Approaches for mobile and migrant populations in the context of malaria multi-drug resistance and malaria elimination in the Greater Mekong Subregion

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Front cover: Migrant worker temporary housing in a rubber plantation, Attapeu province, Lao Peoples Democratic Republic. Photo credit: Dr Bousay Hongvanthong

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Acronyms

ACT	artemisinin-based combination therapy
AIM	Action and investment to defeat malaria 2016-2030
ASEAN	Association of Southeast Asian Nations
BCC	behavior-change communication
BMP	border malaria post
CAP Malaria	Control and Prevention Malaria project
CBM	cross-border malaria
CSR	corporate social responsibility
DOT	directly observed treatment
EDAT	early diagnosis and treatment
ERAR	Emergency Response to Artemisinin Resistance in the GMS
GMS	Greater Mekong Subregion
GPARC	Global plan for artemisinin resistance containment
GTS	Global technical strategy for malaria 2016–2030
HIA	health impact assessment
HiAP	Health in All Policies
IEC	information, education and communication
ILO	International Labour Organization
IOM	International Organization for Migration
IRS	Indoor residual spraying
IPC	interpersonal communication
ITN	Insecticide-treated mosquito net
JUMINA	Joint Initiative on Mobility and HIV/AIDS
KAP	knowledge attitude and practices
LLINs	long-lasting insecticidal net
MC	Malaria Consortium
MMPs	mobile and migrant populations
MMWs	mobile malaria workers
MoU	Memorandum of Understanding
MDR	multi-drug resistance
OSH	occupational Safety and Health
PCR	polymerase chain reaction
PPM	Public Private Mix
PPP	Public Private Partnership
PRA	Participatory Rural Appraisal
PSI	Population Services International
P. falciparum	*Plasmodium falciparum*
P. vivax	*Plasmodium vivax*

RBM	Roll Back Malaria
RDS	Respondent Driven Sampling
RDTs	rapid diagnostic tests
UHC	Universal Health Coverage
USAID	United States Agency for International Development
VHW	village health worker
VMW	village malaria worker
WHA	World Health Assembly

Summary of key points

- Artemisinin resistance has been confirmed in the Greater Mekong Subregion (GMS), emerging in the same location as resistance to earlier anti-malarial drugs. Drug resistance has hastened the commitment of GMS countries to eliminate malaria by 2030.
- Population mobility is a key priority for addressing drug resistance, but a range of challenges has inhibited the capacity for countries to effectively engage Migrant and Mobile Populations (MMPs). New strategies are currently underway and should be evaluated, refined and replicated across the region.
- Population mobility in the GMS is strongly associated with shifting land use, including large rural infrastructure projects and agricultural industries that attract migrant labor and influence human-vector contact.
- The epidemiology of malaria in many parts of the GMS is shifting toward adult migrant men who are exposed to vectors through high-risk work in the forest or on construction sites, and who have variable access to health services.
- Outdoor biting mosquitoes present a major challenge for vector control for MMPs working at night or sleeping outdoors and forest-fringe communities.
- Border communities, ethnic minorities and forest-fringe communities are strongly impacted by mobility. Programs should approach mobility as a system involving multiple demographic groups.
- Mechanisms should be in place for soldiers and other special groups, and risk reduction strategies should be established to prepare for disasters.
- Containing artemisinin resistance and eliminating malaria in the GMS will require a future-oriented and cross-sectoral response, involving non-health government agencies and the private sector. Cross-sectoral commitments to address the links between malaria transmission and shifting land use will play an important role in responding to drug resistance and achieving elimination in the GMS.

Key recommendations

Build a foundation for cross-sectoral collaboration in elimination. Population mobility in the GMS is strongly associated with shifting land use. Programs should be proactive in establishing relationships with non-health government agencies including ministries responsible for forestry, agriculture, mining, roads and infrastructure and the military. Programs should develop partnerships with major private sector investors and employers of migrant workers, and with major regional actors such as ASEAN and the Asian Development Bank. These agencies should be made aware of the malaria risks associated with shifting land use and be engaged as partners in mitigating these risks. The GMS would benefit from establishing a Memorandum of Understanding for cross-sectoral collaboration in the context of malaria elimination. The Mekong Basin Disease Surveillance (MBDS) could be one possible existing platform in this regard, having already the commitment of ministers of health of the GMS for disease surveillance and response.

Develop targeted activities to reach out to MMPs. Programs should clearly identify and describe MMPs at risk of malaria including their locations and seasonal behaviour patterns so as reach the most at risk groups through intensified activities in key foci and develop targeted interventions to reach others. Any risk profiling should be triangulated with clinical data and based in evidence, and programs should be cautious of disproportionately blaming migrants for a range of challenges. Activities can be implemented to prevent, detect and treat malaria at all stages in mobility systems (pre-departure, transit and destination), including at work-sites and local communities. Many promising pilot projects are underway and programs should evaluate, document and share experiences to identify approaches that can be scaled up and used as models across the region.

