inside of more than 1.1 million homes, with insecticides to kill mosquitoes. The most widespread promotion of preventive and curative malaria activities in the history was launched; whereby 86% (April 2010) and 72% (September 2010) of Tanzanians have heard a malaria message on the radio within the previous month. As a result, the number of deaths of children under five years has plummeted from 148 per 1000 live births in 1999 to 81 in 2010. According to calculations contained in this report, malaria efforts have helped save the lives of more than 63 000 children under five in the past decade. Furthermore, these improvements in health have been equitable to both the poor and well-off. In Tanzania, malaria control is available to all those who seek it.

Though Tanzania has made progress, it cannot yet claim victory and still, too many suffer from malaria. However, fewer children still die from malaria in Tanzania. To a great extent, the country's progress depends on how well it does in waking up the population to the fact that malaria is unacceptable, and so the saying: *Zinduka! Malaria Haikubaliki* (Swahili for "Wake up! Malaria is unacceptable"). Our ultimate goal should be that not one of the citizens will suffer or die from malaria. I am told that such a goal is unattainable; however, this report shows that substantial gains can be made in the face of overwhelming odds.



The progress in malaria control is owned by all who have worked to ensure that what needs to be done is done.

From the health workers at a health facility, to the National Malaria Control Programme, and to the partners, such as the Roll Back Malaria Partnership, the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund), the World Bank, the United States President's Malaria Initiative, the World Health Organization, UNICEF, and many others; all have played an important role in the success narrated in this report. I convey my gratitude to you for the efforts and support. Ultimately though, it is the family and the community who deserve the

most credit, for ensuring that children sleep under an insecticide-treated bed net every night, allowing their homes to be sprayed with insecticides, making sure that pregnant women take their preventive treatment during pregnancy, and promptly taking any feverish children to a health provider for appropriate care.

You are the essential element of our success.

**Blandina S. J. Nyoni**  
Permanent Secretary  
Ministry of Health and Social Welfare

# EXECUTIVE SUMMARY

## *Progress and impact of malaria control in Mainland Tanzania at a glance*

- Tanzania's National Malaria Control Programme (NMCP) has provided strong, stable leadership in coordinating malaria control activities since 1995.
- Because of continuity and focus on programme implementation, both the number of partners and resources have been growing, most notably over the last seven years. Between 2003 and 2010, about US\$ 450 million in external funding was allocated to scale up the malaria control programme.
- These increasing contributions have been used to deliver preventive and curative services.
  - 18 562 571 insecticide-treated mosquito nets (ITNs) were distributed between 2007 and 2010 through mass campaigns and the national voucher scheme.
  - Indoor residual spraying (IRS) began in 2007 and had expanded to cover 94% of the targeted structures in 18 districts by March 2011.
  - Rapid diagnostic tests (RDTs) and artemisinin-based combination therapies (ACTs) have been deployed to reach half of the population so far, and health workers have been trained in using them. Efforts have also been made to make these new treatments available in the private sector, where up to 40% of the rural population seek care for fever.
- This deployment of interventions has resulted in improved coverage.
  - 63% of households owned at least one ITN in 2010, compared with 23% in 2004–2005.
  - 64% of all children under five and 56% of all pregnant women nationwide used an ITN the night before the 2010 survey—a more than twofold increase since 2007.
  - In addition, between 2001 and 2006, Tanzania changed its recommended antimalarial drug from chloroquine to sulfadoxine-pyrimethamine (SP) to ACTs, thereby providing access to more effective antimalarials.
- Because of good coverage results, the Tanzanian government has been able to reduce disease burden and save lives.
  - In the Ifakara surveillance area, the prevalence of parasitaemia in children under five was reduced by more than 5-fold, from 25% in 2004–2005 to less than 5% in 2010.
  - Nationally, severe childhood anaemia was halved, dropping from 11% in 2004–2005 to 5.5% in 2010.
  - All-cause under-five child mortality fell by 45% between 1999 and 2010—from 148 deaths per 1000 live births in 1999 to 81 per 1000 live births in 2010.
  - According to the Lives Saved Tool (LiST estimation model), the lives of 63 000 children under five have been saved by malaria control interventions since 1999.
- Tanzania's improved malaria and health indicators are all signs that malaria control efforts are working and delivering results. Consideration of other factors that might explain the declines in all-cause under-five mortality leads to the conclusion that the improvement in child health is due in large part to malaria control efforts. The country is also achieving equitable impact on major mortality and malaria coverage indicators.
- With demonstrated ability to deliver and achieve impact on child survival, Tanzania has articulated even more ambitious malaria control goals: universal ITN coverage, IRS in half of the country, and enhanced diagnosis and ACT treatment of all malaria cases. This will require increased funding and a strengthened health infrastructure. If challenges of resource mobilization, boosting the work force, and strengthening the health system can be met, Tanzania will have paved the way towards unprecedented public health achievements and protection of its population against a major scourge.

## Box 1: The extent of malaria in Mainland Tanzania

The focus of this document is progress and impact of malaria interventions in Mainland Tanzania only. Henceforth, Mainland Tanzania will be referred to as Tanzania. A future document in the series will

address progress and impact in Zanzibar, which together with Mainland Tanzania, makes up the United Republic of Tanzania.

### Malaria in Tanzania at a glance

- Tanzania has an estimated 43.2 million inhabitants in its 21 regions, 113 districts, approximately 10 300 villages, and approximately 10 million households.
- Malaria is endemic, with approximately 40 million of Tanzania's population living where malaria is transmitted.
- According to the latest Health Management Information System report, there were approximately 11.5 million clinical malaria cases in 2008.
- Up to 2009, the National Malaria Control Programme (NMCP) estimated that 60 000–80 000 malaria deaths among all ages occurred annually in Tanzania.
- Health facilities report malaria as the leading cause of outpatient and inpatient health care visits and as the primary cause of deaths among children.
- Malaria was estimated to have caused 24% of all deaths in Tanzanian children under five years of age in 2000.

Three malaria epidemiological strata exist in Tanzania:

- Unstable, seasonal malaria: In about 20% of the country, largely in the arid central plateau, malaria is unstable and seasonal.
- Stable malaria with seasonal variations: The southern part of the country has a single main rainy season (March-May), while northern and western Tanzania experience bimodal rainfall (November-January and March-May). Seasonal

malaria peaks occur at the end of the rainy season.

- Perennial malaria: In the coastal fringe, southern lowlands, and regions bordering Lake Victoria, malaria transmission is stable with very high transmission intensities.

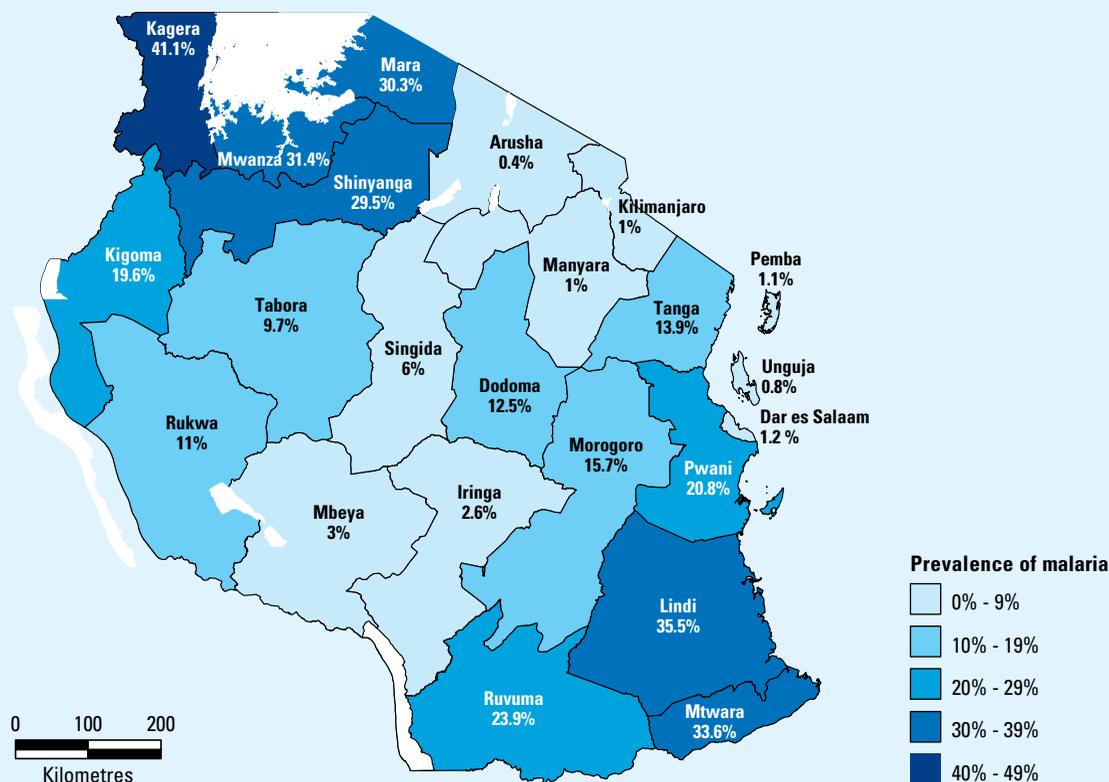
*Plasmodium falciparum* accounts for 96% of malaria infections in Tanzania. The principal malaria vector is *Anopheles gambiae* complex.

Many challenges exist to measuring the burden of malaria in Tanzania. Without the ability to confirm malaria by laboratory testing, many health professionals have had to rely on clinical symptoms, mainly fever. Now that rapid diagnostic tests (RDTs) for malaria are becoming more widely available—their deployment began in 2009—this will facilitate collection of data on confirmed malaria cases.

Malaria has exacted a huge toll on the Tanzanian population. In addition to causing disease and death, malaria has a huge economic impact. It jeopardizes development, either directly—through the costs of health care and hospitalization—or indirectly—through working days lost to personal illness or to caring for a sick child. It consumes families’ resources, leaving Tanzanians with less money to take care of their basic needs.

**Figure 1**  
**Prevalence of *Plasmodium falciparum* malaria among children 6–59 months, Tanzania, November 2007–February 2008**

*Malaria prevalence is highest along the coast, in the southern lowlands, and in regions bordering Lake Victoria.*



Source: Tanzania HIV & Malaria Indicator Survey, Final Report. NBS & ORC Macro, August 2008.



# THE EARLY YEARS: BIRTH OF THE NATIONAL MALARIA CONTROL PROGRAMME

*From the early days of the colonial era to the present, malaria control efforts have evolved into a national malaria control programme able to provide leadership and coordinate partners' activities. For the first time in its history, Tanzania has been able to aim for nationwide scale-up of malaria control interventions.*

Malaria control in Tanzania began when Germany was apportioned the part of Africa later known as Tanganyika, which it ruled from 1885 to 1919. During that era, quinine was introduced to treat malaria, but it mainly benefited staff and family members of colonial officials. The Germans planted cinchona trees, still standing today, in the Usambara Highlands of the Tanga Region, which became the source of quinine for the German army. Also, the first mosquito nets, woven out of cotton, were used, and local residents were compelled to take quinine during intermittent mass drug administrations. The health service infrastructure was rudimentary except for a few hospitals in urban areas.

At the turn of the 20<sup>th</sup> century, the Germans started a larval control programme in Kilwa and Dar es Salaam. Because Dar es Salaam was surrounded by such permanent mosquito breeding sites as swamps, rice fields, permanent pools, ponds, and undrained streams and creeks, the initial impact was negligible. Legal measures introduced in 1913 required that containers be emptied, kerosene be poured on stagnant water, and property owners drain water from their land. As larger settlements were established, drainage and other major engineering works intensified in Dar es Salaam. By the outset of World War I, the mosquito population had been reduced by 90%.

After the First World War, Tanganyika became a British protectorate from 1920 until 1961, when it gained independence. During World War I, the British Royal Army Medical Corps continued

drainage interventions in Dar es Salaam. After the war, this work was continued by the Sanitation Branch of the Medical Department. Similar work extended into the countryside, supported by the adoption of Township Rules in 1932. Training and recruitment of malaria control staff were boosted by the establishment of the East Africa Malaria Unit (now the Amani Research Centre of the National Institute for Medical Research).

In 1951, the British administration established the Tanganyika Malaria Service, which focused on larviciding in urban areas. That era also saw the mass production of chloroquine, which became widely available for treatment. The generation that benefited from colonial malaria control efforts still remembers the effectiveness of the programme.

Despite the launch of the Global Malaria Eradication Programme (1955–1967), Tanganyika, like most of Africa, benefited little from this effort.

After the country's independence in 1961, the Tanganyika Malaria Service collapsed. Spraying, larval source reduction, and disease surveillance came to an end. In 1964, Tanganyika was joined by Zanzibar to form the United Republic of Tanzania.

For the next two decades, the government's main concern was to build the health infrastructure and train health personnel. Health statistics highlighted an overwhelming malaria burden for the populations attending the health facilities; however, the only malaria control strategy was treatment of fever cases with chloroquine.

In 1979, local researchers reported on the first cases of chloroquine resistance in the country and the government recognized the urgency of reviving malaria control measures. In 1985, the government sought bilateral support from Japan through the Japan International Cooperation Agency (JICA). An ambitious programme deploying indoor residual spraying (IRS) and reduction of breeding sites was launched in the cities of Dar es Salaam and Tanga with the hope that the government would assume control and scale it up to the entire country. Mosquito nets were introduced as well as larviciding. As a result, malaria parasitaemia fell markedly in the population covered; however, the project ended because resources could not be found to sustain it.

In 1995, the National Malaria Control Programme (NMCP) was created as a unit of the Directorate of Preventive Services. Since its inception, the programme has led and coordinated bilateral and multilateral initiatives and defined the strategic direction for malaria control in Tanzania. In addition, the NMCP facilitates major policy decisions such as revising malaria treatment guidelines (in 2001 and 2006), implements them, and builds partnerships with academia, research institutions, nongovernmental organisations (NGOs), and the private sector.

In 1996, the Ifakara Health Institute, first established as a field research station of the Swiss Tropical Institute in 1956, launched a social marketing programme for insecticide-treated nets (ITNs) in two districts that continued until 2000. Also in 1996, through support from the Accelerated Malaria Control Initiative of the WHO Regional Office for Africa, Tanzania developed a 3-year operational plan (1997–2000). In 1998, Population Services International (PSI) launched a social marketing programme (SMITN) in four regions, which

developed into a national programme (SMARTNET) that ran from 2002 to 2007. There followed the first strategic plan (Malaria Medium-Term Strategic Plan 2002–2007) and the second strategic plan (Malaria Medium-Term Strategic Plan 2008–2013), under which activities are currently coordinated. Capacity is being built among malaria health staff across the country, and since 1996 a WHO national programme officer for malaria has been assigned to Tanzania.

Tanzania was among the first countries to benefit from the political and technical support of the Roll Back Malaria (RBM) Initiative, launched in 1998. The analysis of a 2003 RBM mission to identify needs and prioritize actions served as an effective advocacy tool and helped guide the implementation of Tanzania's first major malaria control grant, during Round 1 of the Global Fund.

In 1999, health sector reforms incorporated malaria in the Package of Essential Health Interventions, which allowed local governments to integrate malaria into local planning, resources, and implementation of activities.

Tanzania played an active role in the crafting of the Abuja Declaration on malaria in 2000 and was instrumental in mobilizing the malaria community around its goals.

With the advent of the Global Fund in 2001 (first Round 1 disbursements in 2002), and the support to Tanzania of the US-PMI starting in 2005 (first funding disbursed in 2006), implementation of malaria control interventions accelerated. For the first time in its history, Tanzania was able to plan and implement a full scale-up of malaria interventions and protect its population countrywide.

## Box 2: Interview with His Excellency Dr Jakaya Mrisho Kikwete, President of the United Republic of Tanzania

### **Malaria has become one of the defining issues of your presidency. Why have you taken on malaria?**

Before I became president and then afterwards, when I was conceiving my thoughts about the country, my priority was to improve the living standards of our people. There are two aspects to improving the living standards of Tanzanians: one is to make available good quality basic social and economic services and the second is to increase people's incomes.

We decided to give malaria the highest possible priority on our health agenda, because malaria is the number one killer disease in the country, and it was putting so many at risk, particularly women and children. We had 16 million cases of malaria per annum and at that time more than 120 000 people died of malaria every year.

Four in 10 clinic visits were made by patients suffering from malaria. We lose so much, in terms of people who don't go to work because of malaria, in terms of children who don't go to school because they suffer from malaria. The disease takes the lion's share of the health care budget, with expenditures for medicines and care in hospital. We had to do something.

### **What approach to the malaria fight have you taken?**

We reviewed the national health policy, and in 2007 we came up with a new policy into which we anchored malaria properly. We looked at four major interventions: sleeping under long-lasting insecticide-treated bed nets (LLINs), effective drugs and counselling to use artemisinin combination therapy (ACT), IRS, and environmental mosquito control.

We talked to Sumitomo Chemicals, which was ready to invest here with a Tanzanian company,

A to Z Textile Mills, which manufactures mosquito nets in Tanzania. We started with a programme of subsidized bed nets, first for pregnant mothers and then for children under 5 years, using a successful voucher scheme to subsidize the nets. Then for the "catch-up" campaign, the government contributed money to distribute 8.7 million bed nets to children under five years. The programme has worked very well.

We later talked to the Global Fund, the US government, the UK government, and a number of donors, who were generous and supported our policy of achieving universal insecticide-treated bed net coverage in Tanzania. The universal coverage campaign we have just completed in October 2011 distributed 18.2 million free LLINs. Adding to that figure the number distributed through the "catch-up" campaign, we have distributed nearly 27 million completely subsidized ITNs across Tanzania in the last few years.

### **What successes are you seeing in Tanzania?**

We have made great advances in the first three interventions. We also have Zanzibar as a success story, but then this will be the third time someone has been able to say that we have been able to control malaria in Zanzibar. I want this third time to be the last time. Now we must focus on the mainland, on those areas close to Zanzibar such as Dar es Salaam and Tanga, and then we will have isolated Zanzibar enough from malaria so that this success can continue.

On the mainland, visits to hospitals and clinics due to cases of malaria have been cut by half, from 40% of all visits to only 20%, and the same goes for admissions. In the past you would go to the hospitals and see beds full of malaria patients, but now we have empty beds!



### How important is political will in the fight against malaria?

I see political leadership, political will, to tackle malaria as critical, because it is leadership that makes the difference. We made the correct policy decision at the political level. We liaised well with experts in the fight against malaria on the kinds of interventions to effectively deal with this problem. And then of course we also made a financial commitment to invest resources for this fight.

It will be a happy day for all of us when we can declare that Tanzania is free from malaria.

