Priority Setting on Malaria Interventions in Tanzania: Strategies and Challenges to Mitigate Against the Intolerable Burden

Emmanuel A. Makundi,* Leonard E. G. Mboera, Hamisi M. Malebo, and Andrew Y. Kitua
National Institute for Medical Research, Dar es Salaam, Tanzania

Abstract. In Tanzania, malaria remains one of the major causes of illness and death. The disease causes major obstacles to social and economic development. The extent of the problem is greatest among children less than five years of age and pregnant women. Malaria has been estimated to cost Tanzania more than US$ 240 million every year in lost gross domestic product, although it can be controlled for a fraction of that sum. Tanzania has actively participated in malaria research and in developing most control tools. However, the use of such tools and scaling up of effective interventions has been a major challenge. Major system constraints include inadequate human, financial, material resources, as well as an inefficient health care system. With an increasing burden with human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS), there has been a shift in the use of resources whereby more prioritization is given to interventions for HIV/AIDS than for malaria. The country is faced with several challenges including diagnosis, treatment, and control measures. Districts are faced with the inability to generate reliable information needed to make decisions to inform policy and lack skills for priority setting and planning. Budget allocation is not done according to evidence-based priorities, thus leading to stagnation over time. In this report, we present some success stories and discuss the challenges facing scaling up of interventions and propose priority areas to solving the problems.

BACKGROUND INFORMATION

Malaria remains one of the major threats to public health and economic development in Africa. It is estimated that three million deaths result from malaria throughout the world, with Africa having more than 90% of this burden. The burden of malaria in Tanzania, in particular, remains high. Every year, 14–18 million new malaria cases are reported in Tanzania, resulting in 120,000 deaths. Of these deaths, 70,000 are in children less than five years of age. The annual incidence rate is 400–500/1,000 people and this number doubles for children less than five years of age. Malaria is the leading cause of outpatients, inpatients, and admissions of children less than five years of age at health facilities. Malaria is considered to be the major cause of the loss of economic productivity in persons 15–56 years of age and an impediment to learning capacity of people 5–25 years of age. The disease is one of the most important obstacles to economic development and foreign investment in Tanzania.

The United Republic of Tanzania has a population of 37.4 million, 90% of whom are at risk of malaria, with endemicity and risk of transmission varying as mapped recently by Mapping Malaria Risk in Africa (MARA). Tanzania has the third largest population at risk of stable malaria in Africa after Nigeria and Democratic Republic of Congo (MARA-lite Software 3.0.0, available from http://www.org.za).

In terms of cost implication in relation to gross domestic product (GDP), Tanzania is considered one of poorest countries in the world (partly as a result of the burden of malaria); with an annual GDP of U.S. $280 per capita (2004), and 36% of the population living below the basic needs poverty line. Malaria is estimated to consume 3.4% of the GDP or $240 million every year. It is estimated that Tanzania spends $2.14 annually on malaria services of every $11 spent per person per year on health. Approximately 75% of the expenditure for malaria is borne by households, with the government contributing 20% and development partners 5%. Approximately 30% of this expenditure at the household level is spent for anti-malarial drugs and 50% for mosquito nets, insecticides, coils, and other strategies. The burden of malaria is greatest especially among the poor, given the vicious circle of poverty and ill health.

MALARIA CONTROL STRATEGIES IN TANZANIA

The history of malaria control in Africa dates back to the early 1900s, when malaria was seen as a major threat to development in areas where the disease was endemic. In Tanzania, colonial governments implemented a number of interventions to address the situation. Multiple techniques combining environmental management, effective housing designs, personal protective measures, and anti-malarial drugs were simultaneously used for malaria control. In Tanzania (formerly known as Tanganyika), malaria control efforts were initiated to protect the German colonial personnel in the late 1890s. Efforts were gradually increased during the British colonial era and Tanganyika participated in the malaria eradication efforts through the Pare-Taveta scheme, which conducted indoor spraying with prompt treatment. Since Tanzania became an independent country in 1961, a number of prevention, management, and control measures have been instituted. However, the initial period was marred in the confusion after cancellation of eradication efforts in 1961.