Interventions should be timed with seasonal mobility, especially if seasonal mobility coincides with vector breeding cycles and peak periods for transmission, **or is associated with practices known to increase malaria transmission** such as deforestation or slash-and-burn agriculture. Many GMS countries collect data on internal migration in the census, and through other planning activities.[1] Surveillance should be in place to guard against outbreaks of malaria in urban areas, or in lower prevalence parts of the country that attract migrant workers. This is of particular importance where seasonal mobility patterns move to, through or from an area with confirmed drug resistance.

Develop and scale up migrant-friendly health services. In addition to developing targeted interventions, programs should quickly scale up existing evidence-based interventions in areas where artemisinin resistance has been confirmed. Programs should expand health care in remote regions undergoing population growth, and introduce mobile clinics, mobile malaria workers and employer-supported Early Diagnosis and Treatment (EDAT) in high transmission foci without adequate health services. Programs should shift toward migrant-friendly approaches to health care and identify ways to reduce disincentives to seeking health care. Cross-border collaboration at national and local levels of government supports migrant-friendly health services in border regions. Ensuring quality EDAT for MMPs should be a priority in addressing drug resistance and the malaria elimination agenda.

Programs should ***identify the operational challenges*** that impede their engagement with MMPs and identify the capacity building needs that will enable them to better address these operational challenges. Programs should issue statements informing other sectors of the risks surrounding drug resistant malaria, in order to ***support changes in the broader policy environment*** that will improve health outcomes for MMPs, for example, including measures to facilitate documented cross-border mobility and to ensure sufficient housing for migrant workers. Programs should ***advocate for adequate human and financial resources*** to enable them to scale up activities to address malaria elimination in areas of high population mobility. This involves building a business case for malaria elimination with multiple stakeholders involved in the effort. Donors should ensure that funding restrictions do not inhibit the capacity of countries to respond to population mobility through cross-sectoral work and the trial of innovative strategies, and should provide a funding environment to allow countries to eliminate malaria.

Strengthening program activities to engage mobile populations. Population mobility requires innovative new strategies to extend program reach and adapt to a changing malaria landscape. At the same time, programs should scale-up program activities in areas of high population mobility, especially in sites of confirmed drug resistance. To avoid unnecessary duplication and fragmentation, programs should carefully identify which population groups can be engaged through intensified program activities, and which require targeted interventions. Pilot projects currently underway should be evaluated, documented, refined and where successful replicated in similar contexts elsewhere in the GMS.

1 Introduction

The emergence of multidrug resistant malaria in the Greater Mekong Subregion (GMS) has been identified as an emergency issue that may have catastrophic consequences on the future of malaria elimination in the GMS and globally. Approximately 326 million people live in the GMS, and this large population could be directly affected by the development of drug resistance in the subregion. Drug resistance may carry major public health consequences if it leads to an increase in malaria morbidity and mortality.

In recognition of the urgent nature of this problem, the WHO launched the Global Plan for Artemisinin Resistance Containment (GPARC) and established the Framework for Emergency Response to Artemisinin Resistance (ERAR).[2] In collaboration with the Ministries of Health of GMS countries and other development partners, WHO established a bi-regional hub in Cambodia, and advocated for political and financial support to address artemisinin resistance. Among other funders, The Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) responded with the launch in March 2013 of the Regional Artemisinin Resistance Initiative with an initial commitment of USD 100 million.

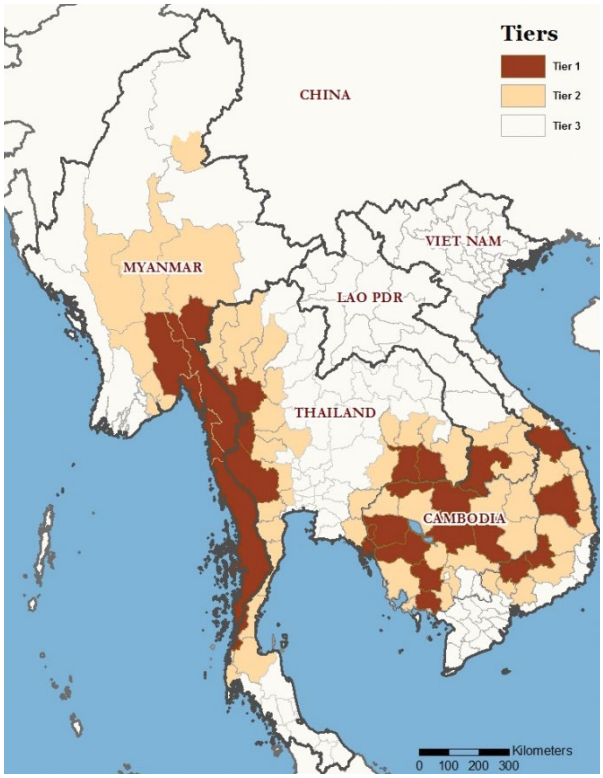
Population mobility has been identified as an important concern in the context of multidrug resistant malaria:

