



PHOTO: BRITISH NAVY

Background Paper

Program Management Issues in Implementation of Elimination Strategies

Prepared for the Bill & Melinda Gates Foundation
January 2014



UCSF GLOBAL HEALTH SCIENCES

THE GLOBAL HEALTH GROUP

From evidence to action

Contents

Acknowledgements	2
Acronyms.....	3
Introduction.....	4
Problem statement and research questions	4
Methods.....	4
Key tasks to be managed.....	4
Elimination-specific interventions.....	4
Levels of intervention and elimination tasks.....	5
Task priorities in elimination versus control	8
Vertical and integrated elimination tasks	8
Enabling factors for elimination.....	9
Roadblocks to elimination.....	12
Application of managerial practices	14
Implications for global malaria elimination strategies	14
Recommendations	15
Conclusions.....	18
Appendix A: Illustration of key tasks related to malaria elimination, by level of health system	19
Appendix B: Mindsets in Partnership tool.....	25
Appendix C: Interview guide for management of malaria elimination programs.....	27
References.....	28

Acknowledgements

This background paper is a rapid synthesis of current evidence prepared for the Bill & Melinda Gates Foundation to inform strategy development.

This report was authored by Jonathan Gosling (University of Exeter), Peter Case (Bristol Business School), Jim Tulloch (Independent Consultant), Daniel Chandramohan (London School of Hygiene & Tropical Medicine [LSHTM]), and Cara Smith Gueye, Gretchen Newby, Jennifer Wegbreit, Kadiatou Koita, and Roly Gosling of the Global Health Group at the University of California, San Francisco (UCSF).

The authors acknowledge with thanks the contributions of the many people who have participated in the collection and exploration of information contained in this report: Rabindra Abeyasinghe (World Health Organization Regional Office of the Western Pacific [WHO-WPRO]), Bruce Aylward (WHO Global Polio Eradication Initiative), Richard Feachem (UCSF Global Health Group), Gawrie Galappaththy (WHO-Myanmar), Kara Hanson (LSHTM), Simon Kunene (Swaziland National Malaria Control Programme), Sylvia Meek (Malaria Consortium), Rob Newman (WHO Global Malaria Programme), Nyasatu Ntshalintshali (Southern Africa Malaria Elimination Support Team, Clinton Health Access Initiative), Kevin Palmer (Vectorborne Diseases Associates), Frank Richards (The Carter Center), Allan Schapira (Independent Consultant), and Marcel Tanner (Swiss Tropical and Public Health Institute).

We thank Kersten Svendsen (UCSF Global Health Group) for her work on the graphic design of this report.

The authors are responsible for any errors or omissions.

Acronyms

AMFm – Affordable Medicines Facility - malaria

FSAT – Focal Screen and Treat

GDP – Gross Domestic Product

GIS – Geographic Information System

GFATM – Global Fund to Fight AIDS, Tuberculosis and Malaria

IEC – Information, Education and Communication

IRS – Indoor Residual Spraying

IVM – Integrated Vector Management

LLIN – Long Lasting Insecticidal Net

LSDI – Lubombo Spatial Development Initiative

MoH – Ministry of Health

NGO – Non-Governmental Organization

NMCP – National Malaria Control Program

PPPs – Public-Private Partnerships

VDCP – Vector-borne Disease Control Program

WHO – World Health Organization

Introduction

Effective program management is essential to ensure the elimination and eventual eradication of malaria.¹ Malaria elimination, defined as the interruption of local transmission in a specific geographical area,² is a long-term, focused and technical process that requires effective management and communication at all levels. There are several core features of successful health program management, all of which are critical to achieve elimination.³ In general, elimination is facilitated by robust health systems, determined leadership, appropriate incentivization, an effective and real-time surveillance system, and regional collaborations. Elimination is hampered by sclerotic or inflexible health systems, a lack of sustained political and financial commitment, ill-equipped managers, unmotivated and untrained staff and external donor constraints.

Program management in a malaria elimination setting differs in a number of ways from program management in a malaria control setting, and there is currently a lack of research and thorough understanding of these distinctions. In several respects, the requirements of an elimination program conflict with those of a control regime;⁴ thus, an additional challenge is successfully managing the transition from control to elimination. In this paper we do not advocate generic, prescriptive management protocols, but rather contextually appropriate guidance at the country level, continuous learning and adaptation, and, in some circumstances, direct operational intervention. Based on our research, we provide specific recommendations to address the management challenges that arise during the transition from control to elimination and in the interfaces between vertical and integrated processes.

Problem statement and research questions

There is evidence that malaria elimination often fails, even in countries where malaria control programs have been successful.^{5,6} There are also some examples where elimination program failures have been followed by successful corrective action.⁶⁻⁸ Success is determined not just by the public health interventions *per se*, but by the ability to manage and sustain the administration of those interventions, including a long-term discipline of surveillance and readiness to respond. Failures result from a combination of complex factors, and include the operational constraints of malfunctioning health systems in target regions⁹ and the difficulties of developing and sustaining financial and political commitment.¹⁰ In identifying potential solutions, we have been guided by the following questions:

How do we devise managerial approaches that are relevant and sustainable in various cultural contexts, where local health systems are often resource-poor and/or dysfunctional?

Can we implement management measures in such a way that they accommodate complexities, allow for necessary operational variation and yield demonstrable health outcomes required for malaria elimination?

Methods

Our findings were informed by published and grey literature, including a selection of the UCSF Global Health Group and World Health Organization (WHO) Country Case Studies on Malaria Elimination. We also conducted key informant interviews with malaria field experts and members of malaria control and elimination programs, as well as experts in the eradication of diseases other than malaria (see Appendix C for the Interview Guide).

Key tasks to be managed

In this section, the numerous malaria program tasks that must be managed are described across several dimensions: control versus elimination, level of health system and degree of program integration.

Elimination-specific interventions

Malaria elimination relies upon a similar mix of interventions as malaria control: high quality and effective case management, vector control and surveillance. However, elimination programs also require intensified

parasitological and entomological surveillance, ideally using real-time data (see UCSF Global Health Group Background Paper *Surveillance Systems to Facilitate Malaria Elimination*, 2014), rapid and targeted responses, and a predictable supply of resources for diagnosis, treatment and vector control. In addition, elimination requires a high degree of intervention timeliness and precision,¹¹ including the ability to detect and interrupt transmission in foci, microfoci or hotspots, which can be comprised of individuals, households or groups of households that maintain ongoing transmission in a community.¹² Interruption of transmission also requires the targeting of hotspots, specific high-risk populations defined by demographic characteristics such as occupation, that can carry infection from workplace to home and serve as reservoirs for ongoing malaria transmission.¹³ Depending on the context, particularly in countries where health systems are weak, the implementation of these tasks may be better suited to non-Ministry of Health (MoH) staff with stronger operational capabilities, with the MoH serving as the strategic or technical lead. Finally, in an elimination setting there must also be adequate funding and managerial commitment for a period of at least six to ten years for transmission interruption and an extended phase of consolidation.^{4,14}

Levels of intervention and elimination tasks

Interventions are carried out at each level of the health system: community, primary health facility, district health office, regional or provincial health office, national or central level (often referred to as the malaria control program, or NMCP), and levels above national. Appendix A illustrates the malaria control and elimination tasks by level of the health system, with the caveat that there will be variation and complexity at these differing levels and across contexts. This task matrix provides a basis for discussion of the program management practices needed across levels and activities.

Unpaid village health workers and paid malaria staff at the community level are tasked with engaging populations in elimination activities, in particular building awareness of malaria elimination, conducting surveillance, organizing communities in preparation for vector control, and diagnosis and treatment in some areas.¹⁵ These activities should be directed at both residents and migrant populations. The primary health facility level is responsible for case management, including prompt and correct diagnosis, treatment compliance, and immediate reporting of infections. In many programs, district health offices coordinate all elimination activities, working directly with community-based malaria workers and receiving logistical support from the provincial (or regional) health offices. Districts should also focus efforts on surveillance and response measures in the public and private sectors. Tasks at this level include case investigation and reactive case detection, focal screen and treat (FSAT) campaigns, mass blood surveys, and, in some cases, indoor residual spraying (IRS) campaigns, long lasting insecticidal net (LLIN) distribution and larval source reduction.

Provincial (or regional) health offices provide logistical support and quality assurance for malaria elimination activities conducted either at the community, primary health care or district level, and monitor the district malaria situation. The role of the national or central level depends upon whether the structure of the health system is centralized or decentralized (see Table 1 for country examples of the transition from centralized to decentralized). In a centralized program, the national level coordinates and implements elimination activities, including entomological and parasitological surveillance. In a decentralized system, which is more common in an elimination setting, the national level develops malaria strategy, guidelines and operational procedures, and provides technical support to the health offices and community health workers at the lower administrative levels. This level also monitors trends and provides quality control for surveillance, vector control and diagnosis. The levels above national, such as the Director of Communicable Diseases or Health Minister, appoint the director of the national program, ensure political and financial support for elimination and, in some cases, develop multi-country initiatives for elimination. Support for malaria elimination is a key task at this level, which becomes more challenging when malaria cases are rare and other high-burden diseases are a more urgent priority.