First, we have to build on the success we have achieved so far. Also, we have to make sure we allocate adequate resources to continue with the three main interventions and look at programmes like Zinduka! Malaria Haikubaliki, a major campaign we launched against malaria, using all our celebrities, and print and electronic media, to tell the story about the fight against malaria. This has got to be done and needs to continue to be done.

With support from the Global Fund, US government, UK government, and many other friends of Tanzania, and friends of Africa, we were able to mobilize all the necessary resources for bed nets, ACTs, and IRS.

But the key of course is commitment, commitment on the part of leaders. This is precisely what we are doing with the African Leaders Malaria Alliance (ALMA).

A few of us decided to come together and spearhead the fight against malaria on the continent, and we established ALMA. If we succeed in eliminating malaria in Zanzibar and fail to eliminate it on the mainland, then malaria will return to Zanzibar. And if Rwanda succeeds in eliminating malaria and Tanzania does not succeed, then malaria will return to Rwanda because people move across the borders. So we need to work together, pool our resources, and coordinate our efforts so that we make sure that all the major malaria interventions are readily available everywhere on the African continent to eliminate the disease. I am happy because of the successes we have achieved. Getting more than 60 million bed nets distributed is actually through the efforts of ALMA. Joint purchases, joint presentations, joint appeals. Through this process we were able to mobilize RBM to come to our support, the Global Fund to come to our support, and the donors to come to our support. We have become a credible force.

### What advice would you give other African heads of states in the fight against malaria?

Africa is home to 38 of the 49 poorest countries in the world. Unfortunately, these are also the countries most affected by malaria, accounting for 90% of global deaths from malaria. The first responsibility is to devise the right policies and identify the right interventions. Make appropriate budgetary allocations for these resources and use the support from friends well, correctly, and for the purposes intended. I am sure that if we do that we should be able to reach our target: no more malaria on the African continent at the earliest possible time.





# ROLLING OUT MALARIA CONTROL INTERVENTIONS AND ROLLING BACK MALARIA, 2000–2010

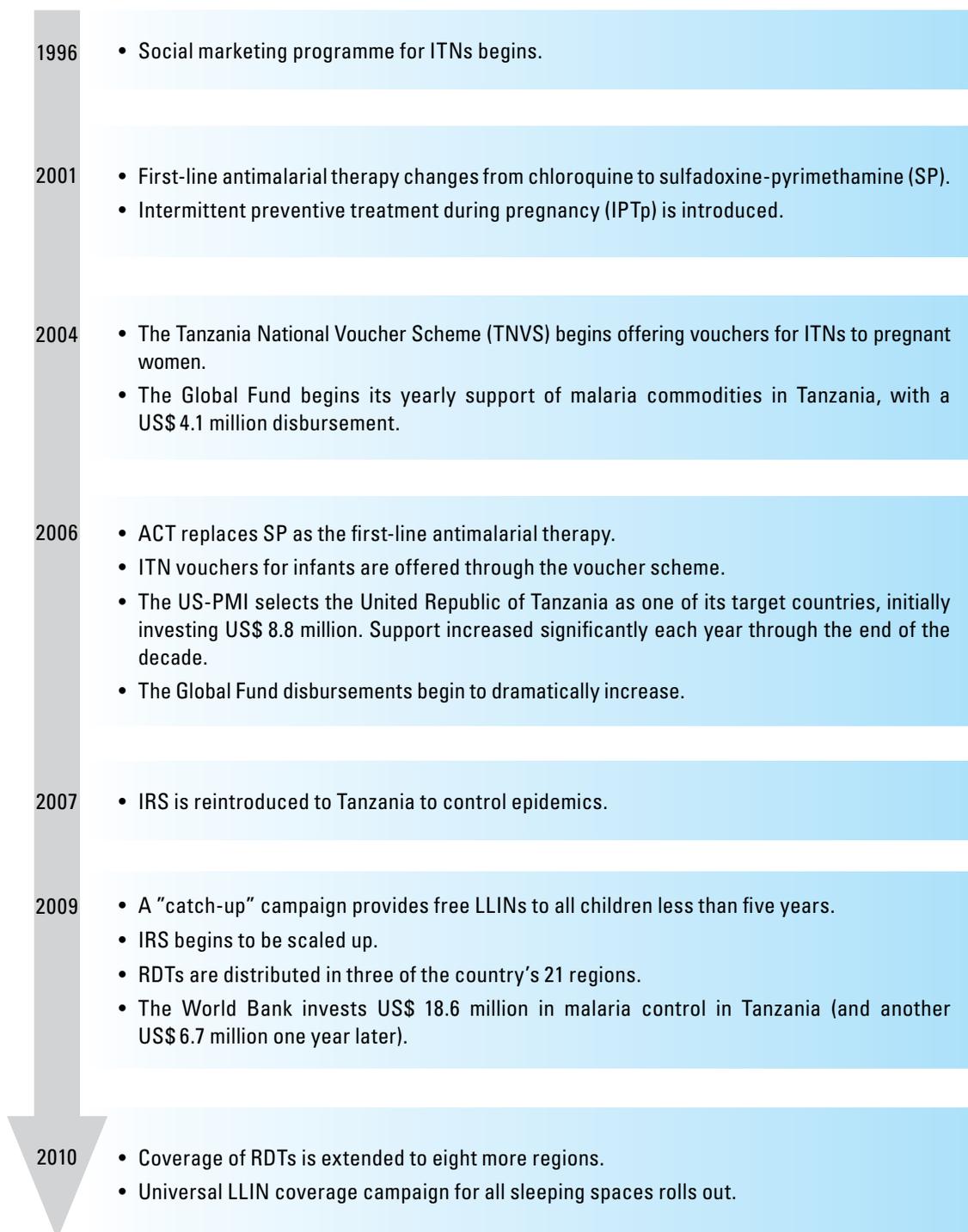
*This chapter describes Tanzania's efforts and successes in rolling back malaria—strong management and planning, an essential step for securing funding; intervention implementation; and monitoring and evaluation (M&E), which includes measurement of intervention coverage and impact. Based on M&E data, Tanzania has recrafted its implementation strategies so that interventions have equitably reached Tanzania's target groups and reduced the impact of malaria.*

## a. Management and planning

### **Tanzania's National Malaria Control Programme (NMCP) at a glance**

- Since its creation in 1995, Tanzania's NMCP has had strong, stable leadership, which has provided continuity and focus.
- Tanzania's prevention and control activities are guided by M&E and strong operational research conducted by national institutions and supported by local and external partners.
- The National Strategic Plan has set up some ambitious goals and targets with 90% of households owning at least one ITN, and 80% of under-fives and pregnant women using a net by 2013.
- The number of the NMCP's technical personnel has increased from fewer than 10 in 2000 to 22 in 2010.

## Milestones in malaria policy, funding, planning, and implementation



## Management

The NMCP in Dar es Salaam coordinates malaria control efforts in Tanzania. This unit, within the Ministry of Health and Social Welfare's Directorate of Preventive Services, is responsible for designing strategies, developing guidelines, mobilizing funding, facilitating implementation, monitoring progress, and evaluating impact. Tanzania has a decentralized health system, and therefore the districts, with guidance from the regional and central level, prioritize and budget all health interventions, including malaria activities. Malaria focal persons are deployed in the regions and districts to help manage and monitor activities.

Under the leadership of a programme manager, the NMCP is organized into five units: administration, case management, vector control, information and education, and M&E (including operations research). Each unit has a team leader and two to four staff members, some of whom serve all five units.

The NMCP works with partners in the commercial sector, faith-based organisations and hospitals, NGOs, donors, academia, other government agencies, and other service groups, which help extend its reach to the community. It also has an extensive network of international partners (see Annex A).

Tanzania's malaria programme has support from the country's top leaders, including His Excellency Dr Jakaya Mrisho Kikwete, the President of the United Republic of Tanzania. He provides strong support to malaria control and serves as the founding and current chair of ALMA, a collaborative effort of African leaders to work together with the African Union, United Nations, and other local and international partners to combat malaria in Africa. Tanzania is signatory to the Abuja Declaration, as well as the Millennium Declaration.

## Research

The NMCP has benefited from Tanzania's world-class malaria research institutions: the National Institute for Medical Research (NIMR) and the Ifakara Health Institute (IHI). Other research partnerships engage research institutes outside and inside Tanzania, including Muhimbili University College of Health and Allied Sciences.

## Planning

In the last decade, Tanzania has been fortunate to have strong stable leadership from the NMCP, which has developed and finalized the following policy documents to guide national malaria efforts:

- The first 5-year strategic plan (Malaria Medium-Term Strategic Plan 2002–2007) and more recently, the Malaria Medium-Term Strategic Plan 2008–2013
- NMCP Monitoring and Evaluation Plan 2008–2013
- NMCP Communications Strategy for Malaria Control Interventions 2008–2013
- NMCP Master Plan for IRS Using DDT<sup>7</sup> in Tanzania Mainland
- ITN Cell Plan of Operations 2010

Within the NMCP, three groups coordinate M&E activities: the M&E Network, a broad umbrella group of partners; the M&E Cell within the NMCP, responsible for daily M&E operations of the NMCP; and the M&E Technical Working Group, which is tasked with operations research planning and review. In its Malaria Medium-Term Strategic Plan 2008–2013, the NMCP includes such priority operational research areas as case management, IPTp, vector control, and epidemics.

<sup>7</sup> DDT (from its full name, dichloro-diphenyl-trichloroethane) is a synthetic pesticide.

To coordinate and direct actions, the NMCP has established committees and task forces. The National Malaria Steering Committee offers the government state-of-the-art technical advice on malaria control. Four committees deal respectively with case management; vector control; M&E; and information, education and communication and behaviour change communication (IEC/BCC). ITN promotion is coordinated through the National

Insecticide-Treated Nets Programme. All activities are coordinated under the Malaria Medium-Term Strategic Plan (2008–2013).

Tanzania’s NMCP maintains a liaison with the Country Coordinating Mechanism for the Global Fund, whose chair is the secretary to the Tanzanian National Coordinating Mechanism and the Global Coordinator of the Tanzania Commission for AIDS.

**Figure 2**  
**NMCP’s Malaria Medium-Term Strategic Plan 2008–2013 Goals and Targets**

GOAL: MALARIA MORBIDITY AND MORTALITY REDUCED BY 80% FROM CURRENT LEVELS BY THE END OF 2013.	
	Target
Ownership of at least one ITN	90% of households
Ownership of at least two ITNs	80% of households
ITN use by pregnant women	80%
ITN use by children under 5 years	80%
IRS	50% of national population protected and IRS scaled up to 60 districts
IPTp (two doses)	80%
Case management in children under 5 years	80% diagnosed with uncomplicated malaria in health facilities and appropriately managed 80% of children with fever receiving appropriate treatment within 24 hours of onset of fever

### Staffing

In 2000, the NMCP staff consisted of three medical officers and four health officers, and the Programme received technical support from the Italian Cooperation, Department for International Development (DFID), World Health Organization (WHO), and United Nations Children’s Fund (UNICEF). In recent years, with support from the government and technical support from partners, the programme has gradually increased staff size and areas of expertise. Currently, the programme has five medical doctors with master’s degrees in public health or

applied epidemiology, three environmental health officers with degrees in public health or sociology, two environmental engineers, a nursing officer who is obtaining a master’s degree in M&E, a pharmacist, a laboratory technologist, a social welfare officer who is obtaining a master’s degree in public health, a health administrator, accountants, and support staff.

In summary, Tanzania’s NMCP benefits from excellent leadership, access to strong local research partners, and strong political support, all of which have attracted increased funding to help it meet its targets outlined in the Medium-Term Strategic Plan (2008–2013).



### Box 3: Operational research in Tanzania

Tanzania is recognized by the global malaria community as a leader in malaria research. From early and important research on the effectiveness of ITNs in protecting populations from malaria to global policy-changing research in intermittent preventive treatment of malaria in infants to ground-breaking research in malaria vaccines, Tanzania-based institutions and scientists have made important contributions to how malaria is prevented and treated.

Research on malaria in Tanzania goes as far back as the end of the 1800s. Robert Koch, one of the pioneers of the modern germ theory of disease, lived in Dar es Salaam for almost a year starting in July 1896 and conducted some of the first malaria research in the country. In 1897, Koch helped found the first government-run health laboratory that has gradually transformed into Tanzania's current National Reference Laboratory.

The two premier health and medical research institutions working on malaria that evolved in Tanzania are the National Institute for Medical Research and the Ifakara Health Institute. Both institutions are run by Tanzanians. Although their research is not limited to malaria, the most significant proportion of both institutions' research agenda is malaria. NIMR and IHI work closely with the NMCP to determine research priorities, adopt results, and change policy based on research results.

- The National Institute for Medical Research, a WHO Collaborating Centre established in 1979, is the successor to both the Amani

Medical Research Centre and the East African Medical Research Council. These institutions served the East African community with technical assistance, research, and training in malaria for more than 30 years. Today, NIMR is composed of 15 stations across Tanzania and is responsible for national research priorities. By July 2011, NIMR had a total of 660 staff, of whom 155 are researchers with PhDs, master's, or bachelor's degrees. Among NIMR's most important contributions are studies on malaria epidemiology, efficacy of therapeutic regimens for malaria, efficacy of ITNs, and testing of netting materials impregnated with a long-lasting insecticide. NIMR is one site of 11 in Africa now participating in the conduct of a phase 3 clinical trial of the RTS,S malaria vaccine candidate, the most advanced to date.

- IHI originates from a Swiss Tropical Institute field station in Ifakara Town which started operating in 1956. Today, IHI is a nonprofit organisation, with more than 500 employees and 100 researchers. IHI has been a WHO Collaborating Centre since 2006 and is a regional centre for quality assurance and precertification of malaria rapid diagnostic tests. IHI has developed the Ifakara Tent Trap-B for catching mosquitoes for laboratory studies, and has contributed to the understanding of malaria epidemiology and mosquito behaviour. A landmark IHI study determined that ITNs could reduce mortality in children under five by 27%. Also, IHI is currently running phase 1 and 3 malaria vaccine trials.

## b. Securing appropriate funding

### Outside funding for malaria control in Tanzania at a glance

- From 2003 through 2010, external partners committed a total of about US\$ 450 million to the malaria prevention and control programme in Tanzania.
- From approximately US\$ 100 000 in 2002, external partner funding grew to more than US\$ 137.9 million in 2010.
- From 2000 to 2010, resources available for malaria increased 100-fold. The acceleration began in 2003, with monies from the Global Fund, and then with additional funding in 2006 from PMI and in 2009 from the World Bank’s Malaria Booster Program.
- During the 7-year period from 2003 through 2010, 90% of the funding came from the Global Fund and PMI.

Tanzania has been successful in attracting malaria funding because of its strong leadership, stable programme, and expertise in implementing interventions. The country has received increasing commitments from US\$ 0.14 per person at risk in 2003 to US\$ 3.31 per person at risk in 2010.

The steep increase in malaria funding started with receipt of the first Global Fund grant in 2003. Funding increased further with the advent of PMI support and additional Global Fund grants. Approximately 57% of the 2003–2010 total funding came from the Global Fund, 33% from PMI, 6% from the

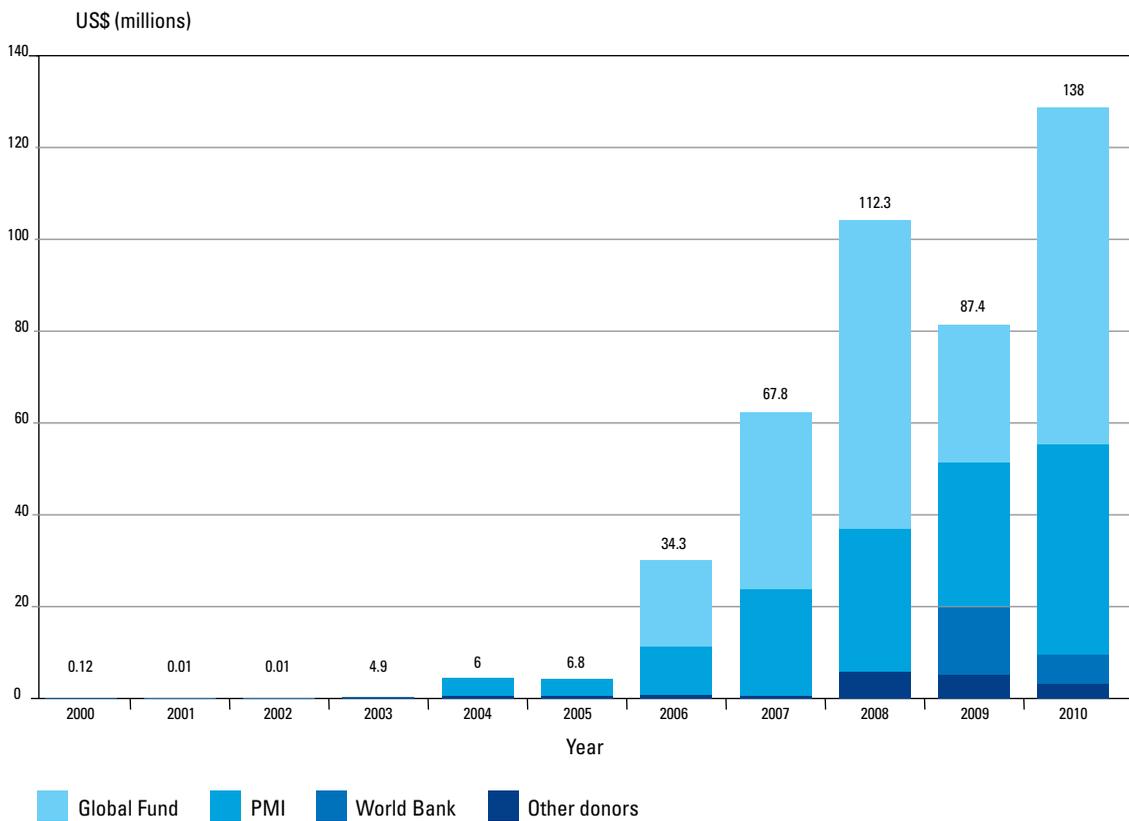
World Bank, and 4% from other donors—WHO, UNICEF, JICA, Swiss Development Cooperation, DFID, Development Corporation Ireland, and the Italian Cooperation. Although the amounts of increased funding are impressive, Tanzania faces considerable expense to scale up interventions and to maintain a high level of coverage.

Partners collaborate on the basis of the National Malaria Strategic Plan and adhere to the Three Ones principles—one national framework, one coordinating authority, and one M&E plan.