- GPARC identified population mobility as a priority area requiring immediate action, especially areas of multidrug resistance including ACT resistance, and in other areas, which are geographical connected through human population movement, and therefore may be affected by the possible spread of drug resistance *(Figure 1).*
- has the potential to reverse the gains that have been made by GMS countries within the past decade., since the GMS is known for its highly porous borders, since resistance to earlier anti-malarial drugs also emerged in border regions of the GMS countries,
- population mobility in the GMS is expected to increase with the formation of the Association of Southeast Asian Nations (ASEAN) Economic Community.[3]
- **Some migrant and mobile populations (MMPs) are highly vulnerable to malaria due to the number of factors and yet may not have adequate protection through established malaria interventions**.
- In addition, population mobility is widely recognized as a key factor leading to the **importation of parasites, which could jeopardize national and regional elimination efforts** by possibly leading to the generation of secondary cases.
- requires immediate attention to mitigate the risk that drug resistant parasites may spread and that importation of cases from other parts of the GMS or from /to regions further afield that are connected to the GMS through air travel, including Sub-Saharan Africa.[4]

Given this context, multi drug resistance including ACT resistance, has helped to facilitate political commitment to eliminating malaria from the GMS, and countries are now committed to a shared goal of eliminating malaria from the GMS by 2030. In its resolution **WHA68.2, the World Health Assembly in May 2015 adopted the WHO Global Technical Strategy for Malaria 2016–2030, outlining in addition targets for malaria 2016–2030. Based on this global strategy, the Strategy for Malaria Elimination in the Greater Mekong Subregion 2015–2030 was developed. The ultimate goal of this strategy is to eliminate malaria by 2030 in all GMS countries and, considering the urgent action required against multidrug resistance in the GMS, to eliminate *Plasmodium falciparum (P. falciparum)* by 2025. In areas and countries where transmission has been interrupted, the goal will be to maintain malaria-free status and prevent reintroduction, with particular emphasis on tackling the growing problem associated with imported malaria.**

Between 2011 and 2014 the WHO and partners facilitated thirteen GMS cross-border meetings and workshops, and momentum is growing to support countries to develop technically sound strategies among at risk MMPs, especially along national borders where the burden of malaria is higher, and in locations where artemisinin resistance has been detected or suspected.[5,6,7] Cambodia and Myanmar have developed specific national malaria strategies for migrant and mobile populations, while other GMS countries have also made commitments to addressing population mobility within their national strategies.

Figure 1: WHO Artemisinin Resistance Tier Map: Updated February 2015



The purpose of this document is to bring together the central concerns related to malaria and population mobility in the GMS, in order to assist countries to identify priorities surrounding population mobility and take action to respond to population mobility. This is intended as a future-oriented document that encourages countries to develop proactive initiatives to respond to emerging mobility trends in the region. Mobility patterns in the GMS are now better understood, and are transforming in ways that correspond with economic and environmental changes and that can be plausibly forecast and factored into planning. Since drug resistance has the potential to develop rapidly, malaria elimination agencies should become more proactive in reaching out to MMPs and in factoring major shifts in the emerging socio-economic context of malaria into planning.

After discussing some general issues concerning population mobility and malaria in the GMS, this document goes on to discuss how programs might incorporate special activities to engage MMPs into established, evidenced-based program activities. **In this way, this report aims to provide a practical tool for national program managers and program staff working with mobile populations to identify areas for action, and to integrate issues of population mobility into their national strategies and ongoing broader program activities aimed at stopping the development of drug resistant malaria and eliminating malaria from the GMS.**

2 Background

2.1 Human population movement as a factor in malaria transmission

Human population movement has spatial, temporal and demographic dimensions, and is driven by a range of social, economic and environmental drivers. These include: transforming rural economies; poverty and uneven economic development; political conflict; natural disaster; deforestation, drought and other environmental factors; and the development of new industries that attract migrant labor. Population mobility **can be internal or cross-border; and involves rural-rural flows; rural-urban flows and urban-rural flows, all of which present different risks in relation to malaria transmission** at origin, during transit and at their point of destination.[8,9]

Human population movement has often been described as a risk factor for malaria, especially in the emergence of drug resistance[10]. Highly mobile MMPs may not stay in an area long enough for a full course of treatment, which may contribute to relapse, onward transmission or the development of drug resistance. Similarly, there is concern that MMPs may return to work as soon as symptoms subside, which may decrease drug compliance and add to drug resistance. The quality of antimalarials accessed through preferred channels of the informal private sector at origin, transit and at destination is also a concern.