Table 1: Lessons from malaria elimination case studies

Case study country	Elimination status and goal	Health system and malaria program structure	Strengths in program management	Challenges in program management
Bhutan ¹⁶	Eliminating; goal of national malaria elimination certification by 2020	Decentralized health system since 1981; Integrated malaria program with other vector-borne diseases since 2003	<p>Multipurpose malaria workers based in health facilities at the district and sub-district levels provide skills and show sustained commitment by the MoH for malaria elimination; these workers also provide quality case management and coordinate all response measures</p> <p>Hard to reach populations targeted for LLIN distribution through GFATM funding; efficient coordination of supplies by district and sub-district facilities</p> <p>Community Action Groups in four of seven endemic districts are credited with reductions in incidence and an increase in LLIN usage</p>	<p>Decentralization of health system partly contributed to increase in malaria in 1984, as IRS implementation shifted from national to district level authorities and supervision and guidance weakened; currently, integration of the multipurpose malaria workers into the larger health system may threaten sustained vigilance, timeliness and quality of response measures</p> <p>Cross border communication and collaboration is not yet functional with Assam State of India; higher transmission occurs in the border district of Sarpang because of daily travel as well as crossing over of longer term migrant workers from endemic areas for various development projects (e.g., hydroelectric dam construction); border screening not seen as feasible</p>
Malaysia ¹⁷	Eliminating, goal of national elimination by 2020; elimination in West Malaysia by 2015; elimination in Sabah and Sarawak by 2020	Decentralized health system to the state level; Integrated malaria program since mid-1980s	<p>Strength of health system for diagnosis and treatment</p> <p>Leadership in Sabah State built a case for increasing resources for elimination, was successful and was able to reduce malaria incidence</p> <p>Workshops and consultations at district and state levels led to engagement from all levels in the preparation for and commitment to elimination</p>	<p>High turnover of leaders in the Vector-borne Disease Control Program (VDCP) puts the program at risk for loss of institutional malaria knowledge and reduced quality of interventions</p>
Mauritius ^{7,18}	First elimination in 1969, resurgence in 1975; currently in prevention of reintroduction since 2 nd elimination in 1998	Decentralized health system; semi-vertical malaria program structure as it was absorbed into health system in 1968	<p>Consistent political and financial support for malaria program by national government throughout elimination and prevention of reintroduction; minimal reliance on external funds</p> <p>Large team of dedicated malaria program staff with strong technical and managerial capacity</p> <p>Legal frameworks that enforce environmental management and vector control activities have incentivized participation by community members; enforcement has not been necessary due to voluntary community buy-in</p> <p>Very robust surveillance system, with particular focus on airport and seaport screening and aggressive follow-up of imported cases</p>	<p>Importation of malaria in 1975 and subsequent resurgence was attributed to the integration of the malaria program into the public health system after initial elimination phase (1960s), which led to relaxation of surveillance, vector control and environmental management activities; financial constraints disrupted recruitment, supply procurement and transport; lapse of focus and support</p> <p>Recent staff reductions put the program at risk for reintroduction if surveillance and vector control activities cannot be maintained at sufficient levels</p>

Namibia ¹⁹	Eliminating; goal of national elimination by 2020	Decentralized health system; Integrated malaria program structure since inception in 1991	<p>Introduction of rapid diagnostic tests and, later, training of staff in their use led to more accurate picture of malaria incidence in the country and improved control strategies</p> <p>Cross-border initiative with Angola to monitor importation of cases and coordinate interventions is underway; partnerships with local NGOs formed to carry out activities</p>	<p>Insufficient human resources at every level of program and high staff turnover threaten the quality of implementation</p> <p>Poor supervision has led to lower quality delivery of services and interventions, due to insufficient staff time, resources (primarily vehicles and fuel) and access (bad roads)</p>
Philippines ²⁰	Eliminating; goal of progressive sub-national elimination; national elimination (all provinces) by 2020	Decentralized health system since 1990s; Integrated malaria program structure	<p>Local ownership of program through devolution, in some provinces, concentrates skills and focus where it is needed most, empowers local staff, allows for tailored approach to interventions and funding</p> <p>Strong, knowledgeable provincial leader in Apayao facilitated GFATM grants and secured political buy-in, which contributed to dramatic decrease in malaria case burden in short period; currently working to build capacity and secure commitment of local staff to ensure continued success of program when grant ends in 2014</p>	Devolution of malaria program without a adequate ground support or training meant that local staff were not equipped to respond to a malaria outbreak in Laguna; this experience 'vacuum' currently exists in provinces that have achieved elimination and remain at risk of future outbreaks (Benguet and Cavite)
Sri Lanka ^{8,21}	Eliminating; goal of national elimination by 2014	Decentralized health system since 1989; Integrated malaria program structure	<p>Interventions were maintained in conflict zone because of NMCP and MoH commitment and through creativity in delivery (various mechanisms for shipment of materials, NGOs and other partners involved in implementation); MoH commitment also seen in maintenance of malaria diagnostic and treatment centers in hospitals</p> <p>Program is supported by strong health system and robust entomological research and surveillance activities</p> <p>Flexibility to adapt, using and trying new strategies: targeted IRS, insecticide rotation, integrated vector management (IVM), reactive and proactive case detection</p> <p>Monthly case review meetings create opportunity for discussion of issues and best practices with a feedback loop to district level</p>	<p>Low number of cases has led to a decline in personnel (e.g. IRS spray teams, health inspectors) as they have retired or been transferred to other duties, and the MoH has shown a lack of commitment to fill personnel vacancies; remaining personnel have a lack of awareness of malaria treatment and prevention protocols</p> <p>Incomplete reporting from the private sector</p>

Task priorities in elimination versus control

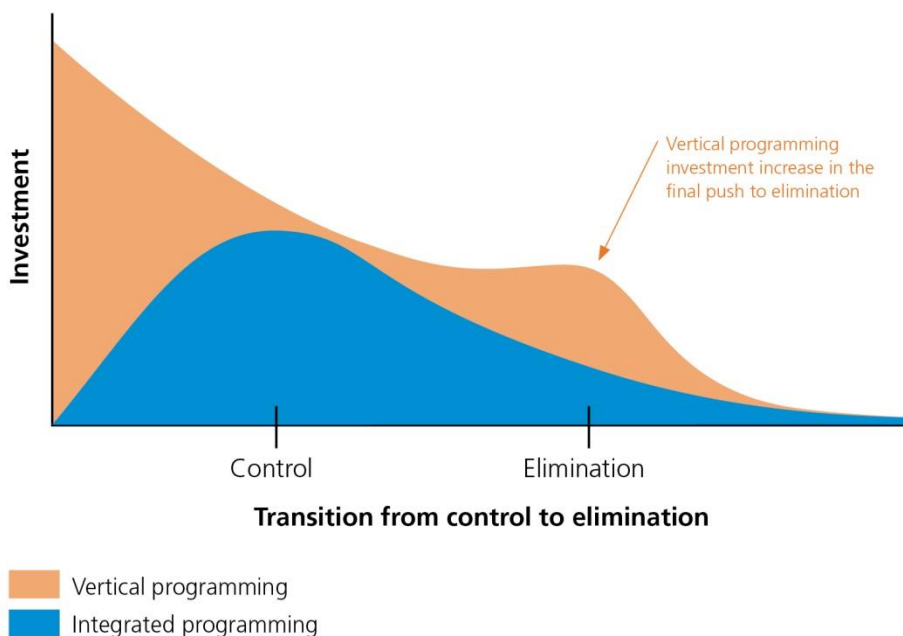
As a country moves toward malaria elimination, priorities change from general curative services to targeted, preventive community action. While control requires a ubiquitous supply of diagnostics, anti-malarials and vector control tools, elimination requires a targeted focus on parasites in each and every individual case, symptomatic and asymptomatic, at the specific sites where transmission takes place.^{4,11} Rigorous case investigation and reactive case detection activities are also necessary in elimination settings in order to track secondary cases arising in these foci. Self-administered and unreported treatments may occur frequently in a context of malaria control, but not in elimination, where every case must be tracked and reported. Similarly, in control settings universal coverage of vector control interventions is often a goal, whereas elimination narrows the focus to hotspots and hotpops. Thus, a key task at all levels is to manage shifting task priorities during the transition from malaria control to elimination, which, according to key informants, requires planning and careful implementation over 2-3 years.