MEASURING THE BURDEN OF MALARIA

Currently, a number of tools exist to measure the burden of malaria in Tanzania. One such tool is the Demographic Surveillance System (DSS), which is rooted in sentinel areas where the entire population is monitored for changes in health status. The DSS uses information from verbal autopsies where interviewers are sent to ask members of households on the causes of deaths. Findings from the Tanzania Essential Health Interventions Project (TEHIP), which is one...
of the International Network of Field Sites with Continuous Demographic Evaluations of Populations and Their Health in Developing Countries sites in Tanzania,\textsuperscript{11} in the districts of Rufiji and Morogoro estimated a burden of malaria of 60% for all causes of morbidity and mortality.\textsuperscript{12} Using DSS to measure the burden of malaria, interventions targeting children and pregnant women from 2002 to 2004 indicated a 40% reduction in the burden of malaria in the area.\textsuperscript{12}

Another tool is the Health Management Information System, which has consistently shown that the burden of malaria in Tanzania has been increasing despite current advances in interventions and technologies to address the burden. Information on morbidity, mortality, and disability from malaria in sub-Saharan Africa as summarized in a new metric, the disability adjusted life-year (DALY), which is an aggregate measuring premature mortality, morbidity, and disability, shows that persons with malaria have more lost DALYs, both for years of life lost and years lived with disability.\textsuperscript{13} However, one challenge resulting from the DALY approach is the inability to capture all burdens because it is manifested in other realms of social and cultural life.\textsuperscript{14} Another tool used in northern Tanzania to estimate the burden of malaria recently involved a qualitative tool of the nominal group technique, which has shown that people, especially in highland areas, consider the problem of malaria to be increasing.\textsuperscript{15} One perplexing challenge in the measurement of the burden of malaria is that current measuring tools are necessary but not sufficient to capture the enormous load caused by malaria especially in societies where prevalence of malaria is high.

**PRIORITY AREAS IN ADDRESSING THE BURDEN OF MALARIA IN TANZANIA**

Currently, most of the existing interventions are vertical in nature. The National Malaria Control Program (NMCP) proposes policies and guidelines to the Ministry of Health and Social Welfare through the National Malaria Advisory Committee (NMAC). The NMAC meets annually to review the state of interventions and assess problems resulting from implementation of policies in the previous year. During the review process, different stakeholders are invited, including United Nations agencies, development partners supporting malaria interventions, research and academic institutions, and selected regional and district representatives, to discuss key implementation issues. One problem facing the current control strategies is the limited capacity of the districts to implement and scale-up interventions. Tanzania is currently implementing a policy of decentralization whereby districts are given more powers and resources for decision-making. Such capacity at the district level is limited in terms of quality and quantity of human resources, poor infrastructure, and geographic inaccessibility of some places given the vast landmass area of Tanzania. In other words, the health system at the district and community level is weak to implement current interventions. The current priority areas are discussed below.

The first priority area, given the political and social stability currently in the country, is that most effective control tools/interventions have been tested in Tanzania. One such tool is use of insecticide-treated nets (ITNs). These nets have been used as a strategy to mitigate against the burden of malaria, as reflected in the government policy through the NMCP strategic plan, and this strategy is one of the most important control pillars. The strategy envisages putting emphasis on children less than five years of age and pregnant women to use treated nets through social marketing because most individuals are aware of the benefits of using ITNs. However, coverage has so far been low, which indicates that less than 15% of households are using ITNs.\textsuperscript{16} Implementation on the use of ITNs at the district level for a pilot stage started in 1998. In 2000, a national social marketing program was initiated by the Ministry of Health, non-government organizations, and development partners to develop and test processes for increasing affordable supply, demand, and coverage, thus stimulating the commercial market for ITNs. Through health sector reforms, a sector-wide approach has put additional funding of $0.75 per capita in the health sector under control of local government councils at the district level to support activities of malaria control interventions, including the use of ITNs at public and private health facilities.