Human population movement from higher transmission areas risks reintroduction and resurgence in malaria-free receptive areas, and has undermined elimination efforts in the past[11],[12],[13],[14] **when programs eventually need to become more focused on managing imported malaria.**[15]

The literature gives a strong focus to illegality, and to MMPs that move rapidly across space, while less attention has been paid to the **large, internal population movements** that also shape malaria transmission.[16] While economic differences between countries drive cross-border mobility, the largest population movements in the GMS are internal rather than cross-border and this internal mobility should also be considered when developing integrated strategies. These population movements include rural populations working in the cities in the dry season and returning to their homes in the rainy season; urban populations returning to their home communities to help with planting or harvests; and rural populations moving between various districts to do seasonal work in more than one agricultural or construction role. In Lao Peoples Democratic Republic, for example, mobility can become concentrated in particular micro localities, such as towns that act as both sources and destinations of MMPs. These are not always in border regions, illustrating that the specifics of local economies and infrastructure have a greater impact on migration than proximity to an international border. This may involve **movement between areas with lower or higher receptivity, lower or higher transmission, and travel to or through an area where drug resistance is present.**

Migrant workers are highly likely to have increased exposure to vectors if they sleep outdoors or in poor quality housing, or if they work at night.[17] In many GMS countries there is concern about 'forest malaria', although there **are strong interconnections between forest goers and forest-fringe and border communities.**[18,19] **Outdoor breeding and outdoor biting vectors present a major challenge to GMS countries in general, including in forest-fringe and border communities affected by population mobility**.[20] To compound this, there is evidence that MMPs often have a poor uptake of bednets, hammock nets, repellents and protective clothing while working outdoors or while on the move, raising questions about how to develop effective vector control in these situations.[21] The poor labour rights and housing conditions of many migrant workers greatly exacerbate these health risks. MMPs often work in "dirty, dangerous and disliked jobs", often for a very low income, and with limited ability to negotiate better working conditions.[22] The economic necessity to earn a living may mean that MMPs may be prepared to risk malaria in order to earn even a small income through high-risk work.[23]

2.2 Towards a conceptual framework for addressing population mobility

There are a number of steps that programs should take in order to develop a more active response to population mobility. Preliminary steps toward this involve:

- Clarification around definitions and categories of MMPs most relevant to malaria transmission
- Sharing knowledge to identify mobility drivers and points of intervention
- Developing proactive, cross-sectoral responses to population mobility
- Identifying the operational challenges involved and building capacity to address gaps in program capacity
- Expanding health care in remote areas and developing migrant-friendly approaches to health care and targeted interventions

Firstly, there is a need to more **clearly define MMPs and to clarify the contexts in which mobility presents a significant risk to malaria transmission**. The term MMP brings together a diverse range of population groups including displaced persons, documented and undocumented migrant workers, seasonal agricultural workers, border communities, forest-dwelling indigenous groups, tourists, students, soldiers and many other groups. Since the degree of malaria risk faced by each of these groups is highly heterogeneous, it is important for country programs to accurately identify the extent of malaria risk faced by various types of MMPs and to develop much clearer terminology *(Annex 1)* to identify groups at increased risk of malaria.[24] **Clearer definitions will help to prioritize interventions, facilitate cross-border discussions and ensure clarity and accuracy in messaging. Approaches need to avoid unnecessary program duplication by grouping together subgroups of MMPs that can be engaged through similar interventions** *(Annex 2)*.

Important considerations:

- some MMPs (such as rural-urban flows) are less relevant to malaria transmission, while others (such as soldiers) should be engaged through special processes.
- some of the groups described as mobile are in fact relatively sedentary border or forest-fringe communities or ethnic minorities that are grouped together with MMPs as they engage in low levels of culturally normalized mobility and are seen as hard-to-reach due to remoteness or cultural barriers. These groups are part of broader mobility systems, but should be engaged through different strategies compared to those for highly mobile MMPs.
- progress needs to be made toward a more accurate framework for identifying the malaria risks associated with various types of mobile populations. For example:
  - Cambodia is developing an index to identify mobile populations at risk of malaria,[25] while
  - Myanmar has categorized MMPs into subgroups that may be engaged through similar strategies.[26]

Recent studies have identified the social and economic factors that shape malaria risk in and within each GMS country.[27,28] Most of these studies also show working or sleeping in the forest at night to be a very high risk factor, which often translates to place poor, young adult migrant men at high risk of malaria.[29,30,31] These **risk factors vary from site to site** however, and it is important to remember that the families of migrant workers and forest-goers, forest-fringe communities, border communities, ethnic minorities and other demographic groups are also at ongoing risk of malaria.