Vertical and integrated elimination tasks

Other key differences between control and elimination are the degree to which the intervention is integrated in the local health system and the investments in type of programming. It has been observed that investments decrease gradually as programs move from control to elimination.²⁰ During this transition, there may also be a shift in vertical and integrated investments, in which integrated programming investments are highest during the control phase, and vertical investments increase in the final push toward elimination (see Figure 1). As case incidence declines, governments and external sponsors tend to taper funding and the malaria program relies solely on integrated services within the general health system.²² However, this approach has been shown to be potentially harmful to elimination efforts and can result in outbreaks and a return to higher incidence of malaria, as seen in Mauritius and the Philippines (Table 1). A countervailing strategy would be to maintain dedicated malaria teams during integration phases, as the programs in Bhutan and Sri Lanka have done (Table 1). Mobile specialist teams could support non-specialists working within the generic system and ensure that the integrated approach does not jeopardize elimination efforts. In other words, decentralization and integration of interventions should not equate to abandoning vertical command-and-control oversight of the malaria elimination program. Managing the interface between integrated health systems and vertically-controlled endeavors requires considerable sensitivity. It is a similar challenge to that faced by, for example, international security missions as they attempt to hand over peace-keeping to local forces while maintaining a critical intelligence and response capability. Success is dependent upon well-maintained relationships with stakeholders at all levels. Tools and processes for strengthening such partnerships are among the recommendations we make below.

Figure 1. Investment shifts on the trajectory to elimination

In a control setting, there is an increased investment in integrated programming and in the health system in general. As a country transitions to its final push for elimination, greater investment is needed for the management of vertical activities.



Enabling factors for elimination

Malaria elimination strategies differ in their actual material and social practices: some are highly centralized, controlled and directed by a vertical chain of command, while others are integrated into locally-organized health provisions and with other vector-borne disease control activities. Our review of previous experiences, including that related to other diseases and health initiatives, shows that elimination requires *both* vertical *and* integrated attention, sustained over a long period of time, in varying proportions.^{3,23,24} One key informant likened this balance of vertical and integrated services during elimination to cancer treatment, in which both a primary care physician and a team of specialists see to a patients' various needs during treatment and through to remission. Regardless of organizational structure, the key to a successful elimination program is a keen understanding of local malaria epidemiology and the flexibility to respond rapidly to changing circumstances. A strong elimination strategy should reflect context-specific differences in management focus, accountability and capabilities. It would, therefore, be a mistake to prescribe a general operating model for all circumstances; rather, malaria elimination depends on flexible adaptation and the leadership necessary to guide a program through these changes.

Summarizing key findings from our research, this section identifies *enabling factors* for malaria elimination programs. The subsequent section discusses *systemic roadblocks* to elimination.

1. **A robust local health system.** A strong system provides both a downward flow of data, requisite policies, personnel and materials, and an upward flow of data. Elimination programs may enhance this system in three ways: (1) enable swifter lateral access to data on diagnostic test results,

treatments and responses; (2) provide specialist teams and supplies to intervene in every individual case to ensure the full range of treatment, which, in Bhutan, is done by the multipurpose malaria workers based at the sub-district level (Table 1); and (3) sustain long-term attention to malaria even when cases fall to zero, as seen in Mauritius, where surveillance activities were supported by the government for years after the last indigenous case was reported (Table 1). These enhancements require subnational administration units to create a focused, tailored response package over a period of six to ten years.⁴ However, there is evidence that disease programs can be successful where health systems are weak or dysfunctional. Such programs tend to be autonomous from the MoH and entail contracting out certain elimination tasks, an example being the distribution of LLINs by an NGO in Sri Lanka, funded by GFATM, in conflict zones.⁸ In the global polio eradication movement, large numbers of skilled and unskilled workers from both inside and outside the health sector were recruited to act as vaccinators and surveillance officers, with technical assistance provided by external organizations in countries with weak health systems.²⁵

- 2. Leadership.** This means different things at each level. At the provincial, district and village levels, leadership takes the form of motivated and inventive people able to solve practical problems of supply, funding and personnel; adapt to unforeseen events; mediate between the sometimes conflicting priorities of the vertical and integrated systems; and maintain focus on the key tasks of surveillance and response. For example, in Swaziland, program leaders recognized that surveillance agents must often work evenings and weekends in order to screen community members who are away from home during normal work hours. Thus, they devised a flexible schedule in cooperation with surveillance supervisors and the Chief Surveillance Officer in which agents can reduce their work week hours to compensate for any after-hours activities.²⁶ In Apayao Province in the Philippines, the provincial health officer personally facilitated the GFATM grant process and ensured political support for the project, which led to dramatic reductions in malaria incidence (Table 1). According to key informants, another important facet of leadership is the empowerment of lower-level staff to make decisions and initiate action without constant guidance and input from program managers, thus encouraging local ownership and minimizing response delays.

At the national level, long-term, sustained leadership ensures institutional memory and continuity, and maintains focus on and political power for malaria elimination well beyond its popular urgency. High turnover at the national level can lead to challenges across all activities, as seen in Malaysia (Table 1). At this level, leadership must have direct ties to other ministries (health, finance, development, agriculture, etc.) and have strong links to the Office of the President. Leadership should be vested in recognized malaria specialists to ensure strong professional identification with excellence at each of the tasks listed in Appendix 1.

- 3. Incentives.** Successful elimination can only occur when personnel at all levels are effectively engaged and incentivized. The program in Malaysia sought to achieve this by consulting with state and district levels through elimination meetings and workshops, while in Mauritius legal frameworks were created to incentivize community members to participate in vector control activities (Table 1). Once a decision has been made to start planning for elimination, incentives can be aligned toward a more focused and targeted approach, rewarding swift attention to individual cases. For example, in Afghanistan, surveillance volunteers have been trained to identify polio cases and receive small monetary rewards for every confirmed case they report.²⁷ In Swaziland, the NMCP introduced a team-based system of incentivization, in which surveillance agents worked together to meet set indicators and, if successful, each team member was given a monetary reward.²⁶

Incentives can be independent of normal arrangements for pay, but must enhance the value of malaria health work.^{28,29} Our key informants suggested a range of non-monetary sources of motivation: the need to forge professional identities (particularly important for operational staff

engaged in repetitive and routine work, which can be intrinsically unrewarding); creating opportunities for professional association; and receiving regular communication and positive feedback from supervisors for work well done. For example, when dracunculiasis cases fell to very low levels in Pakistan and new emphasis was placed on promptness of individual case identification, reporting and response measures, the eradication program leaders strengthened supervision and revised the performance review criteria for village health workers accordingly.³⁰ Incentive structures can be developed through an analysis of the question ‘What’s in it for me?’ at each level.³¹ Internal competitions like the best performing health district of the year in Zimbabwe and the annual Microscopy Olympics in China were cited by key informants as viable incentives to improve performance. However, there is no single regime of incentives that is effective throughout the several phases of malaria elimination, or in all contexts. Further research is required to better understand incentivization, particularly at the ‘zero reporting’ stage and in differing cultural/socio-economic contexts (see Recommendations section below).

4. **Surveillance.** Expert epidemiological oversight of surveillance is crucial and may be provided externally or within the health system. Surveillance maintenance is essential; lapses in oversight may cause an elimination program to fail.³² Managing surveillance technology requires specialist attention throughout the life of an elimination program, specifically on the collection, storing, using, and sharing of data. Of note, a geographic information system (GIS) is an especially effective technology if combined with the managerial capacity to respond to the data generated (see UCSF Global Health Group Background Paper *Surveillance Systems to Facilitate Malaria Elimination*, 2014). In some areas, including Swaziland, the use of more sensitive molecular diagnostic tools such as Loop Mediated Isothermal Amplification (LAMP) can help encourage surveillance officers to continue screening populations for malaria, even when RDTs and microscopy regularly yield negative results.²⁶
5. **Regional collaborations.** Controlling imported malaria is critical both during and after the elimination phase.^{11,33} Bi-national or multinational collaboration is necessary to monitor population movement in border regions and intervene to prevent reintroduction of malaria (see UCSF Global Health Group Background Paper *Effective Responses to Malaria Importation*, 2014). Regional collaborations involving national program staff of participating countries, international agencies such as the WHO, and several local organizations and institutions have played a vital role in the eradication programs for polio³⁴ and onchocerciasis³⁵, and helped achieve and sustain large case reductions after decades of coordinated activities. Another example of a regional collaboration is the Lubombo Spatial Development Initiative (LSDI), a joint development program between the governments of Mozambique, South Africa and Swaziland that is no longer active due to funding constraints.³⁶ In addition to a perceptible reduction in infection prevalence seen in Mozambique, the malaria control component of the multi-country collaboration led to a 78-96% decrease in cases in Swaziland and neighboring districts of South Africa through capacity-building, expansion of coverage of malaria control interventions, and the establishment of a regional-level surveillance system. Namibia and Angola have recently embarked on a regional collaboration, the Trans-Kunene Malaria Initiative, seeking to reduce transmission along the border zone through coordinated vector control, primarily LLIN distribution and tracking.³⁷ At operational levels, such collaboration requires personnel who are able and willing to share information across borders and respond jointly with prevention measures, and can adapt to different national health systems.
6. **A Framework of Organizational Learning and Evaluation.** Elimination activities should be guided by a formalized organizational learning structure, similar to the the elimination consultations and workshops organized in Malaysia before embarking on an elimination goal (Table 1). This includes developing metrics to gauge success and failure, but goes further to convening colloquia where outcomes can be interpreted and lessons applied to improve practices. Sri Lanka implemented monthly review meetings with these objectives, where malaria cases and response measures are

discussed, and district managers receive feedback from their peers and from national staff (Table 1). Managers must do more than administer established protocols; they must reflect on their practices, assess the reasons for success or failure, and devise contextually-appropriate solutions. Methods for doing this are well-established and varied;^{38,39} examples include ‘action learning sets’ and tools similar to the one described in Appendix B. In addition, annual micro-planning of elimination activities and weekly monitoring of targets and responses are essential.