Another priority area against the burden of malaria is the availability of health systems tools already piloted in some districts ready for scaling up at the national level. One of these tools is the district health account tool,\textsuperscript{12} which has been piloted by the TEHIP in two districts and are now being scaled up in other districts. The district health account tool maps expenditures through a software analyzing budget in a standard way to generate graphics showing plans for spending or current spending commitments coalesced as a complete plan. This tool is used to reflect the burden of disease profile from DSS and is user friendly. Thus, it can be easily at the district level. On the basis of the burden of disease profile, the tool forms an important guide in the allocation of resources to target interventions at the district level. Currently, 40% of district officials in the Tanzanian mainland have undergone training on the district health accounts tool.\textsuperscript{17}

Another strategy to mitigate against malaria burden in Tanzania is establishment of training centers to address the burden of malaria. Since 2001, this strategy includes the Center for Enhancement of Effective Malaria Interventions (CEEMI) to strengthen the capacity for malaria control through training. The CEEMI was established to provide needed skills for identifying and solving malaria control problems. So far, the CEEMI has undertaken a number of training sessions involving district health officers as focal persons for control activities.\textsuperscript{18} It is important to note that the CEEMI has undertaken malaria seminars to sensitize members of parliament in Tanzania to increase advocacy for malaria control initiatives by policy makers, thereby increasing financial resources from the national budget that target malaria activities.

It is worth noting that for some years there has been a growing global and national political commitment to mitigate against the burden of malaria stimulated by the Roll Back Malaria Partnership and the Global Fund to fight acquired immunodeficiency syndrome (AIDS), tuberculosis (TB), and malaria. This commitment has been reflected in the renewed attention to malaria interventions in Tanzania, national level policies, and to some extent local government activities. The NMCP strategic plan is built on four pillars: 1) improved malaria case management, 2) national scale use of ITNs, 3) prevention of malaria during pregnancy, and 4) prevention and control of malaria epidemics. Other strategies include Intermittent Preventive Treatment in Pregnancy (IPT) and Integrated Management of Childhood Illnesses, which consti-
tute an important part of the Tanzania national package of essential health interventions.

CHALLENGES

Allocation of limited financial resources for malaria prevention, management, and control (PMC) activities is one of the major challenges. This challenge exerts a negative effect on efforts for scaling-up malaria interventions. Tanzania is one of the poorest countries in the world, with limited resources allocated in the health sector. It is estimated that 38% of the total budget is funded by donors, of which 9% is spent on health care. Financial constraints form a major impediment in the implementation of malaria interventions in Tanzania. Some control activities have been implemented at a pilot stage in some districts and sustainability of such initiatives has been a major problem. For example, the Urban Malaria Control Project (UMCP) was conducted for eight years from 1988 to 1996. The Japanese government provided $17 million, and the Ministry of Health provided $2.7 million. Although the UMCP provided many lessons for malaria control in the Dar es Salaam and Tanga areas, the project ended in 1996. The government of Tanzania did not have financial resources to sustain the project and scale it up in other towns.

Another challenge is the human resource crisis in the health sector in Tanzania. It is estimated that currently there is a 65% gap, which means that only 35% of qualified staff are available if we compare the available personnel and Ministry of Health minimum required standards. This situation is exacerbated by the burden of the human immunodeficiency virus (HIV)/AIDS pandemic, in which many health workers have died. Subsequent replacement of staff has not been done in time. Another possible explanation for the human resource crisis is a lack of motivation of health workers, given low incentives provided, especially in remote areas of Tanzania. This problem is succinct and one finds a phenomenon where qualified personnel are found in urban centers and semi-urban settings where the infrastructure is relatively good. Limited human resources for malaria interventions, especially at the district level, impact negatively on the delivery of interventions. During the 1970s and 1980s, districts had malaria focal persons who were instrumental in control activities. Malaria control activities at the district level currently are under district health officers who also deal with other pressing health problems of districts. In situations of other health problems at the district level, malaria intervention activities are given low priority.

An important related challenge to the implementation of malaria interventions in Tanzania is weak health systems at the district level. Given the prevailing situation of human resources, the health system increasingly becomes weak given the multiple burdens of malaria and HIV/AIDS. Thus, delivery of interventions and health care to the poor remains a major challenge, and a particularly difficult one, when working through weak health systems. However, a positive development is an increase in financial resources at the district level to deliver the interventions, in which development partners contribute $0.75 per capita to assist in delivery of interventions. Although these contributions provide additional resources to districts, there is still a deficit because the annual per capita expenditure has not changed.