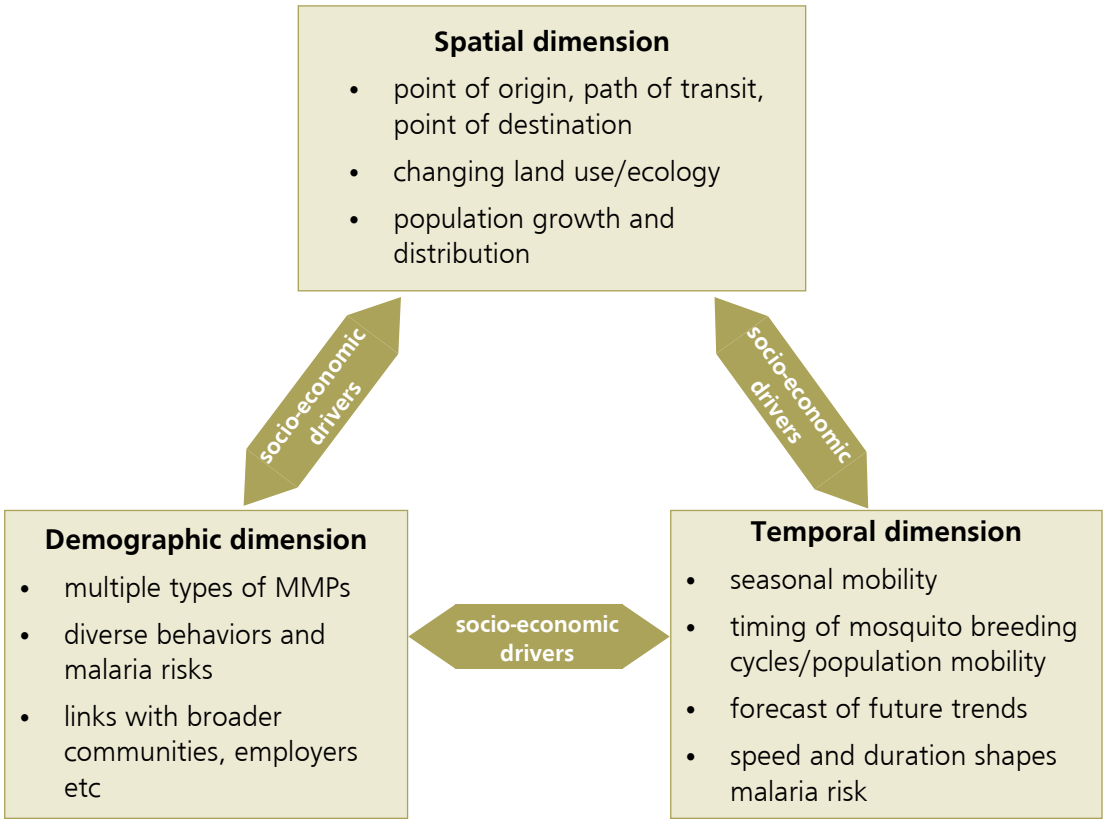
Secondly, there is a need to **share knowledge to identify mobility drivers and to recognize mobility as "a system involving multiple demographic groups, localities and intersecting socio-economic processes"**.[32] **Programs should design interventions "at all points of a mobility system."**[33] *(Figure 2)*. This includes the point of origin, for example through engaging with families and home communities of migrant workers; along the path of transit, such as towns near official and unofficial border crossings, market towns; and at the point of destination, including construction sites, plantations or districts that are recognized as common destinations for migrant workers and displaced persons. This approach may lead to scaling up program activities in areas of multi-drug resistance including ACT resistance and locations that are seen as integral points of access to mobile populations, contribute to more efficient use of resources for malaria control and to higher impact.

Important considerations:

- Large numbers of migrant laborers and seasonal agricultural workers move to well-defined locations and move along routes that are well established. The **timing of cyclical or seasonal migration related to agricultural work can often be predicted and should be factored into planning, especially if population movements correspond with vector breeding cycles and peak periods of transmission**.
- The sources, paths of transit and destination points of population movements can be obtained from **census data, interdisciplinary research and other documentation obtained through cross-sectoral collaboration** (accessed through engagement with non-health government agencies such as ministries responsible for economics, planning, agriculture, roads, transport, immigration and the military; together with aid organizations with expertise in mobility such as the IOM and the ILO)**, that can allow mobility networks can be mapped, integrated into spatial mapping of malaria incidence, and used to inform program stratification**.[34,35,36] To develop a timely and accurate malaria elimination strategy it is **also essential to develop strategies that are future-oriented**.
- Although MMPs are often described as living in very remote and hard-to-reach areas, rapid rural economic development and improved roads and transport infrastructure mean that MMPs often work in areas that are well connected into broader mobility pathways and that are undergoing population growth.[37]

Third, programs should build a foundation for **developing cross-sectoral collaboration** with non-health government agencies and the private sector in containing drug resistance and eliminating malaria. Once cross-sectoral commitment is gained, programs will be able to develop a broader policy environment that is conducive to eliminating drug resistant malaria.