Roadblocks to elimination

The literature review and key informant interviews conducted for this study highlighted numerous and significant management-related roadblocks which adversely affect implementation of malaria elimination programs, many of which were echoed in the case study findings. Although the nature of these challenges differs from country to country and region to region, it is possible to identify and classify some common problems.

1. **Systemic roadblocks.**
 - a. *Conservatism.* Control programs that are typically run through the MoH are often embedded in antiquated systems. Introducing new approaches to elimination requires overcoming inertia and adherence to outmoded practices which, in turn, means instigating institutional change from the top governmental levels downward.
 - b. *Political Commitment.* In most countries, political buy-in for investment in elimination that goes beyond rhetoric is critical to achieve elimination. Interventions have failed where they have not been backed up by campaigns at the local level that reinforce government commitment. Campaigns targeted at bureaucrats, technocrats and politicians must be sustained to give higher profile to the socio-economic advantages of elimination in the absence of the urgency of an epidemic.
2. **Non-specialist managers and administrators.** A common problem identified by key informants is the appointment of personnel who have little or no technical understanding of malaria to positions of authority. Elimination is a highly technical process, and managers without the appropriate skills may make ill-informed decisions and generate a lack of respect from technical staff responsible for operational implementation, resulting in a decline in motivation.
3. **External donor constraints.** During the malaria control phase, countries are often supported by external funding. When case incidence drops and countries approach elimination, a transition often accompanied by a growth in gross domestic product (GDP), access to external funding tends to decline. However, of the 34 malaria eliminating countries (as of 2013), 20 received external funding from the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) between 2005 and 2012.⁴⁰ Compared with the level of funding received by malaria control countries, these grants were most often small but catalytic, ensuring the maintenance of, and sometimes an increase in, domestic funding for the malaria elimination program. However, the addition of external funds can raise a number of difficulties:
 - a. *Restrictive project envelopes.* Project-based interventions are typically three to five years in length, with performance-based renewals and auditing of results and impact. Under these circumstances, funding can be unreliable. In addition to a lack of a predictable funding stream, this type of financing has human resource implications: the MoH has no obligation to retain elimination staff after the funding period ends since they are not government employees. Alternatively, in some countries where government employees’ salaries are topped-up by external donors, the loss of these bonuses can cause staff to lose motivation. Both situations can lead to a drain of skills and difficulties in sustaining programs in the longer term. This is one of several reasons why malaria elimination becomes integrated into health systems, leading to a

loss of focus, expertise and institutional memory. To maintain single-mission focus in an integrated health system, it is essential to retain skilled, experienced and talented employees, particularly at the interface with the MoH, and possibly with medical research facilities. We suggest ways of doing this in the Recommendations section.

- b. *Red tape.* Key informants in this study highlighted the bureaucratic demands of external funders as a major obstacle to the effectiveness of elimination programs. Some pointed a finger, in particular, at GFATM, claiming that the international financing institution is overly procedural, legalistic in its demands, employs administrators with limited technical knowledge of malaria and has a high staff turnover which, in turn, disrupts institutional memory. GFATM grants were perceived to fail to instigate sufficient training for all levels and tended to approve training for those with higher qualifications. While GFATM was criticized by some of our key informants, this was counterbalanced by evidence in the literature^{16,20} indicating that it has been highly effective in reducing cases while building local program capacities in some elimination contexts. In addition, despite the complicated logistics of GFATM grant implementation, the organization has provided much-needed financing to both low and high burden countries and helped drive progress toward elimination through novel initiatives such as the Affordable Medicines Facility – malaria (AMFm), a series of largely successful national-scale pilot programs designed to increase the access and use of quality-assured artemisinin-based combination therapies through innovative financing.⁴¹
4. **Operational constraints.** A number of obstacles at this level were identified by key informants and in the literature review:
 - a. *Generic cultural perspectives.* In some developing countries where malaria is endemic, the disease is so common that it is not believed by affected populations to ‘pose a problem’.⁴² In other areas where endemicity has been very low for several years, local populations do not perceive malaria to be a threat, despite evidence of ongoing transmission at low levels.⁴³ In both situations, there is a risk of under-reporting of cases and thus non-identification of transmission foci. Potential solutions include regular education and outreach at the community level,⁴⁴ and the targeted use of advertising and social marketing techniques to raise awareness among affected populations.⁴⁵
 - b. *High staff turnover and lack of human resources.* High turnover of leaders, such as that which occurred in Malaysia, can pose problems in terms of loss of institutional memory and reduced effectiveness of interventions (Table 1). Similar difficulties with staff turnover and poor supervision have been encountered in Namibia and Sri Lanka (Table 1). Beyond the problem of insufficient human resources, staff with inadequate skillsets is a major concern; key informants observed that there is a general lack of analysis on the part of managers of the skills actually required for elimination, and they emphasized the importance of adding non-medical employees to elimination teams.
 - c. *Inadequate training* was identified by key informants as a serious problem in many countries, and encompasses both specific technical training (including diagnostic, epidemiologic or entomologic training) and general management and operational training (including training in supervision, institutional change or effective leadership). Targeted investment could make a difference at all levels.
 - d. *Misuse and disuse of information.* In some settings, information can be manipulated or withheld for micro-political purposes by individual staff members within an elimination program. This type of information manipulation is evidence of how the dynamics of a given operational group can adversely affect program performance. Development of a professional, collegial culture at

an operational level might help mitigate such self-serving conduct but would probably not eradicate it entirely. In addition, 'disuse' of information is also a problem. Often, data is gathered but staff members do not have the time, resources, or training to process or act upon it. Development of the minimum essential data (see Recommendations section below) may help address this issue.

Application of managerial practices

Applying new technical and behavioral modes of gathering and managing data can be difficult, necessitating the introduction and assimilation of managerial approaches like 'action learning' and 'organizational learning'.^{38,39} For example, health workers who are accustomed to a malaria control regime may not be prepared for the intensive targeting and urgent response rates required in the early phases of elimination, and district level managers who have succeeded in directing rapid response teams may struggle to sustain resources and personnel for later elimination phases. While some techniques and methods, like those for managing diagnostic data and administering treatments, are amenable to didactic training, change management requires greater two-way engagement and participation. Because management requires a high degree of cooperation from 'the managed', behavioral change is far more effective when introduced consensually and collectively, drawing upon the ideas and skills of the people involved. 'Action learning' and 'organizational learning' describe sets of practices in which managers and other staff work collectively to find solutions to the issues faced by each individual in the group, or, at the organizational level, issues faced by differing groups. They learn from the suggestions of others, and from developing a shared understanding of the system of which each is a part.

Similarly, managers should give special attention to the interface between those interventions that are managed vertically and those integrated within the existing health system. In Appendix B we present a workshop methodology, the Mindsets in Partnership Tool, which may be helpful in reviewing, renewing and adapting the working methods and expectations across the vertical and integrated processes. This is a generic tool designed to enable and improve knowledge exchange and capacity building for multi-sector stakeholder groups and/or organizational teams facing complex problems in which multiple interests are in play. In the elimination context, it can be applied at different levels within the health system in order to address potential difficulties posed by rebalancing the vertical-integrated organizational mix. As part of building the leadership development and relationship management platform that we recommend below, managers at national, regional and district level should not only participate in workshops of this sort, but also be supported in learning how to apply this kind of facilitative tool.

Implications for global malaria elimination strategies

Below we describe how effective management practices will inform program implementation. We aim to articulate new points of view that may change how malaria elimination strategies are conceived and executed.

The findings from this study suggest some dramatic changes to the current practice :

1. Because of the need for political and financial support, elimination requires active engagement with the Office of the President and the Ministry of Finance, and institutionalized goals and targets for success need to be agreed upon and documented.
2. Supporting organizational change when programs move from control to elimination is necessary. Although there is current support for 'program reorientation', results from this study suggest that further support is needed to manage the shift. Making the decision to move to elimination is often politically-driven, requiring programs to adapt *post hoc*. Organizational guidance will help ensure a viable transition.