Findings in a study by Alilio and others in Tanzania showed that a weak health system at the district level resulted in the burden of malaria remaining high because the primary health care approach replaced vertical control efforts in the 1960s. Currently, through a process of decentralization, districts have more power to make decisions. However, despite decentralization, the burden of malaria still remains high, partly because of weak district management capacity, poor coordination, inadequate monitoring, and lack of training of key staff.

As shown in Table 1, the district health system is weak in

<table>
<thead>
<tr>
<th>Activity</th>
<th>Measurable outcome</th>
<th>Means of verification</th>
<th>No. of activities observed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classification of malaria problem, including definition of areas with different levels of endemicity, population at risk, factors influencing mosquito-borne diseases in different communities</td>
<td>District guideline for malaria control</td>
<td>Number of healthy facilities using the guideline</td>
<td>None</td>
</tr>
<tr>
<td>Measures most appropriate in different villages and their cost effectiveness, their timing, and sequencing</td>
<td>Manual of DHMT and district staff</td>
<td>Number of health facilities having the manual</td>
<td>None</td>
</tr>
<tr>
<td>Training of health workers on recognition of high risk situations, selection of measures to apply to different settings and health education</td>
<td>Training of staff</td>
<td>Number of staff trained</td>
<td>10 of 35 staff had received specific job training on malaria in the past 8 years</td>
</tr>
<tr>
<td>Understanding of how technically appropriate measures can be organized and how accepted they are within different community settings</td>
<td>A chart showing the malaria control approach for each division</td>
<td>Number of health facilities with and using charts</td>
<td>None of the dispensaries had malaria control charts developed by DHMT; 12 dispensaries had posters on malaria causation and control developed by MoH with no local examples</td>
</tr>
</tbody>
</table>

* DHMT = district health management team; MoH = Ministry of Health.
translating malaria policies at operational activities at the district and village level. These findings indicate a gap between policy on malaria control and reality in actual implementation at the district level, as reflected in the low number of activities observed that are targeted to address the burden of malaria at the community level. Muheza is a typical district in Tanzania, where many research intervention and activities have been undertaken and the situation may not be different in other districts.

Another key challenge relates to the integrated approach on PMC strategies. It is believed that too much emphasis is made in some interventions. For example, advertisements by media on the use of ITNs are currently too forceful in Tanzania, which leads to the erroneous notion that once someone is under an ITN, there is 100% protection. However, it is well established that use of ITNs is not the only panacea to PMC because other strategies are equally important. Data from the Tanzania Demographic and Health Survey in 2005 indicate that coverage of ITNs is 14% in rural areas and 47% in urban areas. The use of ITNs should be emphasized, but the same emphasis should be made for other PMC strategies including indoor residual spraying (IRS). However, IRS is not currently emphasized in NMCP strategies because of a renewal of global emphasis on vector elimination as one of the effective strategies.

Introduction of artesinin-based combination therapy (ACT) is another challenge facing Tanzania. Tanzania introduced ACTs in November 2006. One key issue is the cost of ACTs, which are 20 times higher than the cost of conventional therapies ($2.44 per adult dose). The monthly income in a study in a rural area in Tanzania was $13. This finding shows that the amount spent on malaria treatment is 10% of the total household income. Although ACTs seem to be the best hope for malaria treatment, they are currently not accessible to poor persons. Major limitations in adoption and implementation of ACTs reported by Bioland and others were high costs, high malaria transmission rates, inappropriate use of drugs, inadequate diagnostic facilities, ill-informed policy makers, and weak public health systems in Africa. There are also other issues regarding shortages of artemether-lumefantrine (Coartem) because of the high demand and limited production. This shortage was reported by the World Health Organization in 2004, and Knuning Pharmaceuticals in Yunan, People’s Republic of China, the only supplier of artemether, indicated that it could not produce enough of this drug to cope with the increasing demand.