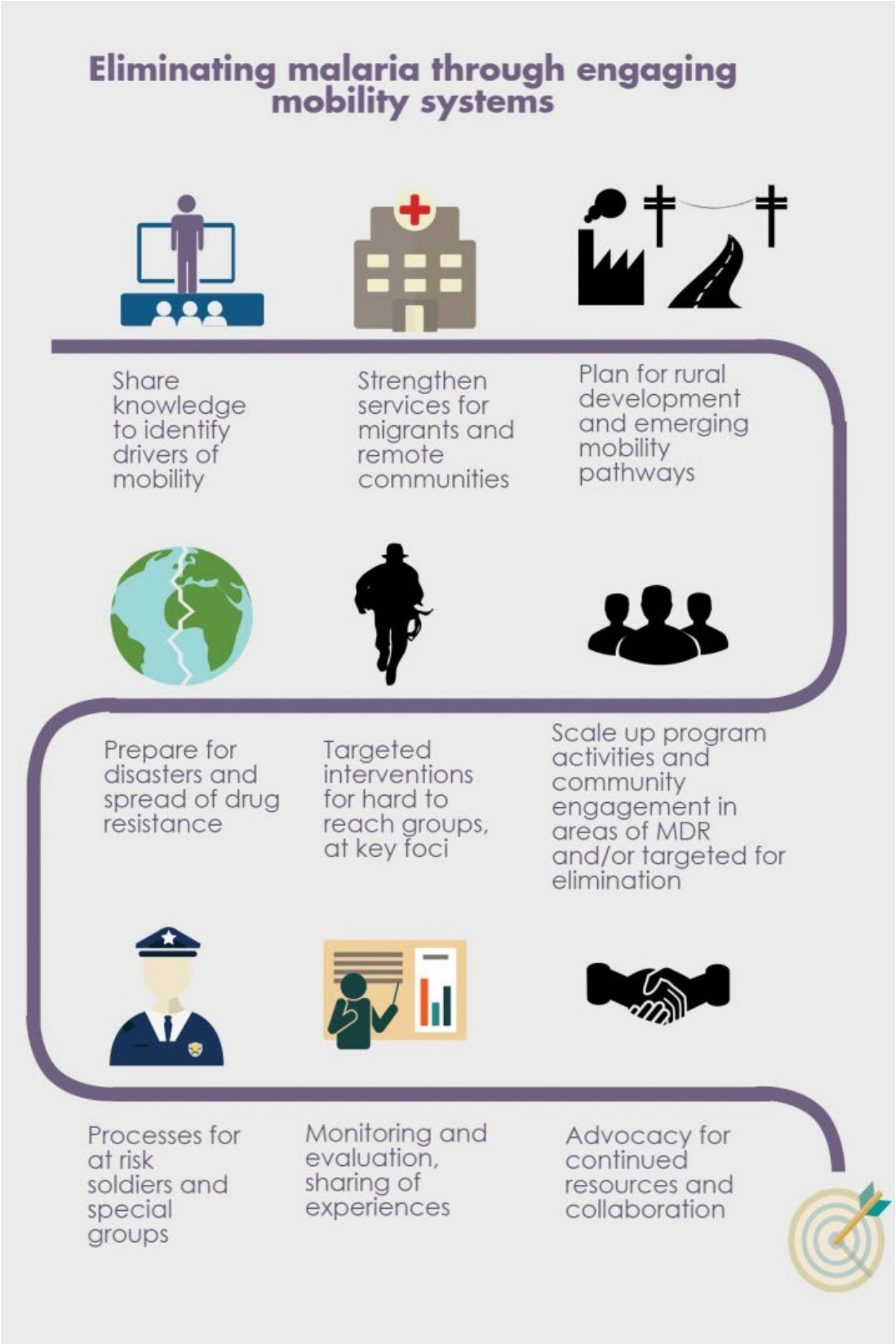
Figure 2: Mobility as a system



Important considerations:

- Non-health government agencies and major private sector actors should be briefed on the malaria risks that are associated with the activities they oversee, and engaged as partners in collaborative efforts to eliminate drug resistance.
- Engagement can be through **formal or informal mechanisms**, ie with non-health government agencies by incorporating published social and economic data into program strategy, through periodic consultations/meetings/exchange of information or **more formal engagements that adopt multisectoral involvement in malaria programs and strategy**.
- This might involve activities such as incorporating malaria risk assessments into rural development planning, removing disincentives for MMPs to seek health care, and developing private-public partnerships to implement interventions at the worksites of employers of migrant workers *(Figure 3)*. It is also important to stay focused on the development of drug resistance and malaria elimination at the regional level and ***to continue cross-border collaboration***, even as each country addresses its own unique challenges.[38]

Figure 3: Eliminating artemisinin resistance through engaging mobility systems



Fourth, in addition, **population mobility should also be understood as an operational challenge** facing malaria programs. Steps should be taken to **identify the capacity building and funding needs** that programs have in order to strengthen their responses to population mobility.

Important considerations:

- For example some operational difficulties surrounding MMPs that require more effort include:
  - the challenges of accessing remote areas;
  - a lack of general health services in remote and border areas where malaria is still a burden;
  - the difficulties of initiating cross-sectoral collaboration within malaria control and elimination;
  - the sensitivities that may surround cross-border data sharing; and
  - the challenges of cross-border collaboration in areas where neighboring countries may have significant differences in reporting processes, treatment regimens, funding environments and program priorities.

Countries should also consider ways to remove disincentives to seeking health care. For example, processes for seeking documented mobility can be complex and expensive, which in some instances inadvertently encourages undocumented population flows.[39] In such cases **improving processes for documented migration will likely increase the proportion of documented migrants and make migrant health easier to manage**.

Fifth, there is a need to **develop a more migrant-friendly approach** (*See section on – Early diagnosis and treatment, Expand migrant-friendly health services)* to addressing population mobility.