3. Community level elimination should be run through a vertical system to ensure focus, quality and sustained supplies. The vertically-organized tasks could be run through NGOs or outsourced. Meanwhile, integration of case management and surveillance within a strengthened local health system should be encouraged throughout the malaria elimination campaign.
4. Appropriate incentives at each step in the elimination program process should be determined and implemented. Incentives may be financial or non-monetary. Regardless of the type of incentive, initiating a system of reward at all levels of the process will require significant investment, whether via training, professional organizations or monetary disbursements.

Recommendations

In this section we identify areas where targeted investment could have significant impact. These recommendations follow from the analysis presented in the enabling factors and roadblocks sections above. Taken in combination they offer a roadmap that leads toward development and implementation of country- or region-specific malaria elimination management systems.

1. **Assessment of elimination management practices and skills.** We recommend assessing the skills and existing management practices in countries that are considering or are ready to transition from control to elimination. The purpose would be to identify strengths and weaknesses in practice, establish the degree of readiness for the control-elimination transition, and identify where management could be improved or capacity developed. These assessments would focus on skills and practices and would refer to the WHO Malaria Elimination Manual⁴ that describes the activities for which management practices are required. This detailed assessment would support rather than replace reviews of high level strategies and program activities which are addressed by NMCP annual planning meetings, five year strategic reviews, and WHO Malaria Programme Reviews.
2. **Leadership development.** We recommend investment in leadership development programs to support the transition from control to elimination and subsequent program implementation at all levels. We also recommend investment in leadership to support the long-term focus on surveillance and diagnostic testing. The type of leadership training will vary by the role of personnel and the level at which they operate. Effective leadership in key senior elimination program roles consists of both the ability to be an inspiring role model and advocate, and technical knowledge and managerial and administrative competence. Investment should be targeted at leadership development programs that encourage and empower continuous learning, adaptation and advocacy. Leaders should be enrolled in 'Action Learning' sets (see recommendation 4 below) with peers from other districts, areas or nations to enhance their awareness and their sense of professional commitment to the goal of malaria elimination. This should occur even when transmission rates are very low and cases are at or near zero for several years. At the national and area levels, it is crucial to have strong leaders who understand the boundaries between vertical and routine health systems, know how to coordinate program transitions and can garner political support. Therefore, leadership development should focus on appropriate skills and techniques for optimising the interface between vertical and routine health systems. Facilitation skills will be high on the agenda at this level, and tools for managing multi-party, cross-sector partnerships and network learning should be deployed (see 'Application of management practice' discussion above).
3. **Management Development.** Provide senior technicians with abilities to manage personnel finances, information, logistics, activity planning and other generic administrative skills. At provincial and district levels, program leaders should be identified and supported with mentoring and training which would adapt to the changing priorities of the elimination phase, from concentration on gathering and interpreting information and directing rapid, comprehensive response in the early phases, to maintaining accurate and trusted diagnostics with active data monitoring over the longer

term. They should have the skills to supervise this range of tasks and have access to the material resources to motivate and reward staff (see Recommendation 5, below).

4. **Organizational learning and capacity building workshops.** Assessment of practices and skills will enable identification of ‘best practices’ in malaria elimination management at all levels and at all stages in the elimination process. We recommend funding workshops and/or exchange visits for key operators within a given country or region. The purpose of the workshops would be to facilitate networked learning and improve elimination practices. Two regional resources, the Asia Pacific Malaria Elimination Network (APMEN) and the Asian Collaborative Training Network for Malaria (ACTMalaria) host workshops targeted to national or sub-national program managers, and the former organization coordinates a country-to-country fellowship program and study tours of host country program activities in conjunction with annual meetings. These organizations could host the additional workshops or activities proposed here. In addition, in-country or in-region ‘champions’ of best practice could be identified and mobilized at government, provincial and district levels to advise and instruct their counterparts, including best practice in these review and learning activities.
5. **Improvements to operational incentive systems.** There are a number of issues at the operational level with respect to incentives for people involved in the elimination effort – including volunteers and community health workers as well as staff formally employed by the program or in the health system. The aim is to develop organizational cultures in which people *want* to do the work. Success is more likely if staff members internalize program goals and are motivated to achieve them. Developing non-monetary incentives in addition to paying a living wage is therefore crucial. Our recommendation is that investment be targeted in the following areas:
 - a. *Operational research into incentive systems.* Building on research presented in this paper, commission a comparative international study of staff incentive systems in disease elimination contexts, including a study of culturally and contextually appropriate incentives for community health workers.
 - b. *Professional identity and career advancement.* In countries where training and pay is adequate, fund initiatives to develop human resource management structures that enhance professional identity for technical staff, create opportunities to associate with other professionals engaged in elimination work and, where possible, provide clear routes for career advancement. The aim would be to improve the meaning and value that staff members derive from their work. We recommend that interventions of this sort be conducted using participatory methods, ensuring that the affected staff directly collaborate in the creation of the incentive and career structures. Such a method would permit cultural differences with respect to incentivization to be accommodated within any system that is devised and implemented in-country.
6. **Improvements to accountability systems.** Accountability is closely associated with both incentives and leadership issues. Our study revealed that government-controlled programs are often characterized by weak accountability systems and high employee turnover, and it is difficult to hold individuals accountable when such circumstances create untenable situations, for example, where a lack of resources prevents staff from doing adequate work, or they simply are not being paid. Externally-funded elimination interventions can temporarily avoid these problems, but, in general, sound performance management procedures should be employed in elimination program activities, whether internally or externally funded. We recommend a participatory approach to designing and implementing performance management because local legitimacy is crucial to success.
7. **Surveillance management checklist.** We recommend investment in the development of a surveillance management ‘capacity for elimination’ checklist. A detailed study of global best practices would be valuable and a comprehensive checklist could inform management teams in

countries about to embark on elimination programs. The malaria elimination training module written by WHO (scheduled for the WHO Western Pacific Regional Office in early 2014) could include this type of checklist for surveillance or be included in tools such as the Elimination Scenario Planning tool, a manual written by WHO and partners.

- 8. *Information management and use of data.*** Improving data quality and reaching agreement on the minimum essential data needs for elimination should be a priority. If a malaria information system is not equipped to investigate at the household level, achieving elimination is not realistic. Where such systems are in place, the lowest levels of elimination programs should be empowered to act autonomously in response to information. Some countries require IT investment, while others need to reanimate and use technologies that are already in place. Many countries have surveillance, stratification, mapping and real-time SMS technologies, yet are not able to use this information to guide management decisions. Key recommendations, therefore, are that investment be targeted at developing a global consensus on the minimum essential data set and the means to effectively and consistently respond to surveillance data in a real-time framework.
- 9. *Trial reforms and enhancement of malaria elimination management.*** Reorientation from control to elimination requires a particular mix of vertically-controlled and integrated activities that are implemented within a specific command-and-control framework suitable for the elimination endgame. According to our key informants, the following activities should be integrated into mainstream healthcare provision: case management/treatment, information, education and communication (IEC), surveillance and response. The following activities should be managed vertically by dedicated malaria teams: activities such as indoor residual spraying (IRS), entomological surveillance and net distribution. In many countries, especially in the early stages of elimination, the responses to a positive test will also be 'vertically' organized; but as the program proceeds and positive cases become rare, responses may be integrated in routine health systems, although quality-assurance should remain a 'vertical' responsibility. Generally, units of implementation should be small and community-based. Although there has been some research on the effectiveness of contracting out health services,⁴⁶⁻⁴⁸ we recommend investment in a series of rigorous studies, specific to each country, to investigate the effectiveness of contracting out vertical activities to external agencies or non-health government ministries. We also suggest investing in research to investigate partnership arrangements between the public and private sector for implementation of these activities.
- 10. *Encourage regional collaboration.*** We recommend that international agencies actively encourage and support the development of regional elimination initiatives to ensure ongoing political commitment and funding. The successful elimination of malaria in many countries depends upon cooperation and coordination with neighbors on synchronized border operations and the monitoring of population movement. While our study revealed some examples of effective collaboration for malaria elimination, many valuable lessons can be learned from other disease eradication programs that mobilized ministries of health, international and local NGOs, academic institutions, and private organizations in long-term elimination activities.
- 11. *Encourage research and development into malaria elimination management.*** The comprehensive literature review undertaken in preparation for this paper revealed a dearth of research that focuses specifically on malaria program management issues, particularly at the operational level. Discussion of management issues was largely generic and poorly informed by knowledge and practice in the fields of management and administrative sciences. Similarly, when asked, our key informants, all of them experienced practitioners, identified the prevalence of poor management practices and the need to remedy this as crucial to the success of elimination programs. Accordingly, we recommend investment in practice-oriented research that is situation-specific and actively engages the managers

on the front line. While informing all functions of management, research and intervention strategies would aim to promote 'organizational learning', an approach and philosophy that is adaptable to varying operational conditions. This research could be coordinated from a specialist center, which could also function to monitor and evaluate implementation of the recommendations made in this paper.