**Figure 3**  
**Trend in external funding sources for malaria control in Tanzania, 2000–2010**

*From the beginning of the sharp increases in malaria funding in 2003 through 2010, external partners committed a total of about US\$ 450 million to the malaria prevention and control programme in Tanzania.*

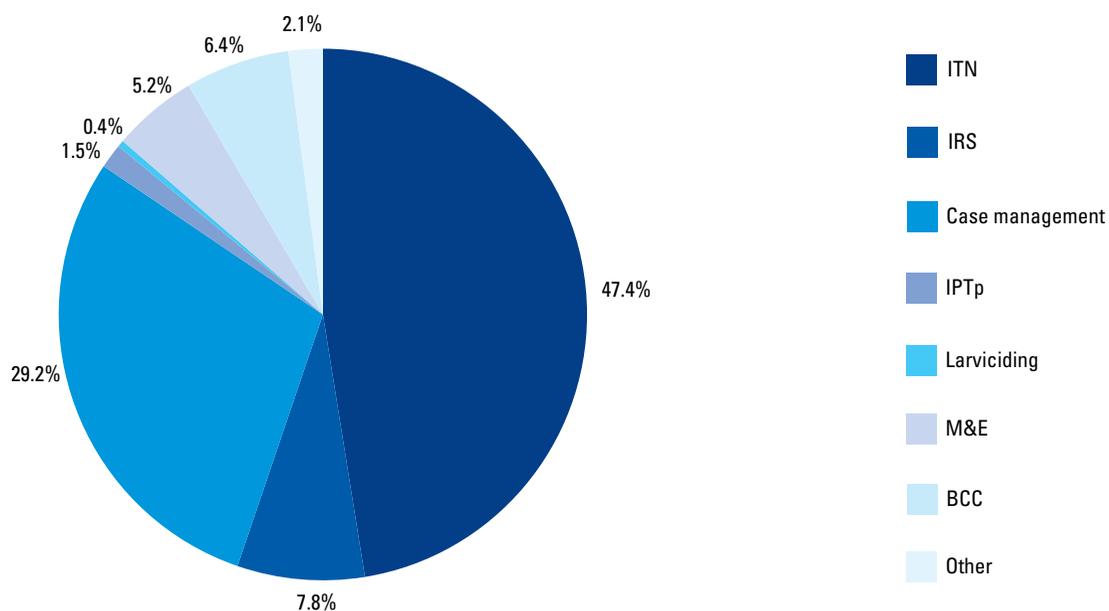


Source: Budgets as reported by donor agencies.

**Figure 4**

**Proportion of malaria budget 2000–2010, by intervention, based on internal and external funding**

*Most of the resources from donors and the government of Tanzania—approximately 56%—were budgeted for preventive activities.*



Source: Budget reports 2000–2010.

Among the four major interventions (ITNs, IRS, IPTp, and case management), ITNs received the strongest support—a cumulative US\$ 215 million, almost half (47%) of the 10-year total. About 29% of the total funding was budgeted for ACTs for case

management. IPTp received 1.5%, and IRS received 7.8%. This pattern of support, favouring ITNs and ACTs, is similar to that observed in other countries in the region and is in line with programmatic decisions made at the country level.



## Box 4: NMCP's BCC strategy at work: focus on Tanzania House of Talent and Zinduka! Malaria Haikubaliki

### Tanzania House of Talent

A unique nonprofit organisation, the Tanzania House of Talent (THT), has expanded its mission from helping disadvantaged urban youth develop their talent in music, dance, theatre, and film skills while working on commercial and social development projects to creating a communications centre capable of supporting communications campaigns, with support from Malaria No More. With its new audio and video production, graphic design, and

theatre performance facilities, the centre provides newly THT-trained youth with the resources to implement a mass communications campaign from concept to completion. THT's communications capacity, as well as its expertise in social mass media communications, youth education and, local market reach, provided a critical resource for establishing an overarching communications campaign for Tanzania: the Zinduka! Malaria Haikubaliki campaign (Wake Up! Malaria is not acceptable).

## Zinduka! Malaria Haikubaliki

In early 2010, THT helped launch the Zinduka! Malaria Haikubaliki campaign, which was endorsed by the Ministry of Health and Social Welfare. Its objective was to create a call to action amongst the youth of Tanzania to adopt malaria prevention measures and become catalysts to create a society that no longer accepts malaria as inevitable. The Zinduka campaign has employed a number of approaches, ranging from using local and international icons for radio, TV, and print media to providing youth with the knowledge and tools to inspire other youth to join “Generation Zinduka” at the district level.

### Youth for Youth

At the centre of the campaign’s approach to motivate youth through youth is the newly established innovative Theatre in Education programme. Youth from THT have held music, dance, and theatre performances across the country, reaching 40 000 secondary school students with messages about effective prevention methods and the importance of seeking early treatment. After each

performance, THT youth conduct workshops with students to disseminate detailed information about malaria more formally. Through the programme, the campaign has established 40 youth clubs at the district level in Morogoro, Tanga, Mwanza, and Dar es Salaam, providing 930 youth with the skills and knowledge to actively participate alongside their icons. These youth have worked to engage and mobilize local residents and local government officers, including malaria focal persons, to continue to promote malaria treatment and prevention efforts amongst local communities. The clubs have also engaged a further 15 000 youth in efforts to communicate malaria messages.

The campaign recognises the importance of partnership and harmonization to most effectively use the resources available in Tanzania. In April 2011, the Zinduka team worked with the Tanzanian Red Cross to implement the country’s “hang-up” campaign, conducting house to house visits with Goodwill Ambassadors and calling on the Zinduka youth clubs to actively participate in behaviour change communications.



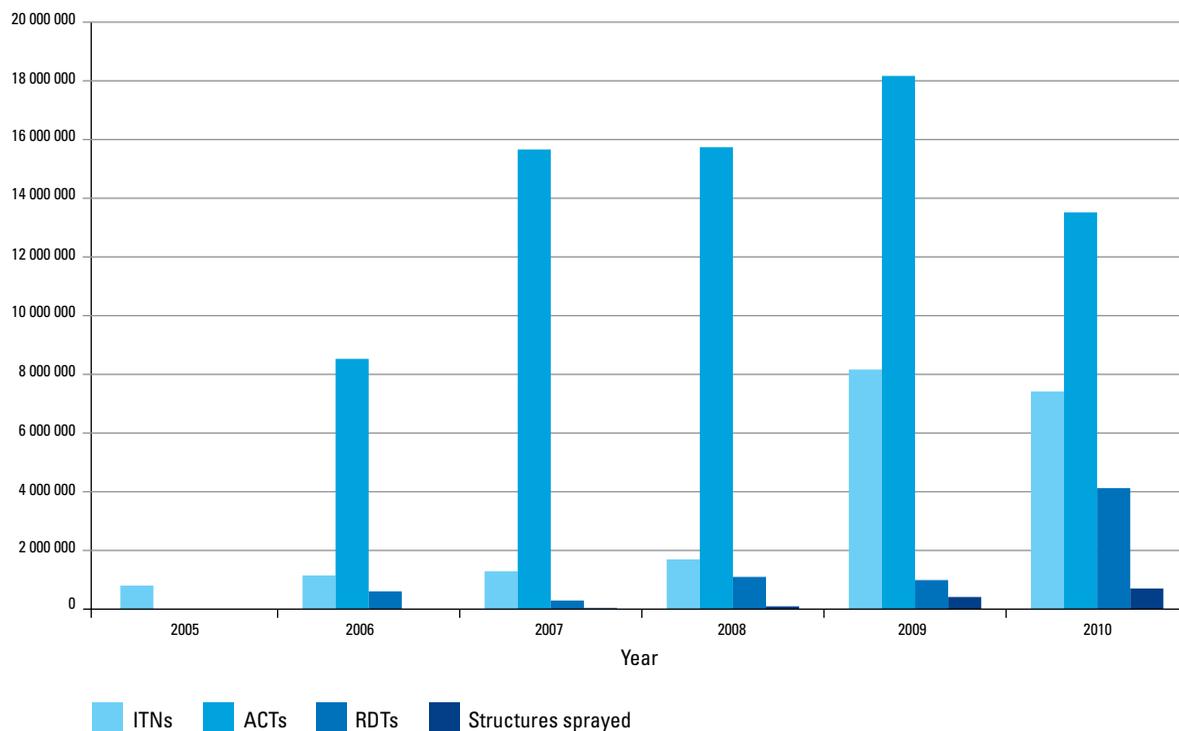
## c. Reaching Tanzanians with life-saving interventions

### Intervention delivery and coverage at a glance

- In 2010, 63% of households owned at least one ITN, compared with 23% in 2004–2005. In 2010, ITN use by children under five years had more than doubled from 2007 levels, from 25% up to 64%, and use by pregnant women had reached 56% up from 16% in 2004–2005. By 2010, coverage of ITNs, previously inequitable, no longer showed differences by household wealth.
- IRS was reintroduced in Tanzania in 2007 as a way to control malaria outbreaks in selected areas of two districts. By March 2011, IRS operations had expanded to 18 districts and reached approximately 94% of the targeted structures in those districts.
- IPTp coverage of at least two doses of SP was 21% in 2004–2005 and 26% in 2010; it also became more equitable in 2010.
- In 2001, chloroquine was no longer effective against the main malaria parasite and was replaced by SP, which in turn was replaced by ACTs as the first-line antimalarial in 2006.
- Approximately 70 million doses of ACTs have been distributed and are now available nationwide.
- To better diagnose people with malaria, Tanzania began distributing RDTs in 2009 and is now scaling these up nationally.
- In 2010, six in 10 children with fever were taken to a formal health provider. In 2010, 27% of children with fever received the first-line treatment (ACT) the same day of, or the day after, fever onset, only slightly more than those who received the first-line treatment (SP) in 2004–2005 (21%).

**Figure 5**  
**Increases in malaria commodities distributed, Tanzania, 2005–2010**

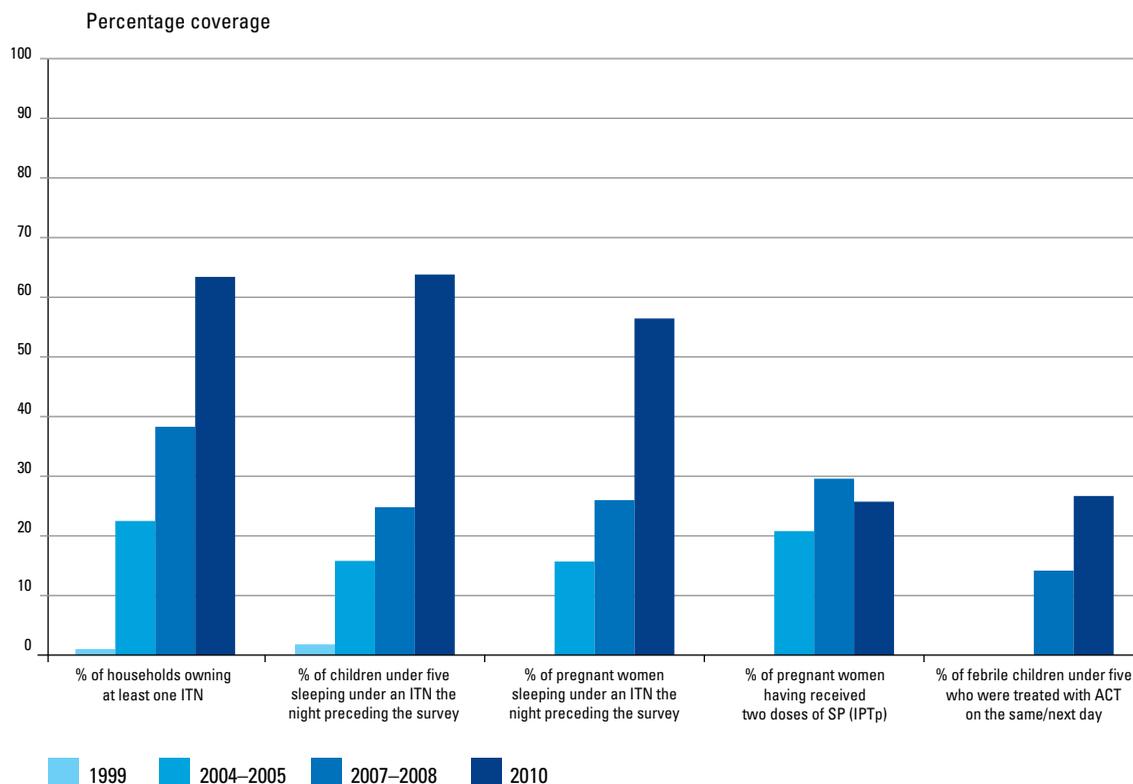
*Malaria prevention and treatment commodities were scaled up between 2005–2010, with sharp increases in ITNs and ACTs in 2009, and RDTs in 2010.*



Source: Budget reports 2005–2010.

**Figure 6**  
**Progress in intervention coverage, Tanzania, 1999–2010**

*Increases in ITN ownership occurred throughout the decade between 1999 and 2010, and large increases in ITN use by children under five and pregnant women, as well as in treatment with ACTs, occurred between 2007–2008 and 2010, while IPTp remained relatively unchanged.*

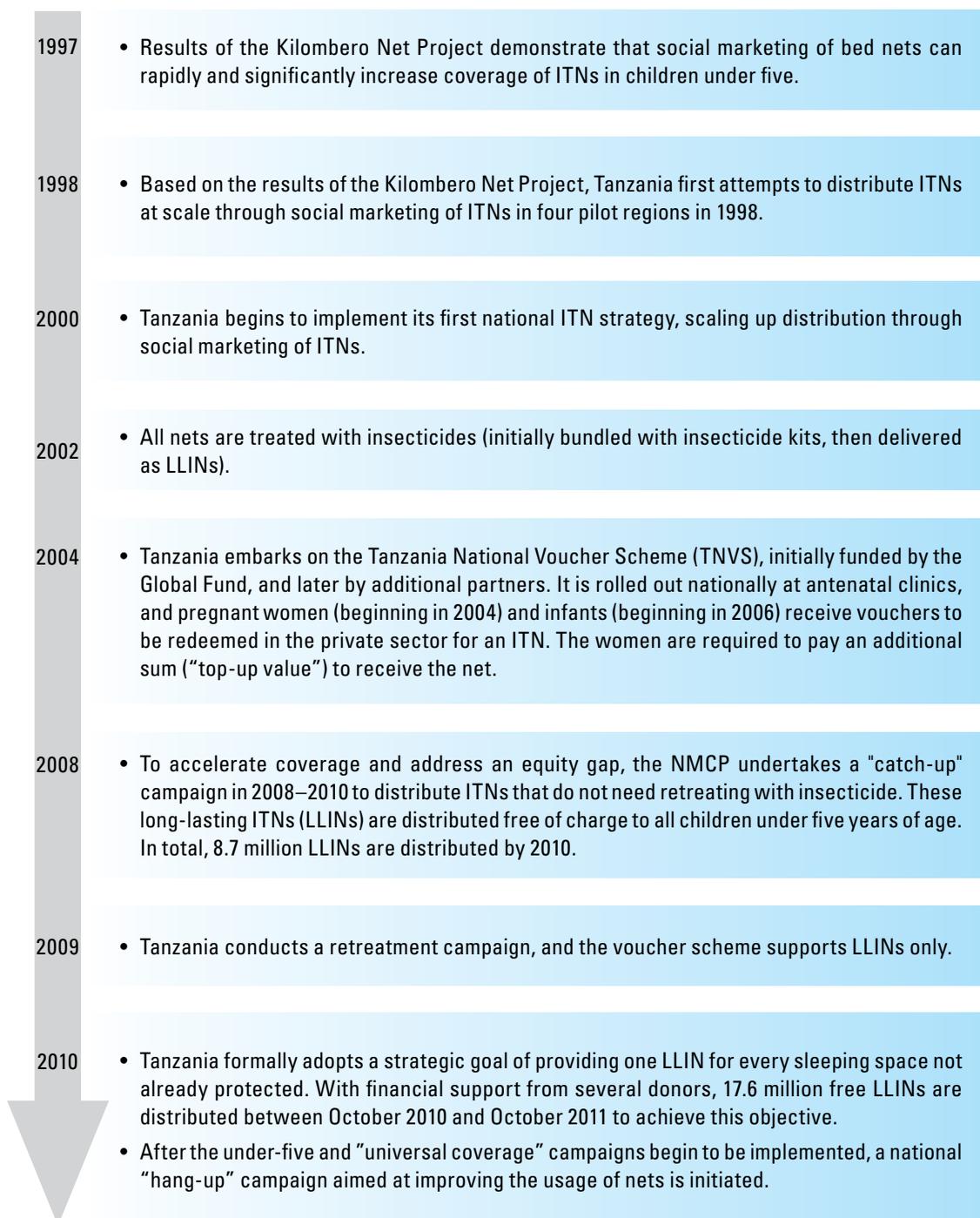


*Note: Questions for calculating ITN ownership were not asked in the 1999 survey, but ownership is estimated to have been around 1%. IPTp is among women 15–49 years who had a live birth within two years of the survey.*

*Source: 1999 DHS, 2004–2005 DHS, 2007–2008 THMIS, 2010 DHS.*

## 1. Increasing coverage of ITNs

### Evolution of ITN implementation in Tanzania, 1997–2011



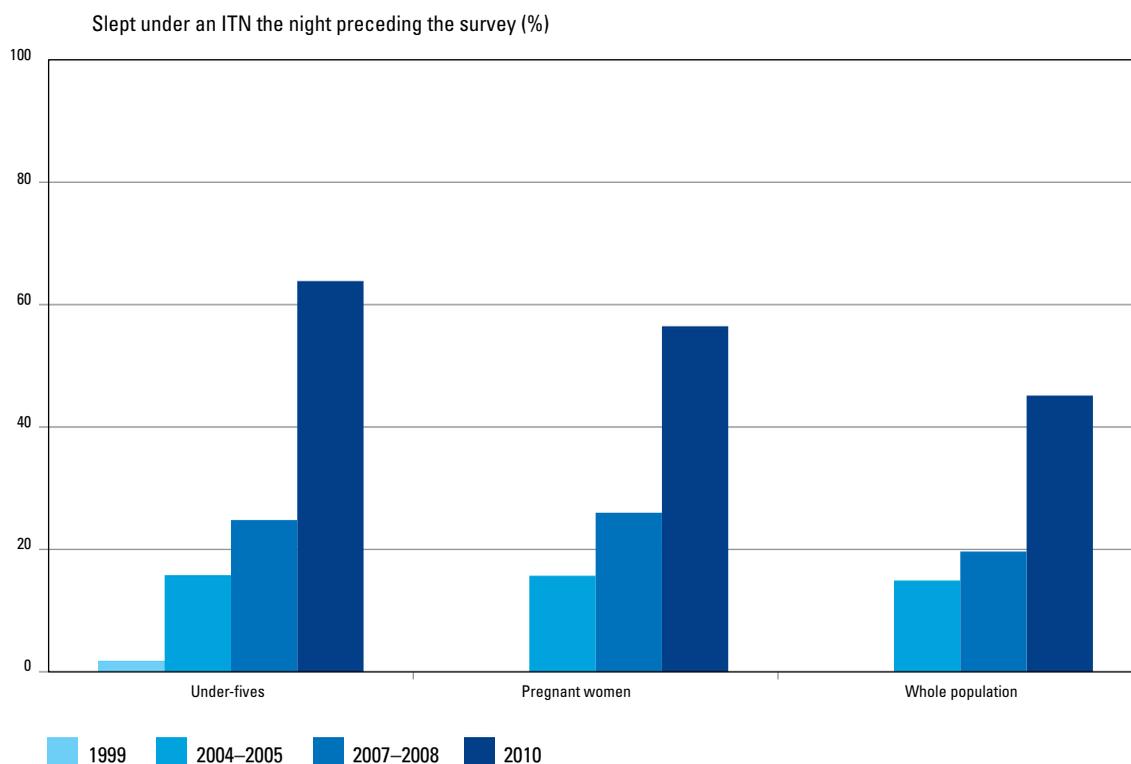
Population-based household surveys—such as the Demographic and Health Survey (DHS) and the Tanzania HIV and Malaria Indicator Survey (THMIS), show that between 2004 and 2010 Tanzania had achieved successes in scaling up malaria control interventions, in particular ITNs.