Political action will be an important determining factor in effective disease management and control. For instance, politics has played significant roles in the management and mismanagement of various disease outbreaks in the developing world, particularly in Tanzania. Politics deals with authoritative allocation of scarce resources. In any disease program, management involves political leadership with the authority to commit the resources of the country or district. The political leadership not only sets the agenda, it also prioritizes the agenda. Politics plays a vital role in all aspects of disease control programs because it influences results and consequences. Political leadership significantly affects outcomes at all levels in financial support in disease control programs. Tanzania has been a net recipient of foreign aid in malaria control activities for many years. This has been attributed by strong political will and the prevailing peace and stability in the country. A recent development in 2006 was a $90 million subsidy provided by the Global Fund to fight HIV/AIDS, malaria, and TB to make drugs affordable for poor people.

According to the national constitution in Tanzania, the power to authorize the national public budget is vested upon parliament. For local authorities, such a mandate is vested to the councilors. They determine how much money should be used for disease prevention initiatives or otherwise. One can judge the level of commitment and appreciation of disease control threats by looking at the government budget structure at all levels.

Politics in Tanzania manipulates allocation of resources to suit particular interests. This allocation depends on the power center even when such interventions do not have a high priority. In the period preceding elections, many promises are made and health facilities are constructed in many constituencies to suit the needs of the electorate. Because plans to recruit health personnel are not coordinated with construction activities, after elections there are many dispensaries built that have unqualified or inadequate personnel. This action forces districts to reallocate already meager human resources to the new established facilities, which increases the workload to already constrained existing personnel.

It may not be possible to calculate the loss that could have been prevented or benefits to be gained if political activity was not involved. However, the most fundamental long-term factor in any disease program is political leadership. It is important that policy makers are involved in the planning, execution, and evaluation stages of malaria intervention programs at all levels to create sufficient political will that is necessary to increase coverage levels. Policy makers should work with researchers and have authentic data to support their decisions and avoid mere promises merely to impress people. Correct and timely information must be available to all participants, including communities, the media, and political leaders, to avoid distortion of information in the implementation of interventions. A certain level of diplomacy is required in handling the politics of disease control programs.

Another issue relates to the priority given to HIV/AIDS compared with malaria. In recent years, there has been an obvious shift in the priority given to malaria control in favor of HIV/AIDS. Although malaria is the leading cause of morbidity and mortality in Tanzania, HIV/AIDS was declared a national disaster in 2003. This decision has shifted much of the efforts by national and international partners in their resource support to HIV/AIDS. In Tanzania, the number of health education programs for HIV/AIDS has increased markedly compared with those targeting malaria control.

One of the factors contributing to the increasing burden of malaria is human migration into Tanzania. Malaria transmission has been shown also to be related to human population movement from low risk areas to high risk areas and vice versa. Reports of the malaria burden in Tanzania are increasing and are originating from places thought to be free of malaria, such as the southern and northern highlands. Some factors that cause people to move most often, such as environmental deterioration, economic problems, and natural disasters, greatly affect the poor. Understanding and identifying the influence of population movements can improve prevention and control programs.
Tanzania may need to revisit national strategies to address the burden of malaria. Scientific evidence of the impact of interventions such as use of ITNs, IPT given to pregnant women during the second and third trimester antenatal clinic visits, IPT given to infants, spraying inside houses with insecticides, reduction of mosquito numbers by environmental management, and use of ACTs that target both the sexual and asexual stages of the parasite to reduce malaria transmission, has been increasing over the past two decades. Interventions capable of reducing the risks of malaria infection in childhood and pregnancy are available.

Although the availability of effective malaria control tools is important, logistics for their full use in malaria control is a more perplexing issue. In Tanzania, the effective use of ITNs and IPTs in populations at risk for malaria has been painfully slow and may never be fully implemented. These interventions are difficult to implement when issues of effective coverage, accessibility, equity, and sustainability are considered on an economic scale. Scientific evidence indicates that such interventions on a large scale can result in huge health benefits and are the most cost-effective malaria interventions. However, key operational questions still remain. What is the gap between rhetoric and reality on the implementation of available interventions? How widespread have available interventions been implemented in a country to reduce morbidity and mortality from malaria in the at risk population? To address this issue, there is an urgent need to revisit national strategies to address the burden of malaria and its control in Tanzania.

The first priority area is investment in strengthening health systems. There is a need to establish and strengthen infrastructure/systems to ensure the required capacity for delivery of effective interventions. This policy entails strengthening, instituting, and coordinating mechanisms for delivering treatment at the community and household levels, and improving patient referral systems within the health system. Strengthening the health system will ensure effective delivery of interventions and health care to the poor, which is a major and difficult challenge. Malaria focal persons at ward and district levels could act as agents of change to local communities.