Conclusions

Approaching malaria elimination with 'business as usual' attitudes and expectations is untenable. Malaria elimination is a long-term, focused and technical process that requires effective management and communication at all levels. The analysis and recommendations we provide in this paper present a way to improve effectiveness of elimination management; building and enhancing existing strengths while offering a menu of options for tackling the remaining challenges. We are confident that both our short-term and long-term proposals are actionable and, if implemented, would lead to significant improvements to elimination management practice. The investment options we describe have the potential to achieve widespread results at country and regional levels which, cumulatively, could have a global impact on progress toward malaria elimination and eradication.

Appendix A: Illustration of key tasks related to malaria elimination, by level of health system

Note: **Bold** font indicates elimination-specific tasks. *Italicized* font indicates tasks for prevention of reintroduction.

1. Community Level

	Case management	LLIN use	IRS	Passive and active case detection
Village Health Workers (voluntary) and Malaria Workers (paid)	Provide information to population on why, when, where to seek care	Provide information to population on why to sleep under LLINs, where to obtain and how to use.	Assist the spray team when they respond to detected foci of cases	Record all self-reported, suspected and confirmed cases in the Passive Case Detection (PCD) register
	Promote treatment adherence	Monitor long-lasting insecticidal net (LLIN) use	Promote the cooperation of targeted households during indoor residual spraying (IRS)	Record all suspected and confirmed cases identified by house visits in the active case detection (ACD) register
	Treat malaria in some countries (presumptive or RDT confirmed)	Liaise with LLIN program manager to ensure targeted households have sufficient nets in good condition		Report confirmed and unconfirmed cases separately and promptly
	Confirm malaria infections seen at PCD.			Conduct ACD through home visits to find new cases. Use RDT or microscopy.
	Depending on context: 1. Treat (with first line treatment and, if used, anti-gametocyte) and immediately report to a surveillance officer OR 2. Refer suspected cases to a surveillance officer without giving treatment			During ACD visits: 1. Treat cases with ACT and immediately report to a surveillance officer. OR 2. Refer suspected cases to surveillance officer without treatment
	Mobilize the community and take part in Mass Drug Administration (MDA)			
		Ensure appropriate and consistent use and coverage of LLINs, acceptance to IRS and larviciding. Encourage other methods such as repellents, draining breeding sites and house improvements.		
Build community engagement and awareness around malaria elimination through information, education and behavior change communication				

2. Primary Health Facility

	Case management	LLIN use	IRS	Passive and active case detection
Primary Health Centers (PHC)	Confirm all cases with RDT or microscopy.	Provide LLIN to pregnant women and children <5	May have role similar to district level	Record self-reporting, suspected and confirmed cases in the PCD register
	Treat all cases according to policy and with appropriate, quality drugs	Plan and oversee community LLIN distribution to achieve universal coverage (including through MWs).		Report confirmed and unconfirmed cases separately
	Conduct directly observed treatment (DOT) where policy exists			Collate the PCD and ACD data from VHWs and MWs and report to the district
	Support and supervise VHW and MW in case management			Notify outbreaks
	Ensure adequate stock of RDTs and antimalarial with prompt ordering and buffer stock			<i>Sustained, comprehensive and rapid detection of new cases through passive system only</i>
	Identify and refer promptly severe cases to secondary health facility (HF)			
	Provide free diagnosis and treatment for all, including non-nationals and private sector			
	Confirm malaria (with RDT or microscopy) before treatment			
	Robust quality assurance of diagnosis			
	Prompt and appropriate treatment			
	Immediate reporting of all new cases			
	Ensure capacity of qualified technicians to confirm cases and immediate reporting to surveillance officers			
	Regular supportive supervision to and collection of information from VMWs; joint problem solving.			

3. District Health Office

	Case management	LLIN use	IRS	Passive and active case detection
District Health Offices	Ensure no stock out of drugs, RDTs, slides, stains etc. at all HFs (depends on supply system - may bypass district)	Ensure HFs are supplied without stock-out (depends on supply system)	Possibly, plan, organize and supervise IRS	Compile, analyse and give feedback to HFs
	Conduct supportive supervisory visits to HF, problem solve	Conduct supportive supervisory visits to HF, problem solve		Report upwards data from HFs to the province.
	Periodically conduct in-service training at PHC, VHW and MW on treatment guidelines			Follow-up on missing reports.
	All new cases (passive and active case detection) immediately reported and then analyzed			Initiate tracking of contacts of new cases in very low transmission settings
	Ensure that cases detected in formal private sector are rapidly reported			Track and treat secondary cases in low transmission setting
	Conduct mass drug administration (MDA) with village health/malaria workers, provincial and National Malaria Control Program (NMCP) offices			Identify, respond to and notify outbreaks.
				Increase program skills in surveillance and data management/analysis skills
				If not conducted by CHWs - conduct proactive and reactive case detection with malaria health workers and provincial and NMCP offices
				Conduct screen and treat operations, entomological surveillance, vector control and education if new hotspot or foci is detected (working with district and NMCP offices)
	Regular supportive supervision for and collection of information from, health facilities. Joint problem solving.			
	At provincial and district levels, maintain activities (vector control, surveillance etc.) targeted to cross border/mobile populations. Participate in agreements/ meetings with neighboring countries. Conduct screening and treatment of travellers from endemic areas/mobile pops/migrant workers.			
	Ensure coverage at sufficient scale (emphasis on hotpops, hotspots and foci) of LLINs, IRS and vector control measures (with provincial and NMCP offices)			

4. Provincial Health Office

	Case management	LLIN use	IRS with insecticide	Passive and active case detection	
Provincial Health Offices	Ensure districts are supplied without stock-out (depending on supply system that may bypass province)	Ensure districts are supplied without stock-out (depends on supply system)	Possibly plan, organize and supervise IRS	Analyse district reports and give feedback	
	Organise training workshops to update districts on national guidelines on diagnosis and treatment		Conduct quality assurance and QC of IRS	Report upwards data to national level	
	Ensure quality assurance of RDTs and drugs supplied to districts			Monitor and ensure a adequate response to outbreaks	
	Monitor efficacy of recommended antimalarials				
	Supply chain management				
	Provide logistical support for MDA				
	Regular supportive supervision to and collection of information from districts; joint problem solving				
	Analyze data from districts on case reporting, vector control, and surveillance measures; monitor if districts are doing well				
	Quality assurance, supply chain management				
	Initiatives pursued to reduce transmission in key neighboring areas; prophylaxis for travellers to endemic areas				
Both at provincial and district levels, maintain activities (e.g., vector control, surveillance) targeted to cross border/mobile populations; participate in agreements/meetings with neighboring countries; conduct screening and treatment of travellers from endemic areas/mobile pops/migrant workers					

5. National level

	Case management	LLIN use	IRS with insecticide	Passive and active case detection	
National Malaria Control Program	Develop, disseminate and monitor implementation of policy and guidelines.	Develop, disseminate and monitor implementation of policy	Develop, disseminate, monitor implementation of policy	Ensure completeness and timeliness of data. Compile and analyze all data. Provide timely feedback.	
	Manage supply chain systems efficiently	Oversee planning	Oversee planning	Ensure ACD is taking place according to policy.	
	Organise training workshops for districts on national guidelines on diagnosis and treatment for malaria	Ensure supply system is working	Ensure supply system is working	Identify hotspots and trends, implement changes to policy or operations as needed.	
	Ensure quality assurance of RDTs and drugs supplied to districts	Supportive supervision to provinces and spot checks of action and veracity of operations data at all levels – problem solve		Develop clear policy guidelines and operational procedures for surveillance and response, MDA and case investigation	
	Monitor efficacy of antimalarial drugs			Analyze surveillance data and detect early warnings of outbreaks, assist districts to prepare a prompt response	
	A strong central reference laboratory and robust quality control system for diagnosis including PCR			Ensure sustained, comprehensive and rapid detection of new cases through passive system, working with PHC system	
	Ensure adequate stock of diagnostic test (if RDTs) and treatment is available			<i>Supervise screening and treatment of travellers from endemic areas/mobile pops/migrant workers</i>	
	Build elimination-specific database with key indicators for analysis; ensure database is coordinated with national health information system				
		Ensure coverage at sufficient scale (with emphasis on hotspots, hotspots and foci) of LLINs, IRS and other vector control measures (in collaboration with district and provincial offices)			
	Supportive supervision to Provinces and spot checks of action and veracity of operations data at all levels. Joint problem solving.				
	Provide technical assistance for lower administrative levels				
	Facilitate cross-sectoral collaboration and relevant legislation (e.g. with Ministry of Defense or Labor/Migration)				
Lead efforts and provide technical input on continuation of cross border malaria control measures, agreements with neighbors; pursue initiatives to reduce transmission in neighboring areas; prophylaxis for travelers to endemic areas					
<i>POR: Reduced or reoriented program management, targeted central capacity</i>					