- Between 1999 and 2010, Tanzania’s ITN campaigns raised household ownership of at least one ITN from nearly zero to 63% of all households.

- By 2010, ITN use by under-fives and pregnant women had reached 64% and 56%, respectively.
- Following the "catch-up" campaign to distribute free ITNs to children under five years, ITN ownership in households with under-fives increased to about 80%.
- Household ownership and ITN use by children under five years and pregnant women became more equitable in terms of household wealth.

**Figure 7**  
**ITN use among children under five years, pregnant women, and the general population**

*Tanzania's aggressive efforts to make ITNs available to those most in need have succeeded, and ITN use increased dramatically from 1999 to 2010.*

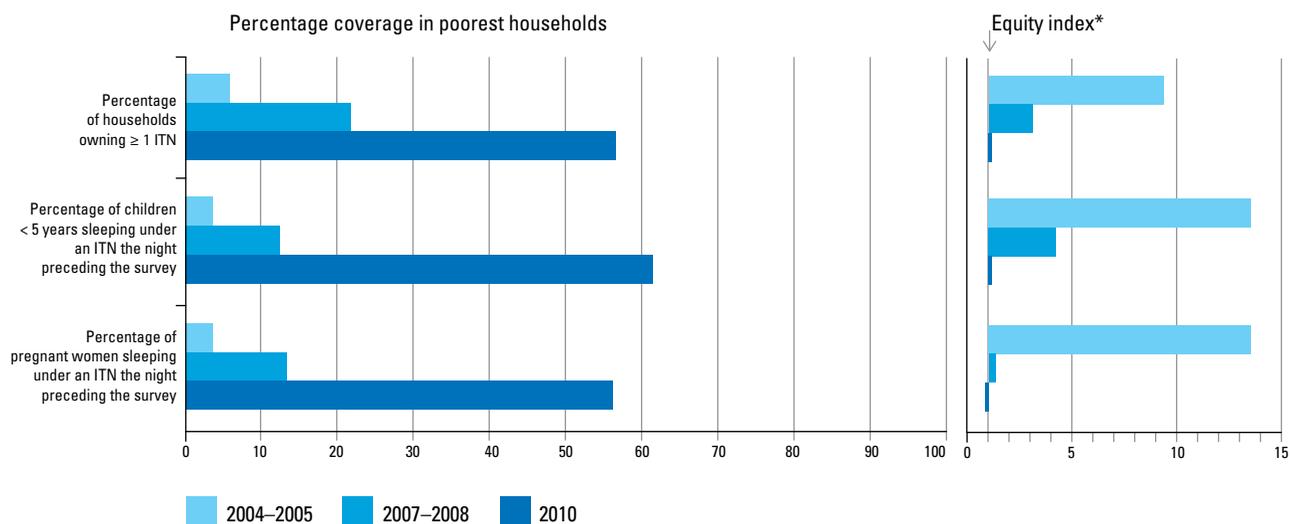


*Note: ITN use data for pregnant women and the whole population are not available for 1999.*

*Source: 1999 DHS, 2004–2005 DHS, 2007–2008 THMIS, 2010 DHS.*

**Figure 8**  
**Increasing equity ratios of ITN usage, 2004–2010**

*In 2004–2005, ITNs were disproportionately owned by the least poor households, and inequitably used by both under-fives and pregnant women. By 2010, those disparities had disappeared.*



\*Equity index = ratio of ITN ownership or use in the least poor versus poorest households using standard wealth quintiles of DHS and THMIS surveys; a value of 1.0 indicates identical coverage in the least poor and poorest households.

Source: 2004–2005 DHS, 2007–2008 THMIS, 2010 DHS.



## Box 5: Tanzania National Voucher Scheme

An important element of public health interventions is sustainability. The NMCP in Tanzania implemented an innovative ITN distribution system through a public-private partnership that established a permanent network of ITN access points.

TNVS is an important component of the national ITN strategy. It has played a role in making ITNs available and accessible to groups most at risk from malaria (pregnant women and infants). Through TNVS, ITN vouchers are issued to pregnant women during their first antenatal care (ANC) visit in a public health facility. As 90% of pregnant women in Tanzania attend for antenatal care at least once, most women have the opportunity to receive a voucher. Vouchers are redeemed, with a small top-up, for an ITN at designated vendors near the ANC clinics. Vendors are motivated to stock and sell ITNs by redeeming the vouchers, which they exchange for additional ITNs at a small profit.

TNVS was established in 2003, officially launched in 2004, and scaled up nationally by May 2006. Staff were trained before pregnant women received vouchers, which could be redeemed with top-up amounts ranging from US\$ 1 to US\$ 1.50, depending on the infrastructure. In 2006, TNVS introduced ITN vouchers for infants and had scaled this up nationally by March 2008. In 2009, in order to optimize redemption rates, a fixed-value top-up of US\$ 0.50 was introduced. The vouchers for

pregnant women and infants were funded by the Global Fund and PMI, respectively.

The vendor network established under the TNVS comprises more than 6000 vendors in both rural and urban areas throughout the country. The network also sells unsubsidized ITNs to non-target groups. In 2006 and 2008, approximately 50% of all ITNs sold in the network were unsubsidized. The availability of ITN vendors helps establish a sustainable culture of ITN purchase and use. The Scheme also means that the private sector takes the responsibility of storing, mobilizing, and distributing ITNs countrywide, rather than the government.

From 2005 through mid-2011, TNVS vouchers helped purchase approximately 8 million ITNs/LLINs. To achieve wider ownership of ITNs among Tanzania's population of approximately 43 million, distribution strategies began to evolve and to rely on campaigns to ensure that populations at risk, especially the poorer, more rural populations, owned an ITN. From 2008 through 2010, a "catch-up" campaign distributed 8.7 million LLINs free of charge to children under five, and starting in late 2010, a universal coverage campaign distributed more than 17 million LLINs free of charge to help achieve the NMCP's goal of one LLIN per sleeping space. Today, TNVS remains an important component of the "keep up" strategy for ITNs, while ITN campaigns are implemented to rapidly increase coverage.

## 2. Expanding IRS interventions

IRS was introduced in Tanzania in 2007 to control malaria outbreaks in selected areas of Muleba and Karagwe Districts in Kagera Region in north-west Tanzania, part of the Lake Zone. Operations were then scaled up to contiguous areas in the two original districts and a further five districts (Chato, Biharamulo, Ngara, Bukoba and Misenyi) in the stable and high transmission areas of Kagera Region. In 2010, another IRS round was successfully conducted in the seven districts of Kagera, and IRS operations began in two additional regions, Mara and Mwanza. By March 2011, IRS operations had expanded to 18 of the country's 113 districts and reached approximately 94% of the targeted structures in these districts.

The three Lake Zone regions have high malaria burdens, with malaria prevalence among children

6-59 months of age estimated at 41% in Kagera, 31% in Mwanza, and 30% in Mara. The planned expansion of IRS will help Tanzania begin to move towards a targeted approach to controlling malaria in the western portion of the Lake Victoria Basin, an area where Uganda, Rwanda, and Kenya have also employed IRS.

The government conducts the vast majority of the spraying, which is free of charge to households. Several private companies, such as mining companies, provide the service for a fee to individual homes in the areas where they operate. A pyrethroid, lambda-cyhalothrin (0.05%), has been used. Insecticide resistance is being monitored, and any changes in insecticide will be made on the basis of these data.

### Box 6: IRS success in Kagera Region

In 2006 and 2007, two districts in north-western Tanzania (Karagwe and Muleba in Kagera Region, est. population of 1.1 million) experienced intense malaria epidemics. More than half of patient admissions at the two district hospitals were children under five suffering from severe malaria.

Two and three patients per hospital bed were a common sight. In the five secondary and tertiary health facilities of Muleba District, over 500 children under five died from malaria between May 2006 and March 2007.



*Children's ward in Muleba District Hospital Intensive Care Unit before IRS in February 2006 (left) and after IRS in February 2009 (right).*

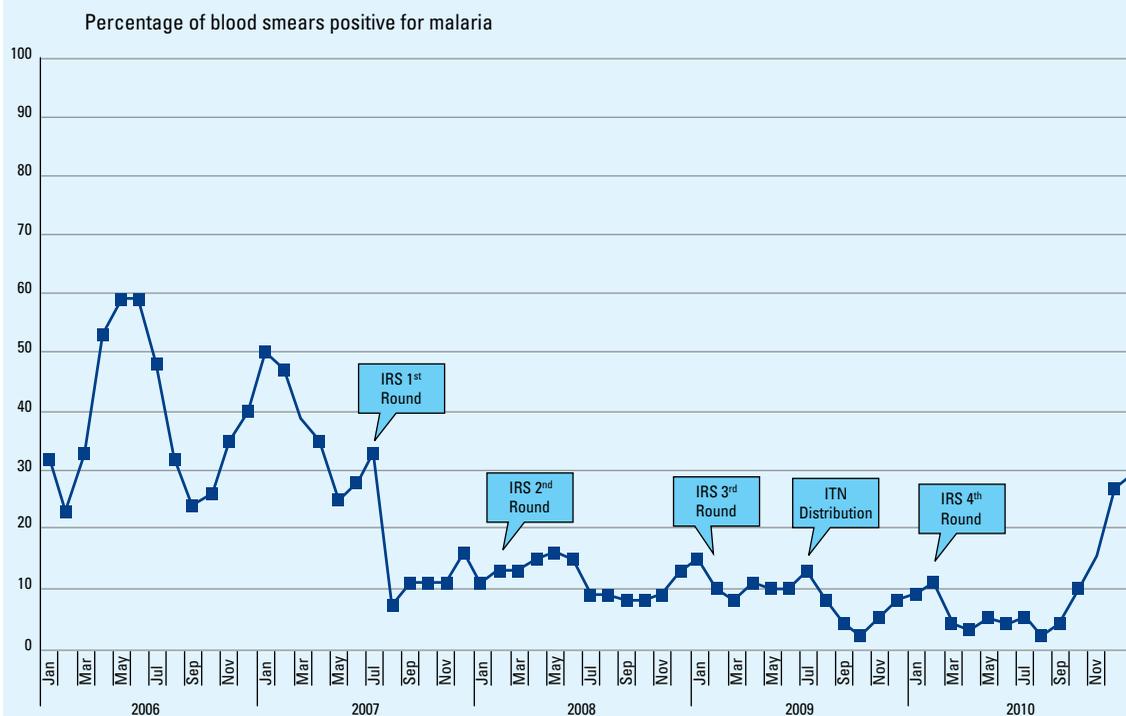


Under the leadership of the NMCP, partners and technical assistance communities mobilized supplies and materials to help stop the epidemic. IRS was among the interventions deployed, and the impact was quickly recognized. Looking forward, the

NMCP decided to implement IRS as a pre-emptive epidemic control measure in selected areas of Muleba and Karagwe before the 2008 malaria season. In both districts IRS campaigns have since been conducted annually.

**Figure 9**  
**Decline in malaria infections in Muleba District, Tanzania, 2006–2010**

*The successive rounds of IRS led to a dramatic decline in malaria infections in Muleba District. However, a resurgence of malaria was observed at the end of 2010.*



Source: RTI International.

In Muleba District, the three hospitals and two health centres with inpatient facilities saw malaria-related admissions and death rates in children under five years of age in 2006 and 2010 drop dramatically from 145 to 23 per 1000 (84% reduction) and from 42 to 5 per 10 000 (89% reduction), respectively. IRS results in Karagwe were also impressive. At its district hospital, confirmed malaria cases fell from an annual average of 23% (2003–2007) to 10% (2008–2009) and 5% in 2010 (January–September). In both Muleba and Karagwe, the introduction of IRS was followed by at least a four-fold reduction in confirmed malaria cases at the respective district hospitals, compared to pre-IRS levels. The decision by the NMCP to deploy IRS in the two districts no doubt saved many children's lives.

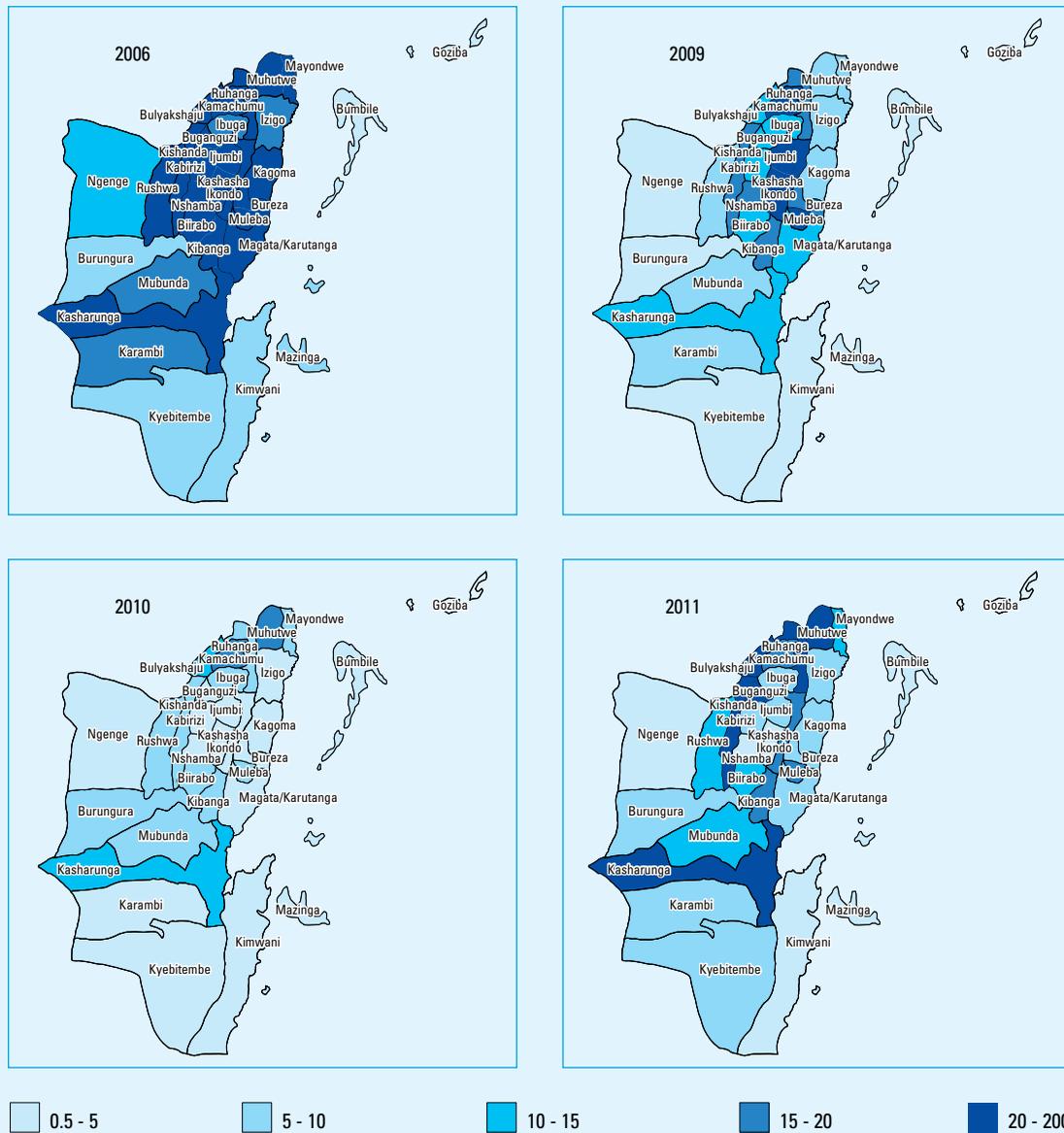
In 2009, the NMCP decided to expand IRS from areas with unstable malaria transmission in these two districts to the remaining stable transmission areas. An average of 100 000 house structures were sprayed per round in the selected areas up to 2009 and over 200 000 house structures between 2009 and 2011, with spray coverage of targeted structures exceeding 95%.

But malaria control is a fragile achievement that depends on the combined contribution of several interventions applied together. In the transmission season of 2011 (May–July) a number of health facilities reported an increased number of malaria cases compared to the previous three years. High mosquito densities were also recorded in some foci within the district. Several factors were associated with this increase: acute ACT stock-outs in first-level health-care facilities, evidence of decreased susceptibility to the insecticide used for IRS in localized areas, suboptimal net distribution in some communities, and low reported net use.

This event demonstrates the risk for malaria resurgence in areas where it has been successfully controlled. The equilibrium between the ideal level of intervention coverage and the desired level of sustained control requires careful calibration and attention. Carefully-coordinated surveillance and response are required to address ongoing, low-level transmission hot spots as well as acute outbreaks once sustained control of malaria is eventually achieved.