Important considerations:

- The current perception of mobile populations as "reservoirs of infection", and a threat to public health may add to the stigmatization and marginalization that many migrants already experience.[40,41] In many cases MMPs lack access to services due to non-citizenship, while others may avoid services due to fear of deportation, poverty, economic disincentives to seek care, or cultural or language barriers or due to complacency surrounding malaria risk. Extending quality health care, and especially access to quality assured EDAT to MMPs should be a core priority of addressing population mobility in the context of drug resistance.
- Malaria programs could adapt many of the lessons learned by HIV/AIDS programs that set aside issues of illegality, identify risk situations rather than risk groups that will help to reduce blame, and develop accurate messaging that engages a range of demographic groups.[42,43] Following the IOM's recommendations of supporting migrant-friendly health care will help to engage MMPs while also supporting broader goals of malaria elimination.[44,45]

3 Strengthening program activities to engage mobile populations

3.1 Malaria prevention through health promotion

Malaria control and elimination will become more sustainable in the long-run if successful health promotion strategies empower communities to prevent malaria and to engage in positive health seeking behaviors[46]. Behavior Change Communication (BCC) is a core component of health promotion that involves a range of activities designed to increase the knowledge of populations surrounding malaria transmission, decrease high-risk behaviors of populations and increase the uptake of positive behaviors that help to prevent malaria on a population level.

Importance

In the context of multi-drug resistant malaria and malaria elimination, effective health promotion is essential to:

- promote high levels of prevention, EDAT and drug compliance,
- ensure that communities in areas of high population mobility do not become complacent about malaria. This may be particularly important in low transmission areas where malaria is increasingly scarce, but where drug resistance is present.

Forest goers, Southern Lao PDR

- inform MMPs about the reasons for increased surveillance and response activities aimed at MMPs, and help to build community engagement and support for program activities in pre-elimination settings or foci of low transmission.
- change behaviors that have a particular impact on drug resistance, such as drug compliance, in addition to promoting malaria prevention and therefore reducing malaria through positive health seeking behaviors.
- in some cases, targeted BCC including the use of interpersonal communication (IPC), help to reach out to MMPs that are not engaged through broader health promotion.[47]

Challenges

Extending health promotion to MMPs can be challenging for a number of reasons:

- health promotion can be difficult in multilingual contexts, which is common in the GMS amongst both cross-border migrants and ethnic minorities in border regions.[48]
- general health promotion messages may not reach MMPs if they have limited access to mass media, either due to remoteness, literacy or language differences or lack of electricity.
- if MMPs have limited access to health care, they are less likely to receive accurate health information from clinics or community health workers and may not be aware of the risks of self-medication or delayed treatment
- MMPs may have misunderstandings of malaria that are informed by cultural views of febrile illness, which is problematic if it leads people to delay treatment.
- MMPs may have moved from a location with lower or higher levels of transmission, so that their exposure to previous health promotion elsewhere may distort their understanding of the risk they face in the new context in which they live. This is particularly important to consider in an area like the GMS where malaria transmission can differ significantly even across a short distance. MMPs often have limited uptake of

bednets while on the move, especially if working at night or sleeping outdoors where bednets are less practical.[49]

- since many MMPs at risk of malaria are poor, economic disincentives to malaria prevention such as the cost of repellents can be considerable barriers.[50] While other program efforts should aim to decrease these disincentives, health promotion that encourages MMPs to take up positive health behaviors despite these barriers is vital.

Approaches

1. ***Surveys and/or studies*** targeted at MMPs to identify the extent to which they have access to general health promotion can help, so that programs can prioritize the use of resources and carry out targeted activities only when necessary. In addition to providing data on which to base health promotion strategies, studies can also act as a tool to evaluate the effectiveness of health promotion in a given area or target group.[51] Various methodologies are used to measure population-based indicators, mapping where vulnerable MMP live and work and how many are there at different seasons, to service quality and effectiveness (including BCC) in strengthening continuity of prevention and treatment services:
    - In its simplest form, KAP studies and PRA used at the local level can be used as a planning tool to generate data through which to develop program activities.
    - Respondent driven sampling is a methodology that utilizes social networks to reach out to MMPs, and has been used to reach out to MMPs and deliver health messages[52].
    - Essentially, we need to know where and how many people are at risk of malaria, not just now but during the life cycle of current program plans and national strategies.
    - We also need to know more about population movements, living and working conditions, access to services, and knowledge and behavior so as to tailor communication to special populations.