6. Above National Level, in country

	Case management	LLIN use	IRS with insecticide	Passive and active case detection
Levels Above NMCP	Provide political support. Review quarterly scorecard – identify issues and take action. Hold NMCP accountable. Seek additional funding as needed.			
	Ensure well-appointed, knowledgeable director of the NMCP; avoid turnover			
	Ensure political and financial support for malaria elimination and post-elimination maintenance while cases continue to decline to very low levels – long term support and adequate budgets			
	Review progress towards goals and apply pressure to NMCP to get job done			
	Pursue avenues to combine infectious disease priorities/overlap infrastructure/funding/advocacy etc.			
	National legislation, such as mandatory implementation of activities by health workers/authors (e.g., immediate notification of cases) or mandatory acceptance by households and businesses of elimination measures (e.g., vector control)			
	Regulate the private sector health providers, including removal of over-the-counter antimalarial medicines			
	Border control measures (e.g., mandatory screening) at ports of entry and case follow up			
	Initiatives/agreements with neighboring countries/sources of mobile populations constructed to reduce transmission in endemic border areas; prophylaxis for travelers to endemic areas			
	High level support given through advocacy activities			
Legislation maintained for cross border activities, agreements with neighbors, screening and treatment of travelers from endemic areas/mobile pops/migrant workers				

7. All Levels

	Case management	LLIN use	IRS with insecticide	Passive and active case detection
All Levels	Ensure incentives for performance			

Appendix B: Mindsets in Partnership tool

Mindsets in Partnership Tool⁴⁹

Benefits

This is a process tool to enhance organisational boundary spanning and partnership activities by building relationships, identifying challenges and opportunities, and creating new insights and learning within teams and across partnerships.

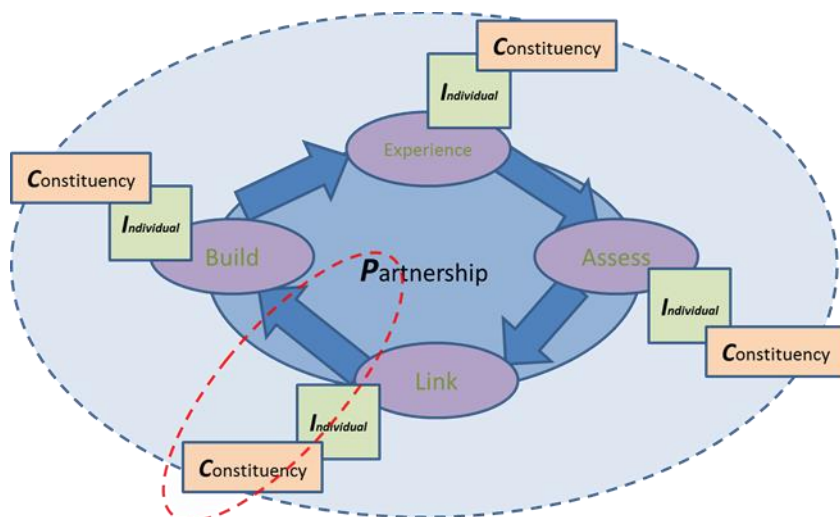
Tool Application:

The Mindset tool is flexible and can be adapted to a range of situations and users. It can be used as a guiding framework to design partnership and team activities or brought into team meetings/workshops for group development. The outcome is a more cohesive team/partnership with a shared understanding of the 'bigger' picture, and thus better equipped for the specific challenges they face.

The tool recognises:

- When organisations face new challenges, establish new partnerships or bring together new teams, people often rely heavily on past 'mindsets' and fail to realise the creative potential of moving forward together. In partnerships, members have to influence and adapt without the authority structures of line hierarchies. Entering a partnership, they must bring the trust and authority of their own organisation, their home constituency; and at the same time identify with the collective work of the partnership, representing this in turn, to their home constituency. **The problem we are addressing here is the relatedness of these three 'identities' – Partnership, Individual and Constituency (PIC).**

Fig 1: P.I.C. Model of Partnership [Partnership Individual Constituency]



- The need to frame and engage in more useful and productive conversations and actions as compared to "do more with less" and "cost cutting" debates/negotiations.

Application area

To deliver sustainable and meaningful solutions to complex issues in a way that effectively utilizes valuable resources, organizations are increasingly engaging in multi-agency partnership. Partnership projects require partners to work with and across distinct business cultures with established boundaries and mindsets. Such ways of working have the potential to both integrate and create knowledge and skills. However, to do so requires constructive and open dialogues that facilitates both information transfer between partners and cross-fertilization enabling the creation of new mindsets. The problem is that many dialogues are limited by (1) the failure of the partnership to identify and utilize valuable information and skills from all partners, and (2) the reluctance of partners to shift from dominant, and/or established mindsets to more flexible, plural mindsets. The tool enables multi sector/organisational teams & partnerships facing these complex challenges in transforming effective knowledge transfer and capacity building in the knowledge exchange arena, and transfers capability to the individual constituent's organisations.

The Mindset tool enables partnerships/teams to get beyond this by:

- Assessing assumptions about priorities, processes and collective practices
- Developing a common framework and language to assess the situation and provide the means to think collectively in new ways.
- Changing ways of approaching the situation and facilitating the discovery of new ways to move forward

Value proposition

In a **partnership** setting, our tool delivers an experiential introduction to working in different mindsets, and frames discussions in relation to the content of each partner's work, so as to provide value to the partnership to build capacity around:

- knowledge,
- relational networks,
- mindsets

for the work of the partnership, the individuals, and their constituencies.

Contacts:

- **Dr Anne O'Brien** : Anne.O'Brien@exeter.ac.uk
- **Professor Jonathan Gosling**: jonathan.gosling@exeter.ac.uk

Address:

University of Exeter Business School
Streatham Court
Rennes Drive
Exeter EX4 4PU
website: <http://business-school.exeter.ac.uk/>

Appendix C: Interview guide for management of malaria elimination programs

The Malaria Elimination Initiative within the Global Health Group at UCSF is in the process of researching and drafting a background paper about management of malaria elimination programs. The purpose of this paper is to inform future strategy, policy, programming, and research. We are documenting practices that have already been tried and either succeeded or failed, as well as those currently being tested or implemented. We are also interested in ideas on what should be done in the future.

With this in mind, we would like you to tell us about your experiences with and viewpoints on the management of malaria elimination interventions. Please note that we will not use your name or the content of any materials you send to us in our background paper without your explicit permission – your responses will be kept confidential and simply serves to improve our understanding.

1. Please describe your experience with management of malaria elimination programs, and if relevant, attach any supporting documentation (protocols, program reviews or guidelines, etc.) that you are comfortable sharing with us.
 - a. What worked, and why?
 - b. What did not work, and why not?
2. Which of these management topics are most in need of attention? What solutions have you come across that might be extended or developed?
 - a. Supply of materials to the field
 - b. Leadership of programs
 - c. Supervision at the front line and all the way up to national level
 - d. Incentives for staff and participants at all levels
 - e. Accountability for results
 - f. Management information – about resources, people, participants, funding etc.
 - g. Maintaining commitment especially at political and policy levels
3. How do programs respond to real-time data? Do they have the ability to do so?
4. What do you think are the biggest roadblocks to improving management practices?
5. Should a malaria elimination program be organized as a vertical or integrated with other disease control programs?
6. Are there differences in the importance of the above listed management topics between a vertical and integrated malaria elimination program?
7. Do you think interventions to improve management should be an explicit focus for funding? Why or why not?
8. Who else would you recommend we speak to about this?