**Figure 10**  
**Muleba District: rate of admissions due to malaria per 1000 population recorded in all secondary and tertiary health facilities, by ward (n=32), 2006–2011**

*The rate of health facility admissions due to malaria declined dramatically from 2006–2010, but showed a sharp increase in 2011 with the decline in coverage of key malaria interventions.*



*Note: Data are from 47 000 patient admissions from five health facilities in Muleba District. Ward-level data. Ward population estimates based on projections from the 2002 NBS census.*

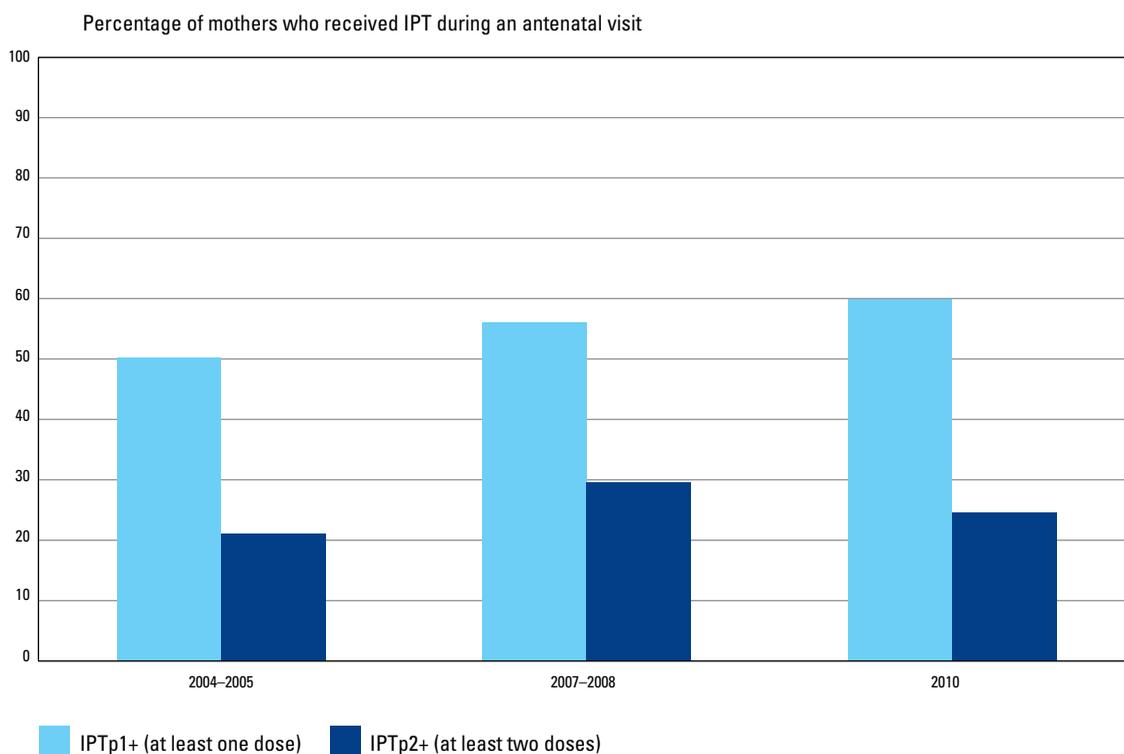
*Source: RTI International, August 2011.*

### 3. Providing intermittent preventive treatment for pregnant women

Tanzania was one of the early adopters of IPTp in sub-Saharan Africa. SP is given at least twice during pregnancy to prevent the adverse effects of malaria infection on both the mother and her newborn. From the time that IPTp was launched in 2001, coverage with this intervention (at least 2 doses) rose from 21% in 2004–2005 to

26% in 2010—well short of the 80% target. However, a higher proportion of women received their first dose of IPTp in 2010 (60%) than in 2004–2005 (50%). Low coverage with the recommended number of doses of IPTp is likely due to several factors, including SP stock-outs in health facilities, provider confusion about timing of IPTp doses, and inconsistent record keeping. Tanzania is taking steps to overcome these barriers.

**Figure 11**  
**IPTp in women of childbearing age with live birth 0–2 years before survey, 2004–2010**  
*While coverage of IPTp2+ increased from 21% in 2004–2005 to 26% in 2010, it remains low.*



Source: 2004–2005 DHS, 2007–2008 THMIS, 2010 DHS.

## 4. Strengthening case management

Prompt and effective case management, requiring correct diagnosis and treatment with the country's first-line antimalarial drug, is critical. In the last decade, Tanzania has addressed both of these issues.

Tanzania has twice changed its first-line antimalarials from a failing drug to a more effective drug in response to clinical evidence. In 2001, Tanzania replaced chloroquine with SP, and in 2006, it replaced SP with ACTs. Use of the more effective, recommended antimalarial drug means that children and adults with malaria who receive the recommended antimalarial are very likely to improve.

ACTs were introduced in the public sector in December 2006. Because of the change in recommended antimalarial drugs, health workers (clinicians, pharmacists, nursing staff) were provided training to adapt to the change to a new antimalarial drug. The government, in collaboration with multiple partners, provided financial support for the training; partners included PMI, Global Fund, Italian Cooperation, and WHO. In addition, Zonal Training Centres in Arusha, Iringa, and Kigoma trained a total of 5 500 staff at designated facilities on the new guidelines and comprehensive case management, including for severe malaria and malaria in pregnancy.

Tanzania also sought to make antimalarials more accessible through the private sector, where up to 40% of the rural population, mainly adults, seek care for fever. In 2003, the Ministry of Health and the Tanzania Food and Drugs Authority, in collaboration with partners, introduced a strategy of accredited drug-dispensing outlets (ADDOs) aimed at strengthening and improving the quality of services delivered through private outlets in the community. The government subsidized antimalarial drug prices so that they would be affordable for clients and

attractive for drug outlets to offer them. Any *duka la dawa baridi* (informal drug shop) could become an ADDO, provided that they met established criteria and appropriate storage facilities for the drugs: their personnel received Authority-approved training in drug dispensing, case management, and appropriate ADDO pharmaceutical management and business practices. After pilot testing in the Ruvuma Region, which began in 2003, ADDOs were rolled out to the Morogoro and Rukwa Regions, followed by seven other regions in the country. Nonaccredited drug shops began to be phased out.

Affordable Medicines Facility for malaria (AMFm), developed by the Global Fund to make antimalarials more affordable in the private sector, was launched in 2009. AMFm negotiates with the manufacturers to reduce the price of their ACTs and subsidizes them heavily for purchase by specified national importers. Support of private-sector ACT distribution through ADDOs is expected to pass to the AMFm. Tanzania was among the first 10 countries invited to participate in AMFm's pilot phase.

Rapid diagnostic tests have helped make it possible to diagnose true malaria in more settings so that patients can be treated appropriately if they have malaria. In April 2009, with assistance from the Global Fund, RDTs began to be introduced at public health facilities. The goal is national scale-up so that all suspected malaria cases can be tested. As of the end of 2011, facilities in nearly half the country have been reached. During 2009, when RDTs were being rolled out, microscopists were trained to support a quality assurance programme for malaria diagnostics.

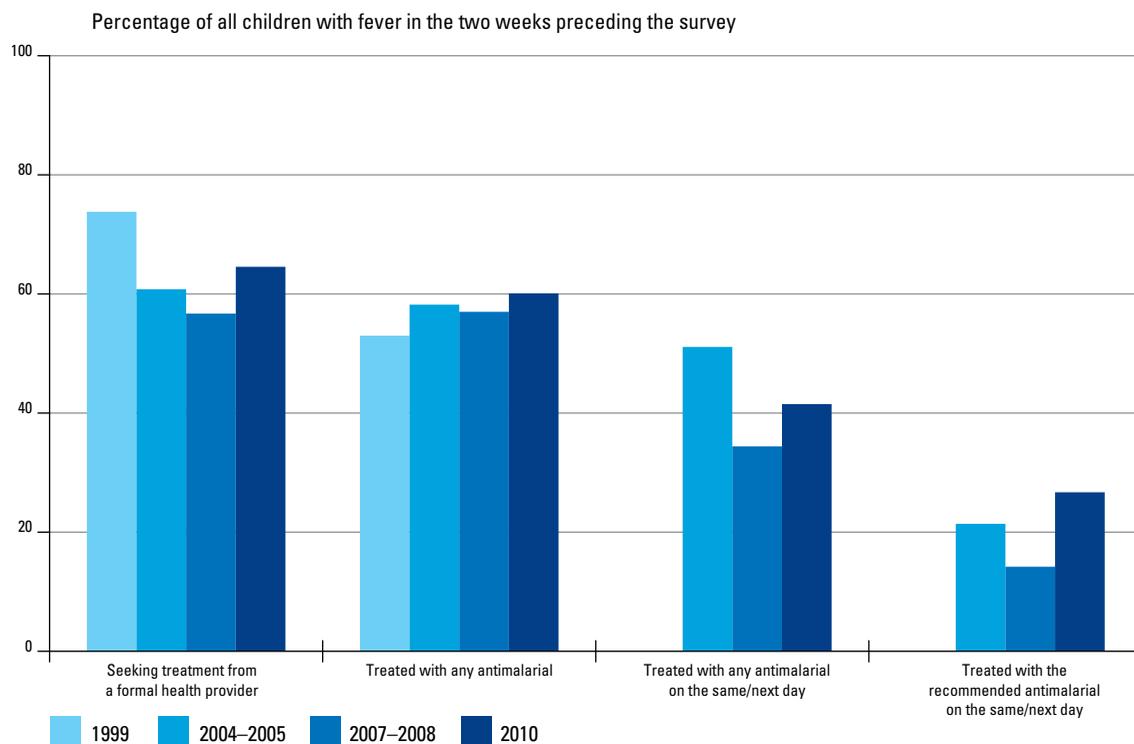
Despite these efforts, there has been essentially no change over the decade in treatment-seeking behaviour or in timely receipt of the recommended antimalarial drug. For most of the decade, the percentage of those who sought treatment from a formal health provider was essentially flat, hovering around 60%. Timely receipt of the recommended

antimalarial did not substantially increase over the period, rising from 21% in 2004–2005 to 27% in 2010. Health facilities' frequent stock-outs of ACTs have

presented a barrier, and efforts are now under way to strengthen the quantification, procurement, and supply management and distribution chain.

**Figure 12**  
**Treatment-seeking for febrile children under five years**

*In 2004–2005, 2007–2008, and 2010, the percentage of children taken to a formal health provider for treatment has remained relatively static: 61%, 57%, and 65%, respectively. In the same periods, much fewer than half—21%, 14%, and 27%, respectively—received the recommended antimalarial either the same day as, or the day following, fever onset.*



Source: 1999 DHS, 2004–2005 DHS, 2007–2008 THMIS, 2010 DHS.



## d. Supporting interventions through communications activities

NMCP has used its National Malaria Communication Strategy 2008–2013 as a guide to addressing priority communications issues related to use of malaria interventions. The Strategy has helped coordinate and harmonize the communications activities of Tanzania’s many stakeholders and implementing partners including Christian Social Services Commission, Health Focus, Interfaith International, Jhpiego, Johns Hopkins Centre for Communication Programs, Malaria No More, Population Services International Tanzania, RTI International, Tanzania NGO Alliance Against Malaria, Tanzania Red Cross Society, and World Vision Tanzania.

### The Malaria Haikubaliki Campaign

The shared vision articulated by the Strategy guided the development of a unified campaign, spearheaded by the NMCP. The campaign’s slogan in Swahili, “Malaria Haikubaliki, Tushirkiane Kuitokomeza,” can be translated as “Malaria is not acceptable; Together let’s kick it out.” Launched at the Zinduka concert, the campaign brought together well-known musicians and was officially presided over by President Kikwete.

Using the logo of this campaign, partners implement coordinated communications activities, using appropriate channels and messages to reach different target audiences. Reach is to be measured and outcomes are to be evaluated so that the information can improve or inform the activity.

Among these efforts were:

- Mobilizing communities through “change agents” who reached the community directly, as part of the Rural Communications Initiative
- Mass media that reached sometimes hard-to-reach communities
- Developing skills in young people so that they can implement communications campaigns, through THT
- Radio messages, signs or stickers to indicate a hanging net, and household visits that sought to make ITN use a standard community practice during the 2011 universal ITN coverage campaign
- Engaging district leaders and stakeholders in malaria awareness efforts and monitoring and problem-solving these efforts in four pilot districts using a successful Ghanaian model
- Training health providers in interpersonal communication.

By educating and empowering communities and individuals to take steps to prevent and control malaria, strategic communications activities hope to contribute to the NMCP’s efforts to ensure that all Tanzanians benefit from malaria interventions.

## Box 7: NMCP's BCC strategy at work: focus on COMMIT

A broad range of partners—Johns Hopkins Bloomberg School of Public Health Centre for Communication Programs, Jhpiego, PSI, and many Tanzanian nongovernmental organisations (NGOs)—joined forces to help put the NMCP's 5-year BCC strategy into action at the national, community, and individual levels. The partnership, called the Communication and Malaria Initiative in Tanzania (COMMIT), seeks to promote a culture of correct malaria practices at the community level, as well as to promote individuals' belief that they can take the necessary steps to prevent and treat malaria.

At the centre of its work is the Rural Communication Initiative, which reaches into the community, including harder-to-reach areas, to mobilize communities around malaria prevention, treatment, and control. To do this, COMMIT relies on its more than 65 NGO partners to supervise 1 200 "community change agents," who make home visits, hold group talks, and carry out school-based activities. These agents also help communities develop and implement malaria prevention plans tailored to their own needs. The community change agents have also been participating in the national hang-up campaign, which encourages village residents to sleep under their ITNs. In addition, village-level activities such as road shows and mobile video units engage communities through entertainment to promote discussion about usual community practices or norms and personal beliefs about malaria prevention and control.

The Rural Communication Initiative has reached more than 8.8 million people with malaria messages. In two of COMMIT's target regions, 65% of the residents had seen either a road show or mobile video unit presentation in 2008–2009. Importantly, 77% of those who had been exposed to malaria messages and events had put all their children

under an ITN the previous night, while only 35% of those not exposed to the messages did so.

The other major component of COMMIT's work is mass media. Designed to support the umbrella campaign (Malaria Haikubaliki) and community-level mobilization, it emphasizes messages on self-efficacy regarding the use of an ITN, malaria in pregnancy, and case management. Different channels and formats have been used, including the following:

- *Two Minutes of Wisdom*, on radio and television, showcases well-known Tanzanians such as former President Ali Hassan Mwinyi discussing their experiences with malaria.
- *Pata Pata* (Get it), a 10-minute children's weekly radio programme, aims to empower children to be change agents in malaria prevention within their own homes and communities.
- The feature film *Chumo*, a love story set on the Swahili Coast, educates viewers on the dangers of malaria in pregnancy and how to prevent it. The film has been distributed by the Rural Communication Initiative's mobile video units and through other national distribution channels in 2011.



The Steadman/Synovate Omnibus Survey,<sup>2</sup> conducted in 2010, showed the following results:

- 86% (April 2010) and 72% (September 2010) had heard a malaria message on the radio within the previous month.
- Of the 72% who had heard a message, 81% reported taking an action:

I make sure my family is sleeping under an ITN every night	44%
I went to buy a treated mosquito net for my family	15%
My family or I now go for a malaria test early, whenever I see signs and symptoms	14%
I discuss with friends the importance of sleeping under an ITN every night	8%

- 91% of respondents had heard the phrase Malaria Haikubaliki.
- 68% of people surveyed could correctly finish the phrase Malaria Haikubaliki.
- 20 000 DVD-VCDs of the movie *Chumo* were sold through commercial channels.
- Actions by children after listening to the programme *Pata Pata* include asking their parents to listen to the programme with them, convincing parents to obtain ITNs, persuading the family to sleep under an ITN, and repairing holes on the ITNs already hanging.

<sup>2</sup> Nationally representative survey, covering all Tanzania regions; a sample of 2000 respondents was drawn among a target population of all Tanzania adults aged 18 and above, to achieve a 40:60 urban to rural ratio.

## e. Saving lives and measuring impact

### Impact at a glance

- In areas where multiple years of data are available, malaria parasitaemia prevalence declined dramatically in recent years. For example, in the Ifakara Demographic Surveillance System site, parasite prevalence fell from 25% in 2004–2005 to less than 5% in 2010.
- Nationally, severe anaemia was halved, from 11% (2004–2005) to 5.5% (2010). The decline was greatest in the age group most affected by malaria-related anaemia—children 6–23 months of age. By 2010, inequities in severe anaemia prevalence by child's sex, residence, wealth, and mother's educational status had narrowed or disappeared entirely.
- Under-five mortality plummeted from 148 to 81 deaths per 1000 live births from 1999 through 2010.
- According to the Lives Saved Tool (LiST estimation model), the lives of an estimated 63 000 children under five have been saved by malaria control interventions since 1999.

Evidence of the impact of scale-up of malaria interventions has been accumulating, especially among children under five years of age. The prevalence of malaria parasitaemia, severe anaemia, and all-cause under-five mortality are all declining. Careful consideration of other possible factors that might explain these declines leads to the conclusion that the improvement in child health is due in large part to malaria control efforts. This is one of the most thorough analyses of the impact of nationwide malaria control efforts that has been conducted globally.

### Malaria parasitaemia

A review of changes in malaria parasitaemia requires a look at the data collected in various cross-sectional surveys, since only one national-level data point is available. All indicate that a decline in malaria parasite prevalence has occurred in recent years during the time of malaria intervention scale-up.

- Household surveys in areas with multiple years of data show a drop in prevalence.
  - Surveys in Lindi and Mtwara Regions documented an approximately 50% decline in all-age malaria parasite prevalence (from 51% in 2004 to 27% in 2007), a 66% decline in parasite prevalence in infants aged 2–11 months (from 57% in 2004 to 19% in 2007), and a 53% decline in parasite prevalence in children 1–4 years of age from 75% in 2004 to 35% in 2007.
  - In the Ifakara Demographic Surveillance System area, all-age malaria parasite prevalence fell from 25% in 2004–2005 to less than 5% in 2010. The method of measuring parasitaemia changed from microscopy to RDTs around 2007.
  - NMCP surveys in 21 districts marked a decline from 19% in 2006 to 16% in 2008.
- Tanzania's malaria parasite prevalence in children 6–59 months old was 18% in 2007–2008, before ITN coverage increased dramatically through the "catch-up" campaigns.



## Severe anaemia

Severe malaria-associated anaemia in Tanzania is predominantly a problem in very young children 6–23 months of age and in rural areas (see Figure 13).