Addressing the human resources crisis in the health sector should also be a major and immediate priority. Currently, recruitment of health workers is through local authorities, who when vacant posts are advertised, often fill these posts with unqualified staff, especially in remote areas. Analysis of the distribution of health workers in Tanzania has indicated that most are found in urban settings. Aerorealistic action is therefore needed by the central government to send qualified health workers to rural remote areas through provision of special incentives to motivate such workers. The same vigor exerted by the government in recruitment in the education sector should also apply to the health sector. The government of Tanzania must clearly define and implement strategies for this important issue.

Conversely, there have been new developments to address the human resource crisis in Tanzania. A new initiative known as the Mkapa Fellows Foundation, which was named after the former president of Tanzania, in partnership with the Bill Clinton AIDS Foundation, was started in 2006. The initiative envisages addressing regional imbalances of human resources in Tanzania by sending health workers to understaffed, disadvantaged, remote areas by providing special incentive packages. One hundred health workers have already been recruited to cover 10 underprivileged districts (each district will initially start with 10 workers). The fellows will work on a contract for three years in understaffed areas.

One urgent aspect that needs to be addressed in the health sector is the issue of training. Tanzania has the lowest ratio of health personnel per capita in sub-Saharan Africa. More investment in training is urgently needed. This effort must be coordinated with efforts to provide incentives to such workers to retain such a workforce. Currently, there are five medical schools in Tanzania: Muhimbili University College of Health Sciences, Hubert Kairuki Memorial University, Bugando University College of Health Sciences, Kilimanjaro Christian Medical College and International Medical and Technological University. Although the number of medical students has increased, the per capita ratio is still low. Affirmative action is needed to increase the number of students in such schools. Such efforts must also target the training of other health workers including assistant medical officers, public health nurses, and other staff.

Another urgent issue is a need to revisit the integrated approach towards PMC for malaria. Public health education is needed to emphasize an integrated approach because focusing only on a few strategies alone will not decrease the burden of malaria. Although emphasis has been on the use of ITNs, implementation of IPT and vector elimination is urgently needed. In addition, prompt and effective treatment needs to be emphasized. In implementing these interventions, given the political stability in Tanzania, the government must commit more resources in the health sector. Increase in investment in the health sector in Tanzania is possible given debt relief provided to the government and an increase in revenue collection over the last five years.

In addressing the challenge related to the introduction of ACTs, increased sensitization (targeting policy makers) is critical because this will accentuate rapid adoption of these drugs. Efforts to enable farmers to grow the plants from which artemether is produced should be intensified.

CONCLUSIONS

Tanzania has unacceptably high burdens of morbidity and mortality caused by malaria. There are effective prevention, management, and control strategies that can mitigate this burden. However, many challenges still remain that impede effective mitigation efforts. There is therefore a need to revisit national implementation strategies for malaria interventions. A policy decision is necessary to effectively engage the public and offer appropriate means on how to implement effective interventions, especially to increase coverage levels. Political leadership is paramount in engaging the general public in the implementation process of effective interventions so as to effectively reduce the burden of malaria. Programs on the island of Zanzibar have increased coverage levels of interventions and significantly reduced the burden of malaria. These interventions need to be emulated in mainland Tanzania, even though contexts may be different. Given the renewed
global and national commitment to intensify efforts to fight malaria, there is hope.

Received August 21, 2006. Accepted for publication September 18, 2007.

Authors’ addresses: Emmanuel A. Makundi, National Institute for Medical Research, PO Box 9653, Dar es Salaam, Tanzania and Centre for International Health, University of Bergen, Bergen, Norway. E-mail: emakundi@nimr.or.tz or Emmanuel.Makundi@cih.uib.no. Leonard E. G. Mboera, Hamisi Malebo, and Andrew Y. Kitua, National Institute for Medical Research, PO Box 9653, Dar es Salaam, Tanzania. E-mail: lmboera@nimr.or.tz, hmalebo@nimr.or.tz, and akitua@nimr.or.tz.

REFERENCES