References

- 1 Feachem RG, Phillips AA, Targett GA, Snow RW. Call to action: priorities for malaria elimination. *The Lancet* 6; **376**: 1517–21.
- 2 Cohen JM, Moonen B, Snow RW, Smith DL. How absolute is zero? An evaluation of historical and current definitions of malaria elimination. *Malar J* 2010; **9**: 213.
- 3 Henderson DA. Principles and lessons from the smallpox eradication programme. *Bull World Health Organ* 1987; **65**: 535–46.
- 4 Organización Mundial de la Salud. Malaria elimination a field manual for low and moderate endemic countries. Geneva, World Health Organization, 2007.
- 5 Cohen JM, Smith DL, Cotter C, *et al.* Malaria resurgence: a systematic review and assessment of its causes. *Malar J* 2012; **11**: 122.
- 6 The Roll Back Malaria Partnership. Eliminating malaria: learning from the past, looking ahead. Geneva, World Health Organization, 2011.
- 7 Tatarsky A, Aboobakar S, Cohen JM, *et al.* Preventing the Reintroduction of Malaria in Mauritius: A Programmatic and Financial Assessment. *PLoS ONE* 2011; **6**. doi:10.1371/journal.pone.0023832.
- 8 Abeyasinghe RR, Galappaththy GNL, Smith Gueye C, Kahn JG, Feachem RGA. Malaria Control and Elimination in Sri Lanka: Documenting Progress and Success Factors in a Conflict Setting. *PLoS ONE* 2012; **7**: e43162.
- 9 Melgaard B, Creese A, Aylward B, *et al.* Disease eradication and health systems development. *Bull World Health Organ* 1998; **76**: 26–31.
- 10 Mills A, Lubell Y, Hanson K. Malaria eradication: the economic, financial and institutional challenge. *Malar J* 2008; **7**: S11.
- 11 Moonen B, Cohen JM, Snow RW, *et al.* Operational strategies to achieve and maintain malaria elimination. *The Lancet* 6; **376**: 1592–603.
- 12 Bousema T, Griffin JT, Sauerwein RW, *et al.* Hitting Hotspots: Spatial Targeting of Malaria for Control and Elimination. *PLoS Med* 2012; **9**: e1001165.
- 13 Sturrock HJW, Hsiang MS, Cohen JM, *et al.* Targeting Asymptomatic Malaria Infections: Active Surveillance in Control and Elimination. *PLoS Med* 2013; **10**: e1001467.
- 14 Feachem RG, Phillips AA, Hwang J, *et al.* Shrinking the malaria map: progress and prospects. *The Lancet* 2010; **376**: 1566–78.
- 15 Malaria Eradication Research Agenda Initiative, WHO Global Malaria Programme. Community-based Reduction of Malaria Transmission. Geneva, Switzerland, World Health Organization, 2012. http://whqlibdoc.who.int/publications/2012/9789241502719_eng.pdf (accessed 20 Dec 2013).
- 16 Yangzom T, Gueye CS, Namgay R, *et al.* Malaria control in Bhutan: case study of a country embarking on elimination. *Malar J* 2012; **11**: 9.

- 17 World Health Organization, Ministry of Health Malaysia, University of California, San Francisco. Eliminating Malaria: Case study, Progress towards elimination in Malaysia. Geneva, World Health Organization, 2012.
- 18 World Health Organization, Global Malaria Programme. Preventing reintroduction in Mauritius. Geneva, World Health Organization, 2012.
- 19 Smith Gueye C, Gerigk M, Newby G, Lourenco C, Uusiku P, Liu JX. Namibia's path toward malaria elimination: A case study of malaria strategies and costs along the northern border (draft publication). 2014.
- 20 Liu JX, Newby G, Brackery A, *et al.* Determinants of Malaria Program Expenditures during Elimination: Case Study Evidence from Select Provinces in the Philippines. *PLoS ONE* 2013; **8**: e73352.
- 21 World Health Organization, Global Malaria Programme. Progress towards elimination in Sri Lanka. Geneva, World Health Organization, 2012.
- 22 Will we eliminate malaria programs before we eliminate malaria? MalariaMatters.org. 2013. <http://malariamatters.org/will-we-eliminate-malaria-programs-before-we-eliminate-malaria/>.
- 23 Msuya J. Horizontal and vertical delivery of health services: what are the tradeoffs? The World Bank and Oxford University Press, 2003.
- 24 Makoy S, Becknell SR, Jones AH, Waat G, Ruiz-tiben E, Hopkins DR. Use of surveillance in disease eradication efforts, Part 2: Lessons learned in Guinea worm disease eradication. In: M'ikanatha NM, Lynfield R, Beneden CAV, Valk H, eds. *Infectious Disease Surveillance*. John Wiley & Sons Ltd, 2013: 41–53.
- 25 Aylward RB, Linkins J. Polio eradication: mobilizing and managing the human resources. *Bull World Health Organ* 2005; **83**: 268–73.
- 26 Email communication with a Swaziland Program Officer. Program Management Issues in Swaziland. 2013.
- 27 Aikins M. The Surge. *Wired* 2013. <http://www.wired.com/wiredscience/polio-vaccine/> (accessed 2 Jan2014).
- 28 Mathauer I, Imhoff I. Health worker motivation in Africa: the role of non-financial incentives and human resource management tools. *Hum Resour Health* 2006; **4**: 24.
- 29 Marjolein D, Viet Cuong P, Vu Anh L, Martineau T. Identifying factors for job motivation of rural health workers in North Viet Nam. *Hum Resour Health* 2003; **1**: 10.
- 30 Hopkins DR, Ruiz-Tiben E. Strategies for dracunculiasis eradication. *Bull World Health Organ* 1991; **69**:533.
- 31 Sullivan W, Sullivan R, Buffton B. Aligning individual and organisational values to support change. *J Change Manag* 2002; **2**: 247–54.
- 32 Barclay VC, Smith RA, Findeis JL. Surveillance considerations for malaria elimination. *MalarJ* 2012; **11**:1–4.
- 33 Koita K, Novotny J, Kunene S, *et al.* Targeting imported malaria through social networks: a potential strategy for malaria elimination in Swaziland. *MalarJ* 2013; **12**: 219.
- 34 World Health Organization, Regional Office for Europe. Securing the gains: cross-regional collaboration in protecting polio-free areas. 2011. <http://www.euro.who.int/en/health-topics/communicable->

- diseases/poliomyelitis/news/news/2011/8/securing-the-gains-cross-regional-collaboration-in-protecting-polio-free-areas (accessed 21 Jan 2014).
- 35 Gustavsen K, Hopkins A, Sauerbrey M. Onchocerciasis in the Americas: from arrival to (near) elimination. *Parasit Vectors* 2011; **4**: 205.
- 36 LSDI. Lubombo Spatial Development Initiative: Annual Report. 2009. <http://www.malaria.org.za/lodi/Reports/2009/LSDIMaputoAnnualReport2009.pdf> (accessed 14 Aug 2013).
- 37 WHO-Namibia, WHO-Angola. WHO Namibia and Angola welcomes historical cross border agreement to close the net on malaria. World Health Organization Regional Office for Africa. 2011. <http://www.afro.who.int/en/media-centre/pressreleases/item/2921-who-namibia-and-angola-welcomes-historical-cross-border-agreement-to-close-the-net-on-malaria.html> (accessed 8 Jan 2014).
- 38 Senge PM. THE FIFTH DISCIPLINE. *Meas Bus Excell* 1997; **1**: 46–51.
- 39 Easterby-Smith M, Araujo L, Burgoyne J. Organizational Learning and the Learning Organization: Developments in Theory and Practice. SAGE, 1999.
- 40 Zelman B, Liu J, Cotter C. Global Financing for Malaria Elimination: Role of the Global Fund and estimates for future needs (Draft). 2014.
- 41 Ren R, Willey BA, Adegoke CA, *et al.* Effect of the Affordable Medicines Facility—malaria (AMFm) on the availability, price, and market share of quality-assured artemisinin-based combination therapies in seven countries: a before-and-after analysis of outlet survey data. *The Lancet* 2012; **380**: 1916–26.
- 42 Heggenhougen HK, Hackethal V, Vivek P. The behavioural and social aspects of malaria and its control. UNDP, World Bank, and WHO Special Programme for Research & Training in Tropical Diseases. 2003.
- 43 Atkinson J-A, Johnson M-L, Wijesinghe R, *et al.* Operational research to inform a sub-national surveillance intervention for malaria elimination in Solomon Islands. *Malar J* 2012; **11**: 101.
- 44 Tobgay T, Pem D, Dophu U, Dumre SP, Na-Bangchang K, Torres CE. Community-directed educational intervention for malaria elimination in Bhutan: quasi-experimental study in malaria endemic areas of Sarpang district. *Malar J* 2013; **12**: 132.
- 45 Bauch JA, Gu JJ, Msellem M, *et al.* Perception of malaria risk in a setting of reduced malaria transmission: a qualitative study in Zanzibar. *Malar J* 2013; **12**: 75.
- 46 Liu X, Hotchkiss DR, Bose S. The effectiveness of contracting-out primary health care services in developing countries: a review of the evidence. *Health Policy Plan* 2007; **23**: 1–13.
- 47 World Health Organization Maximizing Positive Synergies Collaborative Group. An assessment of interactions between global health initiatives and country health systems. *Lancet* 2009; **373**: 2137–69.
- 48 Reaching the poor with health services: Cambodia. The World Bank, 2007. <http://siteresources.worldbank.org/INTPAH/Resources/Reaching-the-Poor/RPPBriefsCambodiaREV.pdf> (accessed 2 Jan 2014).
- 49 Gosling J, Mintzberg H. The Five Minds of a Manager. *Harv Bus Rev* 2003. http://www.tree4health.org/distancelearning/sites/www.tree4health.org.distancelearning/files/readings/The%20Five%20Minds%20of%20a%20Manager_0.pdf (accessed 18 Oct 2013).