Severe childhood anaemia (haemoglobin <8 g/dL) prevalence in children under five, an important proxy of malaria morbidity, decreased by 54% (from 11.9% to 5.5%) in rural areas, and by 24% (from 7.4% to 5.6%) in urban areas, between 2004–2005 and 2010. In 2004–2005, the prevalence of children with severe

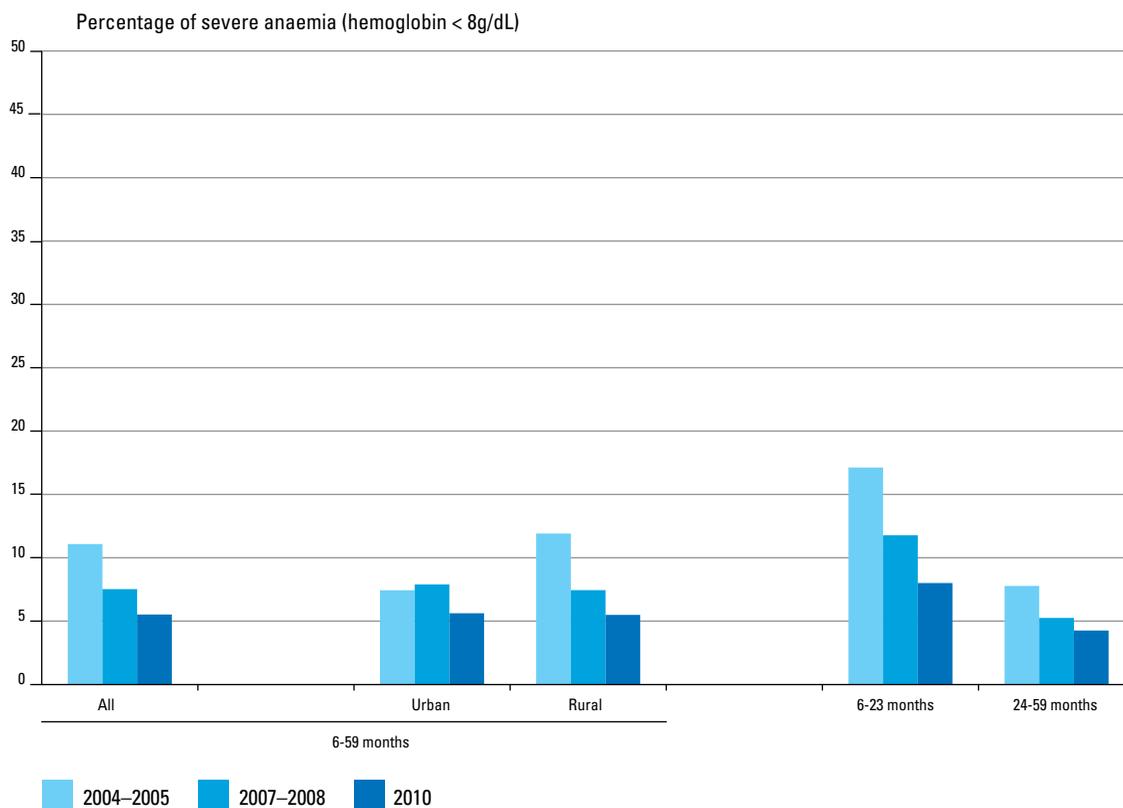
anaemia was more pronounced in the poorest households (14%) than in the least poor ones (7%). The same difference was noted between households with no education (14.3%) and those with at least a secondary education (8.1%). The trend was much less apparent in 2010: 7.1% vs 5.5% and 6.8% vs 6.7% for the same respective groups.

This improved equity in severe anaemia outcomes seems to point again to equity in the delivery of malaria interventions, which has altered the urban/rural difference.

**Figure 13**

**Trends in severe anaemia, 2004–2005, 2007–2008, 2010, by residence and age**

Severe anaemia declined in all children 6–59 months of age between 2004–2005 (11%) and 2010 (5.5%), especially in rural areas and in the 6–23 month age group (the age group most affected by malaria).

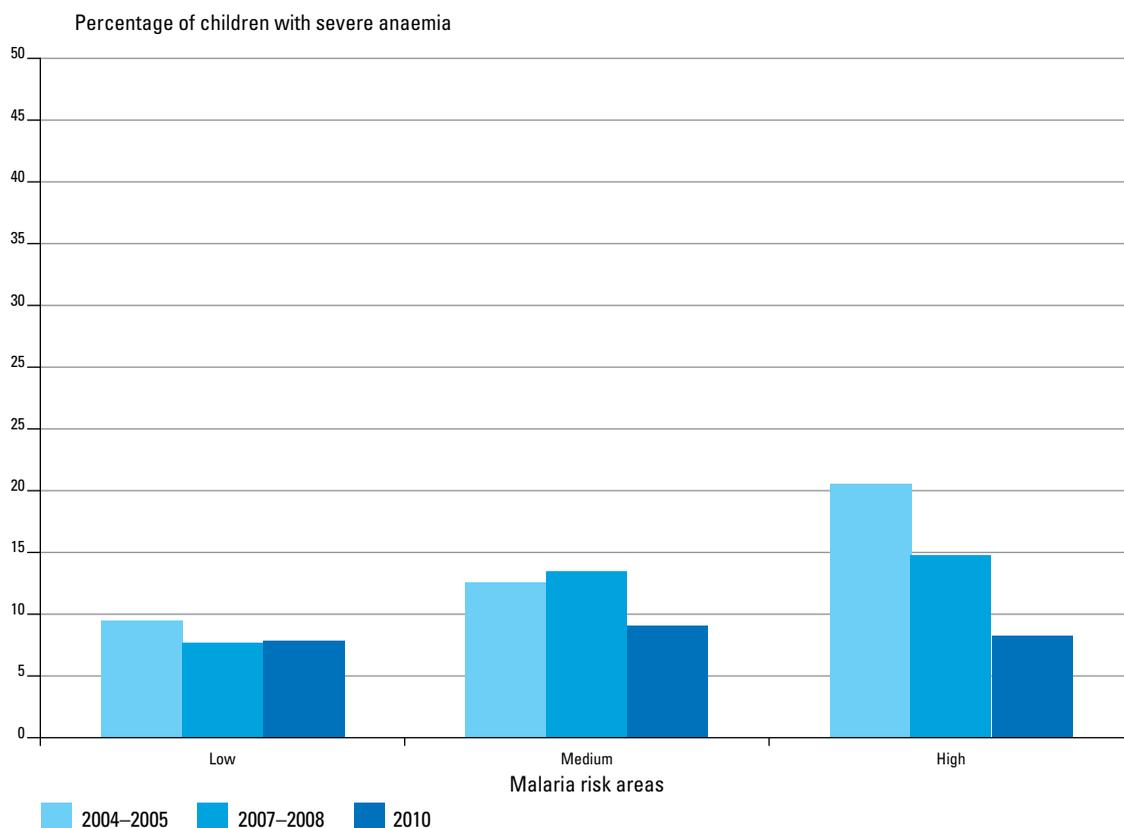


Source: 2004–2005 DHS, 2007–2008 THMIS, 2010 DHS.

As described earlier, malaria transmission varies across the country. Regions were categorized as high, medium, and low malaria risk based on malaria parasite prevalence in children 6–59 months (2007–2008). By risk areas, the largest relative decline in severe anaemia was in high malaria risk areas

compared to medium or low-risk areas. Although there are multiple causes of childhood anaemia, a marked decline in high malaria risk areas—where malaria interventions were deployed—suggests that the decline was due at least in part to malaria-related anaemia.

**Figure 14**  
**Trends in severe anaemia by high, medium, and low malaria risk areas, 2004–2005, 2007–2008, 2010**  
*In 2010, severe anaemia prevalence was similar in the three malaria risk areas, with children in areas of high malaria risk experiencing the same levels of severe anaemia as those in low-risk areas. Between 2004–2005 and 2010, the largest declines in anaemia were observed in the high-risk areas.*



Source: 2004–2005 DHS, 2007–2008 THMIS, 2010 DHS.

## Under-five mortality

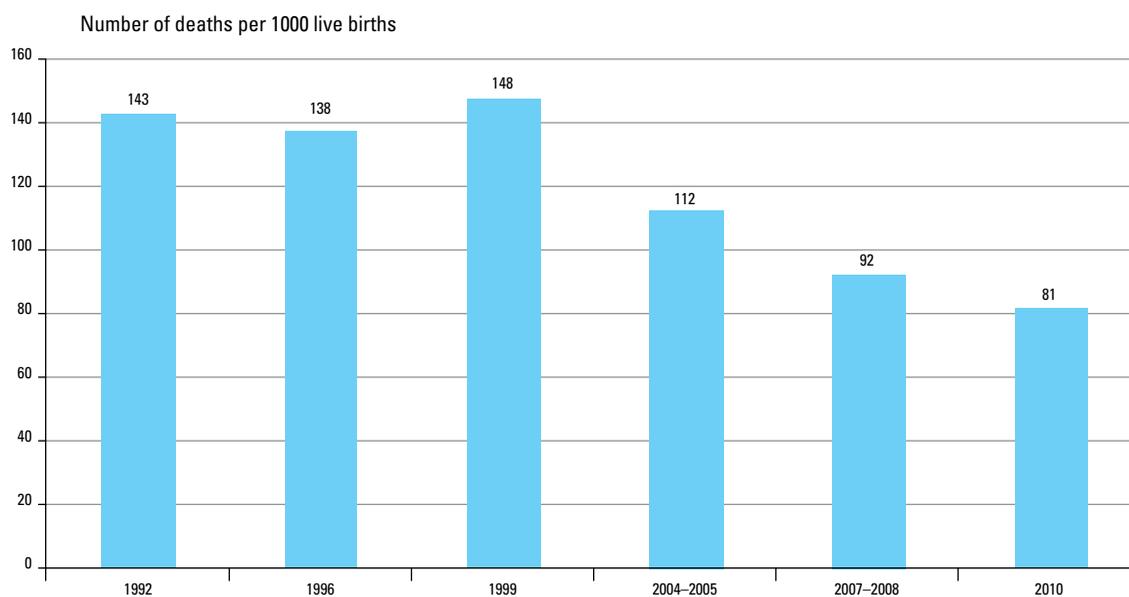
Declines in under-five mortality are used as the primary measure of the impact of malaria control interventions, as malaria-specific mortality cannot be reliably measured in most parts of sub-Saharan Africa. Vital registration systems have low coverage, recorded causes of death have unknown validity, and many deaths occur at home, outside health facilities. All-cause mortality in children under five years of age—which is relatively easier to measure—can be used, understanding its caveats, to determine if there has been an impact.

This section summarizes the evidence of mortality decline in children under five, during the evaluation period, across different age groups, by residence (urban vs rural), and by risk area (high, medium, low).

Because of the rapid expansion of malaria control programme coverage and the proven benefits seen in trials and efforts undertaken by specific districts, it is fully plausible that a substantial portion of the recent improvements in child survival has come from these efforts.

**Figure 15**  
Trends in all-cause under-five mortality

*Although relatively constant throughout the 1990s, all-cause under-five mortality showed a significant decline from 1999 to 2010—from 148 under-five deaths per 1000 live births to 81.*



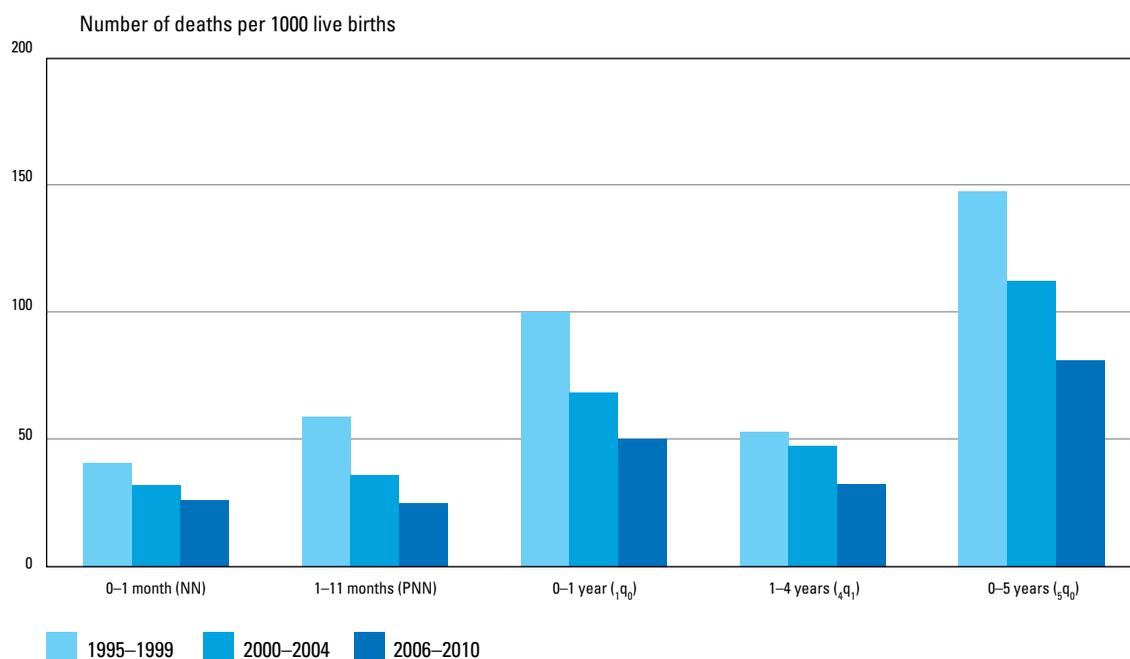
Source: 1992 DHS, 1996 DHS, 1999 DHS, 2004–2005 DHS, 2007–2008 THMIS, 2010 DHS.



**Figure 16**  
**Trends in age-specific childhood mortality, 1999, 2004–2005, 2010**

Mortality in age-specific categories declines from 1999 to 2010, with much of the under-five mortality decline occurring in the infant (first year of life) age category, and even more specifically in the post-neonatal age category (age 1–11 months).

When all-cause under-five mortality is separated out by additional age categories, it can be seen that much of the decline in mortality in children under five occurs in children 6–23 months old. This relative mortality decline in the 6–23 month age group (49%) was nearly 50% larger than the relative mortality change (34%) in the 24–59 month age group. This decline is consistent with the observed improvements in severe childhood anaemia in this younger age group linked to malaria control programme efforts.



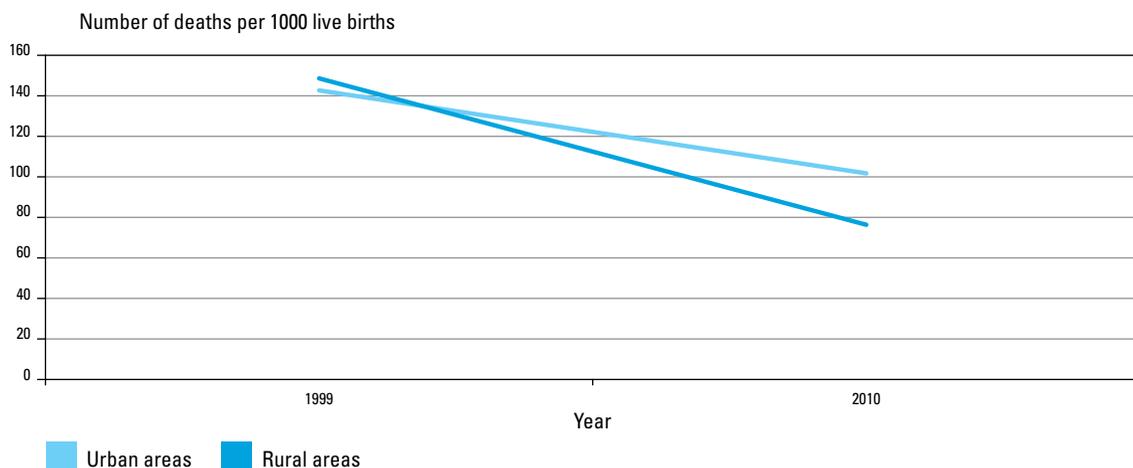
Note: NN = neonatal mortality (first month) per 1000 live births; PNN = postneonatal mortality (age 1–11 months);  ${}_1q_0$  = infant mortality (first year), per 1000 live births;  ${}_4q_1$  = child mortality between exact age 1 and exact age 5, per 1000 children surviving to 12 months of age;  ${}_5q_0$  = under-five mortality, per 1000 live births. Mortality estimates refer to 0–4 years prior to the survey.

Source: 1999 DHS, 2004–2005 DHS, 2010 DHS.

**Figure 17**

**Under-five mortality in urban and rural areas of Tanzania, 1999 and 2010**

*The reduction in deaths among children in rural areas decreased more than those in urban areas, showing that health interventions reached those in poorer, rural areas—where most deaths due to malaria occur.*

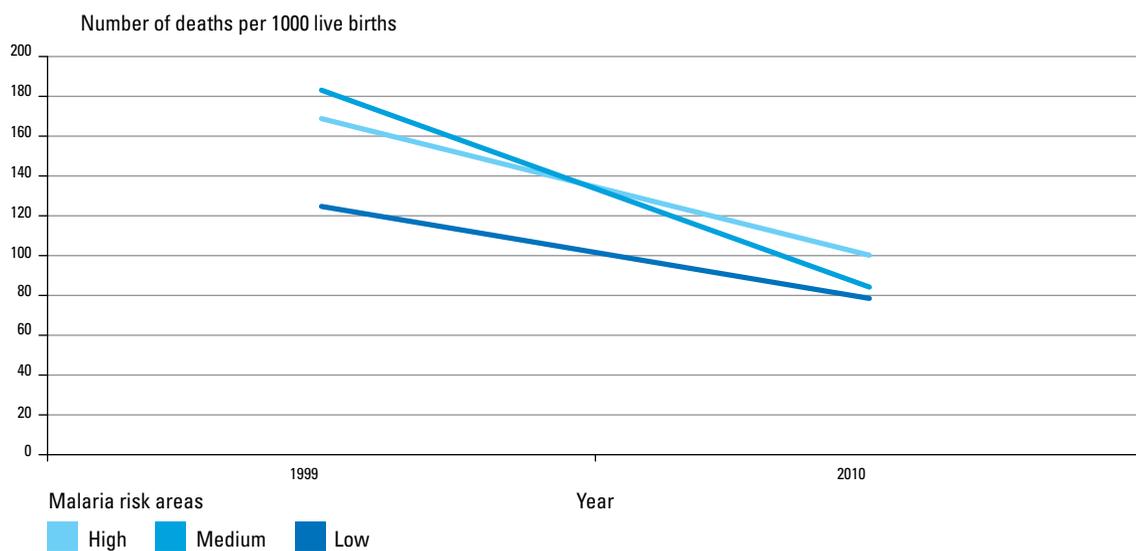


Source: 1999 DHS, 2010 DHS.

**Figure 18**

**Trends in under-five mortality in high, medium, and low malaria risk areas, 1999 and 2010**

*Mortality decreased more in areas with high to medium risk than in areas of lower malaria risk between 1999 and 2010.*



Source: 1999 DHS, 2010 DHS.

In sub-national settings where more complete multiple-year data are available, such as the Ifakara Demographic Surveillance System, it was also observed that malaria control interventions increased, and these increases coincided with morbidity and mortality declines. Over the period 1999–2010 mosquito net use increased—including both “any net” and ITN use. During this period, malaria morbidity (parasitaemia and inpatient blood slide malaria positivity), malaria transmission intensity (measured by the entomologic inoculation rate), and infant and under-five mortality declined. Examination of rainfall data indicates that climate variation is unlikely to explain the declines in malaria morbidity and infant and under-five mortality between 1999 and 2010. A full description of results from the Ifakara Demographic Surveillance System is available in Annex B.

### **Malaria Interventions Helped Save Children’s Lives: The Plausibility Argument**

Changes in all-cause child mortality can be caused by improvements in many areas of health. To examine whether the marked reduction in all-cause child mortality could be attributed to the scale-up of malaria control interventions, we reviewed other determinants of child survival that could offer alternative explanations for the changes observed in mortality during the period 1999–2010 (see Annex C). Two important child survival interventions notably increased during the evaluation period: *Haemophilus influenzae* (b) vaccinations and vitamin A supplementation.

- The coverage of *H. influenzae* (b) vaccinations in children under five rapidly increased to 88% in 2010 following the vaccination’s introduction in the Expanded Programme on Immunization schedule in 2009. While this could have contributed to a reduction in all-cause under-five mortality, it is unlikely to have done so because the lag period between vaccine introduction and the latest mortality measurement was less than a year.

- As shown in nationally representative household surveys, 60% of children aged 6–59 months had received a vitamin A supplement in the six months prior to the survey in 2010, compared with 13% in 1999. However, data from UNICEF suggest that 80% of children under five had been fully protected by two doses of vitamin A since 2000. It is therefore likely that vitamin A may have helped improve child survival but, given the high coverage levels achieved during most of the decade, not to the extent recorded in the second half of the decade.

Similarly, during the period 1999–2010, sustained coverage of other child survival interventions, including other immunization services, continued to contribute to reductions in child mortality, but none had sustained significant increases in coverage during the period 1999–2010. It is therefore likely that these interventions, while contributing to child survival, did not contribute in any major fashion to the observed reduction of all-cause mortality among children less than five years of age. Rainfall patterns favourable for malaria transmission persisted throughout the period from 1999 to 2010.

The decline in child mortality can be seen:

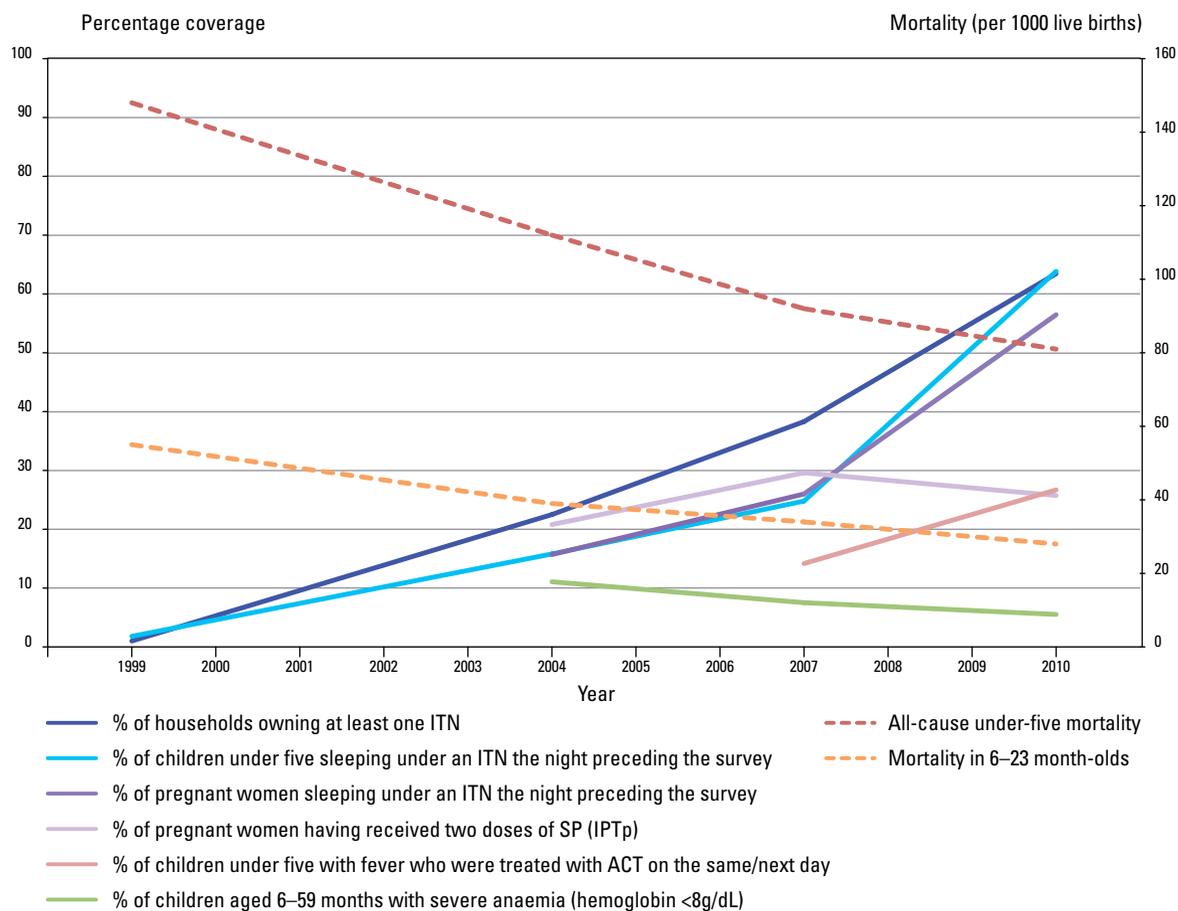
- following high coverage of malaria control interventions with simultaneous decreases in severe anaemia, an important measure of malaria morbidity
- to be highest in high to medium malaria risk areas compared to low malaria risk areas
- in rural areas more than in urban areas
- in the age group of 6–23 months, the age group at highest risk of malaria morbidity and mortality.

We therefore believe that it is plausible to conclude that malaria control interventions in Tanzania helped save many children’s lives and were responsible in large part for the dramatic reduction in under-five mortality in Tanzania seen between 1999 and 2010.

**Figure 19**

**Malaria control scale-up, severe anaemia and mortality, Tanzania, 1999–2010**

Mortality declines continued with the scale-up of malaria control interventions. Coverage of ITNs (ownership and use) increased sharply after 2007 and the use of ACTs also increased after 2007.



Source: 1999 DHS, 2004–2005 DHS, 2007–2008 THMIS, 2010 DHS.



### Number of Lives Saved, as estimated by the LiST model

The LiST model (Lives Saved Tool) is used to estimate the number of lives saved among children under five according to the estimated efficacy of the various malaria prevention interventions and changes in the coverage of these interventions.

The LiST model estimates the protective efficacy of vector control at 55% against malaria-caused mortality. The protective efficacy of prevention of malaria in pregnancy has been estimated to be 35% against low birth weight, which then affects child mortality.

According to this model, approximately 63 000 (range: 33 000–97 000) deaths among children under

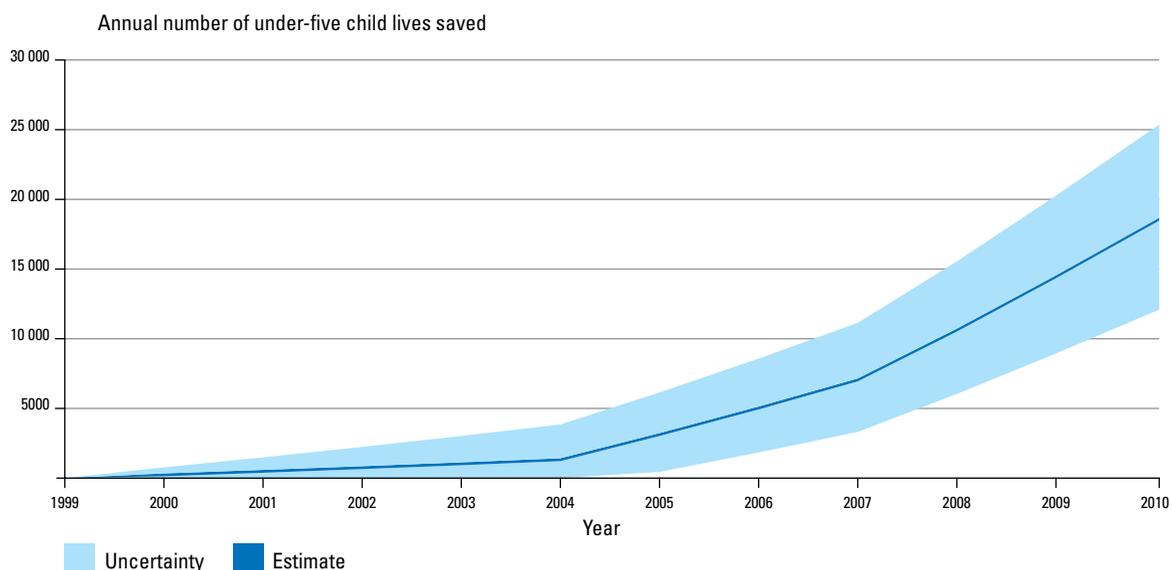
five were averted in Tanzania between 1999 and 2010 (Figure 20), thanks to the scale-up of coverage of vector control measures (defined as households owning at least one ITN) and prevention of malaria in pregnancy (defined as pregnant women sleeping under an ITN the previous night). Household ownership of an ITN accounts for the majority (98%) of lives saved, preventing 61 000 child deaths.

The LiST model provides a conservative estimate, as it does not account for the lives saved through early diagnosis and effective treatment of malaria, the community protective effect of ITN scale-up, or the indirect effects of malaria control on child mortality. It is therefore reasonable to assume that the actual number of lives saved by all malaria control interventions is much higher.

**Figure 20**

**Lives of children under five saved by malaria prevention, Tanzania, 1999–2010**

*Among the lives saved, the vast majority have been saved since 2004, when ITN coverage rates began to increase sharply.*



Source: Data generated using the LiST model (US-PMI, Tulane University and Johns Hopkins University), 2011.

This number of lives saved represents a 31% reduction in malaria-related mortality in children under five since 1999. It is estimated that

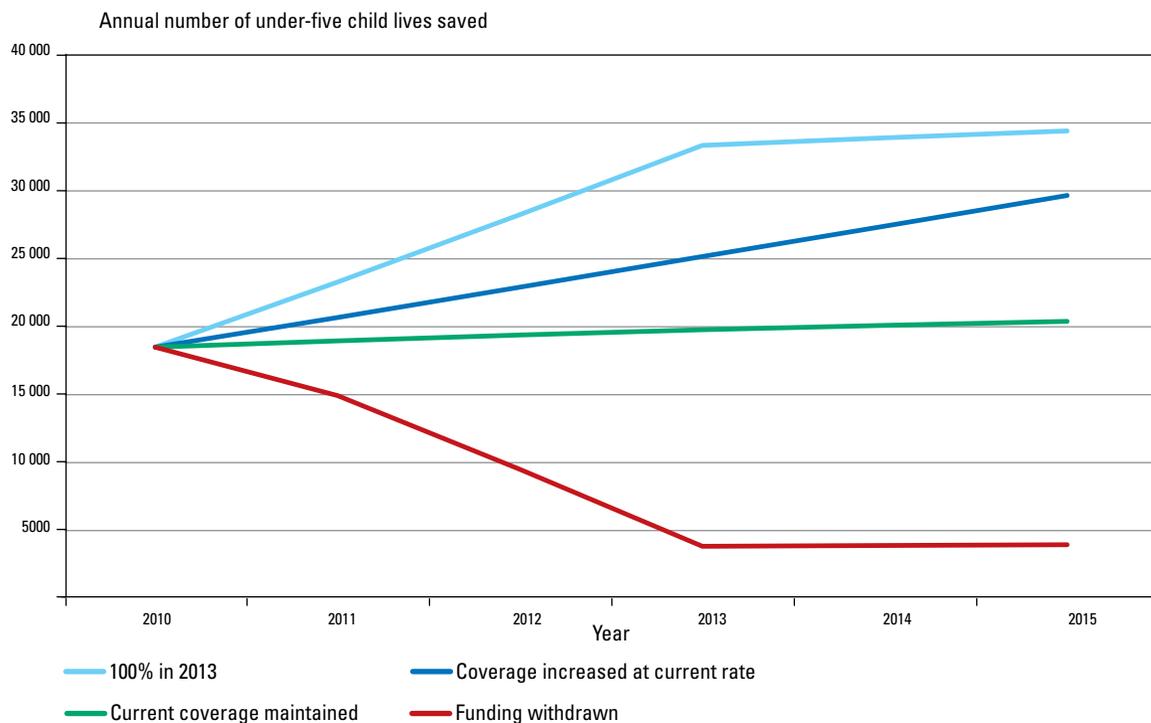
the under-five mortality rate for 2010 is 7.5% lower than it would have been, had the NMCP not expanded malaria control intervention coverage.

**Figure 21**

**Projections of the impact of various NMCP activity scenarios between 2011 and 2015**

Four expansion scenarios were analysed using the LiST model. The first (in light blue) achieves 100% coverage (at least one ITN per household) in 2013; the second (in dark blue) maintains the annual rate of expansion of ITN coverage; the third (in green) maintains the current coverage level (estimated at 63%); and the fourth (in red) shows reduced coverage if funding were to cease after 2010. The annual number of lives saved for children under five according to each scenario is shown on the graph below.

By increasing coverage to 100%, the number of under-five lives saved per year would exceed 30 000. If expansion of ITN coverage proceeds at the same rate, it will take until 2015 to save the lives of nearly 30 000 children. If coverage is kept at 2010 coverage levels (63%), the number of lives saved will stabilize at approximately 20 000 per year. However, by withdrawing funding, and reducing the rate of coverage, the number of lives saved would quickly drop below 5 000 per year.



Source: Data generated using the LiST model (US-PMI, Tulane University and Johns Hopkins University), 2011.



## PREPARING FOR THE FUTURE

### Challenges and opportunities in the coming years at a glance

- Tanzania's improved malaria indicators in the last decade are signs that malaria control interventions are being delivered and are working.
- Tanzania's short-term goals—universal LLIN coverage, higher coverage with IRS, scaling up larviciding, enhanced diagnosis and treatment with ACTs, and higher coverage with IPTp with SP—all require increased funding, strengthened health infrastructure, and perhaps novel strategies and approaches to reach those who have not yet benefited from Tanzania's scale-up of the last decade.
- After these gains are consolidated and maintained, phased malaria elimination is the ambitious goal of the NMCP.

Tanzania is a signatory to a number of national and international commitments seeking to improve the health of its population. Along with representatives of 43 other African countries affected by malaria, Tanzania participated in the African Summit on RBM in Abuja, Nigeria, and signed the Abuja Declaration. Later that year, Tanzania was one of 189 nations to endorse the Millennium Development Goals.

In line with the Government Development Vision 2025 goals, the Ministry of Health and Social Welfare is dedicated to improving the health status and life expectancy of the people in Tanzania. Its mission is to achieve this by facilitating the provision of equitable, high-quality, affordable health care, and the sustainable achievement of improved health status. Tanzania's goals are oriented toward phased malaria elimination, as addressed in its Malaria Medium-Term Strategic Plan (2008–2013).

The benefits of scaling up malaria interventions are clear. This is encouraging: we know that malaria interventions delivered to the people who need them have impact—less severe childhood anaemia, lower parasitaemia levels, and fewer deaths of children under five years. Therefore, these gains must be maintained.

However, it is the NMCP's goal to move beyond maintenance. It has stated that its goal is malaria elimination, achieved in phases. As malaria continues to be rolled back in Tanzania, malaria prevalence will likely become more focal and additional attention will be required to control malaria in these foci. Tanzania will need to find ways to reach these areas and these populations, often hard to reach. This may require new strategies and approaches.

Areas that have already benefited may require new strategies, regarding, for example, ways to ensure that people are using ITNs that have not worn out and are no longer effective. A system for timely replacement will be crucial to ensuring that coverage is maintained.

Challenges also arise in the form of resistance: the parasite's drug resistance and the mosquito's resistance to insecticides used in ITNs and IRS. These might require a shift in insecticide choice or a new rotation strategy. Changes in mosquito behaviour are likely to appear.

With malaria control activities ongoing in most of malaria-endemic Africa, and in other hot spots globally, a novel strategy developed in one country may be adopted and adapted by another. With

contiguous countries strengthening their malaria control efforts, harmonized approaches may prove effective.

As malaria transmission and parasite levels decrease, more accurate and timely data will be needed. Health information systems will need strengthening to be able to produce data at district, regional, and national levels. Surveillance systems will need to be put in place to allow timely identification and containment of malaria epidemics.

There are still lives to be saved and benefits to be achieved. Tanzania's ultimate national goal of malaria elimination, when realized, will be accompanied by many benefits to individuals and families, as well as to the health system.





## CONCLUSION

Tanzania has reached an important milestone in its fight against malaria—interventions have achieved sufficient coverage to generate expectations of reductions in malaria morbidity and mortality. Results from several DHS (1999–2010) show a declining trend in mortality in children under five years of age. There are clear indications that the decline is related to specific decreases in malaria mortality. The LiST model estimates that 63 000 lives of children under five years of age have likely been saved from malaria in the last ten years (1999–2010). Because malaria also kills by making children more susceptible to other health problems, tens of thousands of additional lives were likely also saved through the indirect effects of malaria interventions. In short, malaria control in Tanzania has been successful and is providing excellent value for the investment.

Although such success is commendable, Tanzania is reaching a point in malaria control from which it would be disastrous to retreat. Past experience in Tanzania has shown this. Continued forward progress is the only viable option. Therefore, financing of malaria interventions, as well as political commitment to malaria, must be kept up. Malaria control becomes not just a public health concern, but also a moral imperative.

For the time being, most of the funding to bring malaria under control will need to come from external donors. The initial capital costs are too high for national governments. At some point, the funding responsibility will need to transfer to national governments but that is far on the horizon. At this point the global commitment to sustaining the gains and expanding coverage in countries like Tanzania must be assured.

The government estimates that for the period 2008–2013 approximately US\$ 693 million will be needed, with only 35.5% of that expected to come from its own budget and from international and national donors, leaving a significant gap. The sharp increases in global funding in the last decade are moderating, and renewed donor funding at such high levels cannot be assumed. Other challenges include the scarcity of health workers and the high costs of commodities and implementation, should external funding not keep pace.

Many successful interventions face the same problem. Soon after initial signs of success are perceived, funding begins to shift to other public health priorities. This is the natural history of much development aid. It has taken a decade of advocacy to gain the momentum we now have. It would be irresponsible of the global community to reduce or suspend malaria funding. It is also imperative that Tanzania and its many in-country partners explore growing opportunities to further invest in the battle against malaria.

The success of malaria control in Tanzania is due to many factors—strong, continuous, and enthusiastic leadership from the government and from the NMCP; availability of the right resources in the right place at the right time; strong political support and involvement from government, donor, and technical assistance agencies working together as one team; a shared vision by stakeholders; and a public that is receptive to malaria interventions. All of these elements are needed for success—a decrease in any will seriously undermine malaria control in Tanzania.

# ANNEX A

## List of National Malaria Control Programme Partners

A variety of stakeholders joined the NMCP in implementing the activities and achieving the results described in this report. These stakeholders include:

### National Partners

- A to Z Textile Mills
- Africare
- Amref Tanzania
- Arusha Zonal Training Centre
- Bytrade Tanzania Ltd
- Care Tanzania
- Centre for Educational Development in Health
- Centre for Enhancement of Effective Malaria Interventions (CEEMI)
- Christian Council of Tanzania
- Christian Social Services Commission (CSSC)
- Ifakara Health Institute
- Iringa Zonal Training Centre
- Kigoma Zonal Training Centre
- Kilimanjaro Christian Medical Centre
- Media for Development Trust – Tanzania
- Moshi Textile Mills Ltd
- Muhimbili University of Health and Allied Sciences
- National Bureau of Statistics
- National Institute for Medical Research
- PACT Tanzania
- PATH Tanzania
- Selian Lutheran Hospital
- Shelys Pharmaceuticals Ltd
- Sunflag
- Tanzania Commission for AIDS
- Tanzania Food and Drug Authority
- Tanzania NGO Alliance Against Malaria (TaNAAM)
- Tanzania Red Cross
- Textile Manufacturers of Tanzania Ltd
- University of Dar es Salaam
- World Vision Tanzania

## International Partners

- AED/TMARC
- Adventist Development Relief Agency
- African Malaria Network Trust (AMANET)
- American Red Cross
- Catholic Relief Services
- Clinton Foundation
- Danish International Development Agency (DANIDA)
- Embassy of the Kingdom of the Netherlands
- EngenderHealth
- Family Health International (FHI)
- Futures Group International
- Gates Malaria Partnership
- Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM)
- Health Focus
- Helen Keller International Tanzania
- ICF International
- Improving Malaria Diagnostics (IMaD)
- Interfaith International
- Irish Aid
- Italian Cooperation
- Japan Embassy
- Japan International Cooperation Agency (JICA)
- Jhpiego Johns Hopkins University
- Johns Hopkins Bloomberg School of Public Health Centre for Communication Programs
- John Snow, Inc. (JSI)
- London School of Hygiene and Tropical Medicine
- Malaria Consortium
- Malaria No More
- Malaria Transmission Consortium (MTC)
- Management Sciences for Health (MSH)
- Medicines for Malaria Venture (MMV)
- Mennonite Economic Development Associates (MEDA)
- Plan International
- Population Services International (PSI)
- RPM Plus
- RTI International
- Salvation Army
- Swiss Development Cooperation Office
- Swiss Tropical and Public Health Institute (Swiss TPH)
- UK Department for International Development (DFID)
- United Nations Children’s Fund (UNICEF)
- United Nations High Commissioner for Refugees (UNHCR)
- United States Agency for International Development (USAID)
- United States Centers for Disease Control and Prevention (CDC)
- United States President’s Emergency Plan for AIDS Relief (PEPFAR)
- United States President’s Malaria Initiative (PMI)
- Vestergaard-Frandsen
- Walter Reed Army Institute of Research (WRAIR)
- World Bank
- World Health Organization (WHO)
- World Vision International

# ANNEX B

## Case study: Ifakara DSS area, Kilombero Valley

The Ifakara Demographic Surveillance System (DSS) area, located in the Kilombero Valley in south-eastern Tanzania, has collected time-series data on the epidemiology and transmission of malaria since 1996. The population of the area, comprised of 13 villages in Kilombero District and 12 in Ulanga District, both in Morogoro Region, is approximately 85 000 (2008 estimate). The area is predominantly rural, with subsistence farming as the main occupation of villagers. Here we look at the changes in malaria-related indicators during a time of scale-up of insecticide-treated nets (ITNs) in an area with a pre-existing “culture of net use.”

### Net/ITN usage

- Social marketing of ITNs began in this area in 1997, three years before nationwide implementation commenced.
- By 2001, any net use (of treated and untreated nets) by all age groups was approximately 70%. It continued to increase to approximately 90% in 2008 and 2009 (Figure B1).
- ITN use (by all age groups) in this DSS area rose from approximately 10% in 2001–2002 to 47% in 2009–2010 (Figure B1).

### Malaria illness and death

- Malaria parasitaemia (among all ages) fell from approximately 20% (2001–2003) to approximately 5% in 2009–2010 (Figure B2), with a sharp decline (of 14%) between 2004 and 2005. The method of measuring parasitaemia changed from microscopy to RDTs around 2007.

- Malaria blood slide positivity among children under five years of age admitted to the St. Francis Designated District Hospital, serving the Ifakara DSS area, fell from approximately 70% (1999–2001) to between 18% and 32% (2006–2010) (Figure B2).
- Mortality declines were also observed between 1998 and 2009. Under-five mortality declined from 141 deaths per 1000 live births in 1998 to 88 in 2009 (Figure B3). Likewise, infant mortality declined from 115 deaths per 1000 live births to 60 over the same period (Figure B3).

### Malaria transmission

- Malaria transmission intensity, as measured by the entomological inoculation rate (EIR) for unprotected persons, also declined during this period in the semi-urban town of Ifakara, located between the Kilombero and Ulanga villages. Between the early 1990s and 2008, there was an eighteen-fold reduction in the EIR, starting at 1481 in 1990–1994, dropping to 349 in 2001–2003, and dropping further to 81 in 2008.

### Rainfall

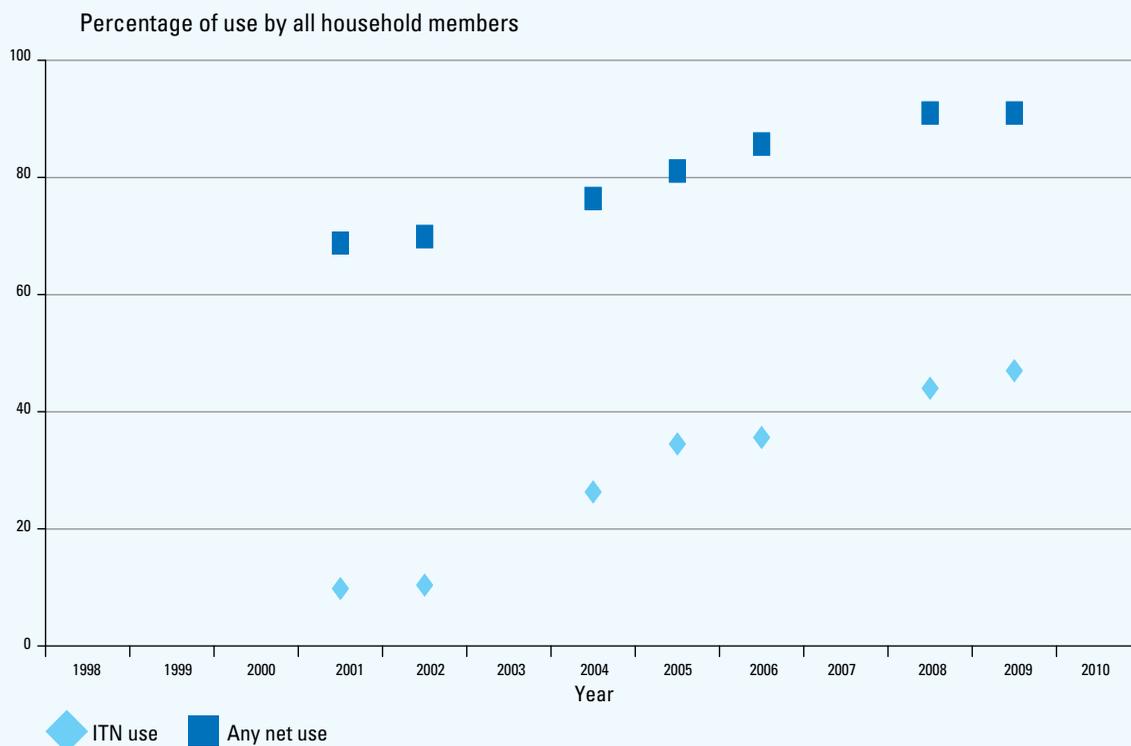
- Rainfall from 1998 to 2010 showed major year-to-year variability, but no systematic downward trend that could explain the change in malaria transmission.

In summary, from 1998 through 2010 there were declines in malaria parasite prevalence, malaria slide positivity among inpatient admissions, malaria transmission, and infant and under-five mortality.

During the same time, high net use was achieved first with any nets (treated and untreated), followed by an increase in ITN use. Declines in morbidity and mortality in the first half of the decade may be attributed to personal protection provided by high net use, urbanization, and other health interventions,

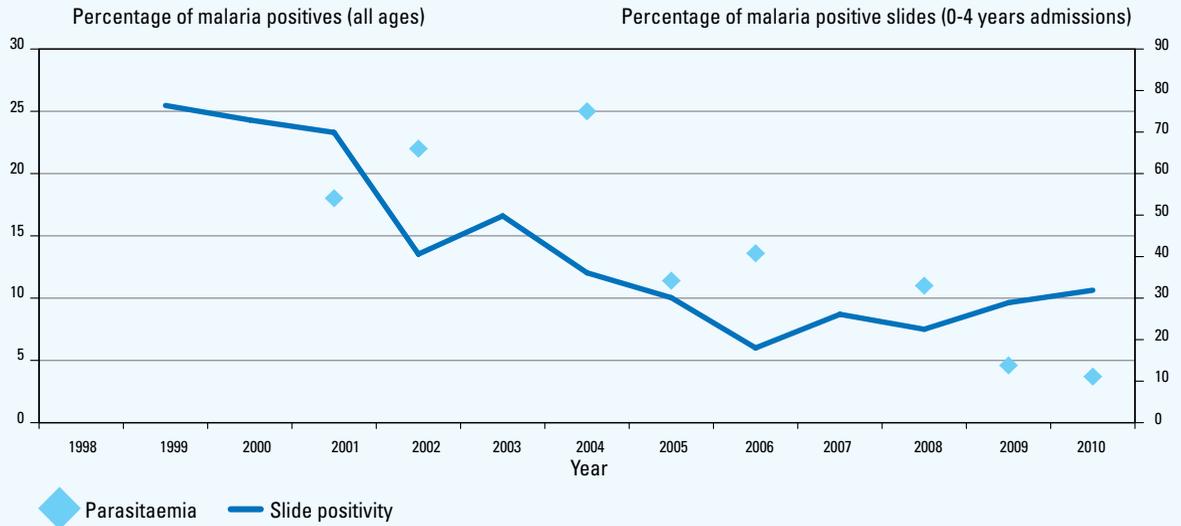
including Vitamin A and integrated management of childhood illness (IMCI). Continued net use with the introduction of ITNs may have contributed to the sustained decline in morbidity and mortality in the second half of the decade in the Ifakara DSS area.

**Figure B1**  
ITN & any net use (all ages)



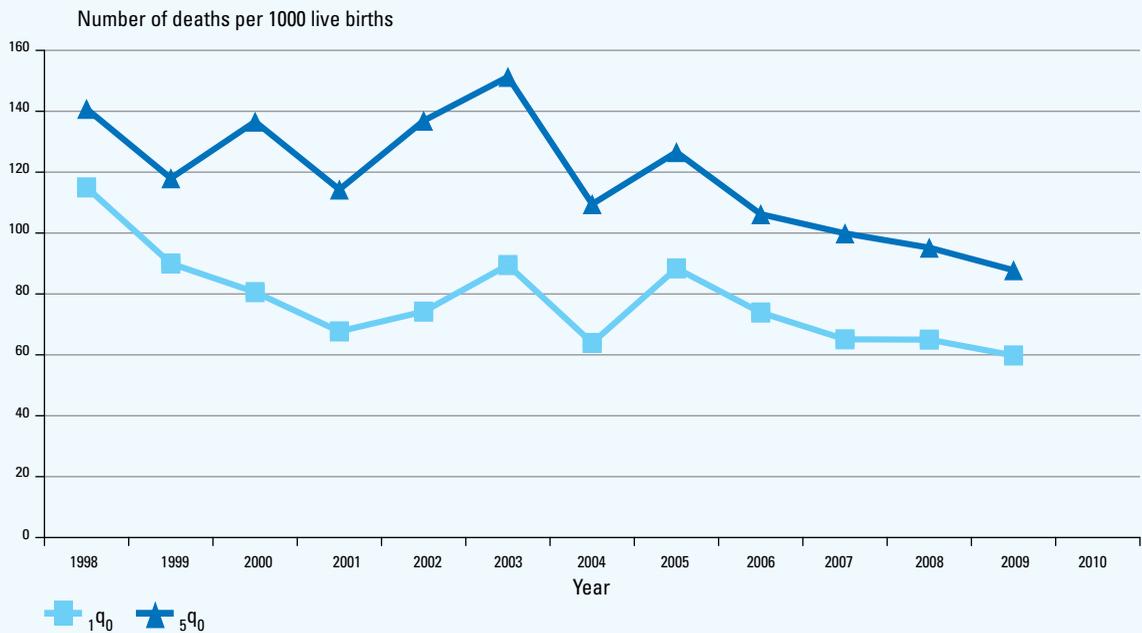
Source: Ifakara Demographic Surveillance System.

**Figure B2**  
Malaria parasitaemia (all ages) and malaria slide positivity (0–4 years)



Source: Ifakara Demographic Surveillance System & St. Francis Designated District Hospital.

**Figure B3**  
Infant ( $_1q_0$ ) and under-five ( $_5q_0$ ) mortality rates



Source: Ifakara Demographic Surveillance System.

# ANNEX C

**Information related to major child health programme coverage that may have contributed to reductions in all-cause child mortality between DHS 1999 and DHS 2010**

Indicator	1999			2010			% change	Sig. <sup>1</sup>
	%	95% CI	n	%	95% CI	n		
<b>Household attributes and asset ownership</b>								
Improved water source <sup>2</sup> (% households)	65.8	(59.1-71.8)	3526	56.9	(53.3-60.4)	9377	-13.5	Ns
Time to water source <15 min (% households)	34.3	(29.6-39.4)	3526	36.5	(33.8-39.4)	9377	6.4	Ns
Improved roof (not thatch/grass/mud) (% households) <sup>3</sup>	50.6	(47.3-53.8)	9483	61.9	(58.9-64.9)	9377	22.3	*
Modern floor material (not earth/sand/dung) (% households)	20.9	(17.0-25.4)	3526	31.8	(28.7-35.0)	9377	52.2	*
Electricity (% households)	7.7	(5.5-10.7)	3526	14.2	(11.9-17.0)	9377	84.4	*
Telephone (% households) <sup>3</sup>	8.9	(7.6-10.5)	9483	45.5	(42.9-48.0)	9377	411.2	*
Often/always had problems satisfying food needs in last yr (% households) <sup>3</sup>	22.6	(21.2-24.1)	9483	23.3	(21.6-25.1)	9377	3.1	Ns
<b>Women's<sup>4</sup> education, marital status, and exposure to mass media</b>								
Mean years of education	4.7	(4.4-5.0)	3929	5.7	(5.5-5.9)	9813	22.0	*
Completed primary education (%)	51.7	(47.8-55.5)	3929	66.2	(63.7-68.5)	9813	28.0	*
Literacy (%)	63.8	(59.5-67.9)	3929	70.1	(67.9-72.3)	9813	9.9	Ns
Married (%)	65.9	(63.3-68.5)	3929	63.5	(62.1-64.9)	9813	-3.6	Ns
<b>Maternal and child health</b>								
ANC visits 4+ (% women, most recent live birth, 0-2 yrs)	69.9	(63.8-75.4)	2131	42.7	(40.6-44.8)	5378	-38.9	*
Tetanus toxoid 2+ (% women, most recent live births, 0-2 yrs)	61.5	(55.9-66.8)	2131	47.9	(45.8-50.1)	5378	-22.1	*
Delivery at a health facility (% women, live births 0-4 yrs)	43.7	(37.6-50.0)	3196	50.2	(46.9-53.4)	7955	14.9	Ns
Births in any high-risk fertility category (%)	56.9	(53.6-60.2)	3196	57.1	(55.2-58.9)	7955	0.4	Ns
Births with unavoidable fertility risk (%)	17.3	(15.4-19.5)	3196	14.9	(13.9-16.0)	7955	-13.9	Ns
Low birth weight <2500g (%)	3.8	(2.9-4.9)	3196	3.6	(3.1-4.3)	7955	-5.3	Ns
Small/very small size at birth (mother's estimate) (%)	10.8	(8.9-13.1)	3196	8.3	(7.5-9.3)	7955	-23.1	Ns

Indicator	1999			2010			% change	Sig. <sup>1</sup>
	%	95% CI	n	%	95% CI	n		
<b>Maternal and Child Health: EPI Vaccination Coverage</b>								
BCG	92.6	(89.7-95.5)	578	95.4	(93.5-96.8)	1533	3.0	Ns
DPT3 / DPT3-HB-Hib	80.9	(73.2-86.9)	578	87.8	(84.8-90.3)	1533	8.5	Ns
Polio3	79.9	(73.9-84.8)	578	84.9	(81.7-87.6)	1533	6.3	Ns
Measles	78.2	(72.0-84.4)	578	84.5	(81.6-86.9)	1533	8.1	Ns
All (BCG, measles, DPT3, polio3)	68.3	(61.1-74.7)	578	75.1	(71.6-78.3)	1533	10.0	Ns
Children 0-4 yrs with ARI sought treatment	81.1	(72.1-87.7)	388	84.6	(78.3-89.4)	319	4.3	Ns
Children 0-4 yrs with diarrhea sought treatment	63.6	(56.5-70.2)	349	52.6	(48.2-56.9)	1086	-17.3	Ns
<b>Breastfeeding and undernutrition in children and women</b>								
Early and exclusive breastfeeding (%)	32.9	(24.4-42.5)	317	58.7	(54.1-63.2)	849	78.4	*
Under-fives stunted (%) <sup>5</sup>	48.4	(44.7-52.1)	2509	42.3	(40.6-44.0)	7292	-12.6	*
Under-fives underweight (%) <sup>5</sup>	24.5	(21.4-27.8)	2509	15.7	(14.4-17.0)	7292	-35.9	*
Vitamin A supplementation within past 6 months (% children 6-59 months)	13.3	(10.3-16.9)	2503	60.3	(57.9-62.6)	6638	353.0	*
<sup>1</sup> Sig.= Statistical significance. Statistics with non-overlapping 95% confidence intervals are considered significantly different change. Ns denotes no statistically significant change and * denotes statistically significant change <sup>2</sup> protected, borehole, piped <sup>3</sup> signifies 2004–2005 DHS source <sup>4</sup> women aged 15–49 years <sup>5</sup> definitions and methods per WHO reference population								



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