    The reader is directed for detail guidance to the recent publication '*Decision-tree framework for selecting study methods for malaria interventions in mobile and migrant populations'* WHO, SEA-MAL-278.
2. ***Multi-lingual health promotion*** may be useful in areas where MMPs do not receive mass-media messages due to language and literacy barriers, but where MMPs do have exposure to mass media. In addition to language, other factors to consider include accent, gender and the cultural applicability of the content and medium of messages. Pictorial mass-media materials may be effective in highly linguistically diverse contexts, where levels of literacy are low, and to engage cultural groups that rarely engage with the written word. Interpersonal Communication Campaigns (IPC) are also important to engage population groups where written and published materials are less effective.
3. The use of ***peer educators*** may be a highly effective strategy to extend BCC to MMPs. For example, programs could:

- **establish a network of workplace based peer educators** to reach out to fellow workers to deliver information about the malaria risks associated with their particular occupation, and to encourage their peers to use prevention measures such as bednets, repellents and long sleeved clothing. This is a particularly suitable strategy for semi-permanent locations attracting MMPs such as rubber plantations and should be considered as an important strategy to reach these groups of MMPs.
- MMPs prefer to receive health messages **from older and respected members of their peer group**[53]. Highly successful programs carried out by HIV/AIDS programs targeting undocumented migrants and highly mobile or hard-to-reach groups such as people involved in illegal logging, suggest that, peer educators are particular effective strategy for use amongst hard-to-reach groups.
- Specialized approaches to BCC such as **positive deviance** initiatives offer specific strategies through which peer educators may improve the uptake of malaria prevention measures amongst others in their communities, including MMPs.[54]

4. **Interpersonal Communication Campaigns (IPC)** can be used to deliver highly tailored messages to particular individuals or small groups of MMPs. This may be carried out by:
   - village Malaria Workers or peer educators, and could be implemented at health care centers implementing other health services,
   - at village meetings, or in places of work.
   - peer educators can also use IPC to promote malaria prevention amongst their peers, for example, by malaria focal points at worksites of migrant workers.
5. Programs may also use ***social networks*** to extend messages to highly mobile or hard-to-reach MMPs such as illegal loggers. For example, one program in the Philippines drivers to deliver health messages to MMPs working near their townships, and to offer free transportation to MMPs needing to access clinics in a nearby township.[55] This was achieved through strong community engagement with a township in an area of high population mobility that established community ownership of local malaria control activities. This illustrates the value of engaging communities involved in mobility systems, in addition to MMPs themselves.

BCC initiatives should be evaluated, and successful methodologies should be developed that can be adapted and replicated in various contexts across the GMS. Indicators for evaluation include results of post-intervention surveys compared to base-line surveys, rates of uptake of prevention measures such as bednets, hammock nets and long-sleeved clothing, and qualitative research with those implementing activities (peer educators, VMWs etc) and with the MMPs.[56] Programs should document and share the results of these pilot projects, and identify successful strategies that can be scaled-up or replicated in other parts of the sub-region.

Box 1: Strengthening malaria prevention through health promotion amongst MMPs in the context of multi-drug resistance and elimination

- Essential to **promote high levels of prevention**, in communities of high population mobility not just in high but in low transmission areas where drug resistance is present.
- Effective health promotion can help to b**uild community engagement and support for increased surveillance and response** program activities **in pre-elimination settings or foci of low transmission.**
- KAP, PRA, RDS etc at the local level can be used as a planning tool to generate data through which to develop program activities to reach out to MMPs and deliver health messages. In addition to language, other **factors to consider include accent, gender and the cultural applicability** of the content and medium of messages.
- The use of **interpersonal communication (IPC)** can help to reach out to MMPs that are not engaged through broader health promotion (workplace based peer educators to reach out to fellow workers; in communities from older and respected members of their peer group etc).
- Successful programs carried out by HIV/AIDS programs targeting undocumented migrants and highly mobile or hard-to-reach groups such as people involved in illegal logging, suggest that, **peer educators (IPC, Positive Deviance) are particular effective strategy for use amongst hard-to-reach groups.**
- Social networks extending to highly mobile or hard-to-reach populations **need to establish links to community engagement** as part of strengthening mobility systems.
- For BCC and other health promotion activities to be effective, it is important to also **strengthen community engagement** to create a sense of community ownership in malaria control activities.
- **BCC initiatives should be evaluated**, and successful methodologies should be developed that can be adapted and replicated in various contexts across the GMS

3.2 Early diagnosis and treatment

Early diagnosis and treatment (EDAT) is a cornerstone of malaria control and elimination globally, and GMS countries have traditionally sought to deliver EDAT through strengthening public sector health services. EDAT is essential to:

- reduce the severity of symptoms and helps to reduce deaths.
- reduces the parasite reservoir and lowers the risk of onward transmission, which is of particular concern in an elimination or pre-elimination setting.

- In the context of drug resistance, helps to safeguard drug efficacy by reducing self-medication or the diagnosis based on clinical features alone, and improving drug compliance.

Challenges

Population mobility poses a number of challenges to delivering effective and quality EDAT.

- Since EDAT is generally administered through the public health sector, it is sometimes not available to remote communities and MMPs in remote areas where health services are often lacking and thus may make MMPs more likely to self-medicate or to miss out on treatment all together, both of which are understood to contribute to drug resistance and onward transmission of malaria.
- While GMS countries have banned artemisinin-based monotherapy, if MMPs continue to seek care in the private sector it is possible that they may gain access to substandard or counterfeit pharmaceuticals that may contribute to drug resistance.
- Even when health care is available, migrants and sedentary farmers in remote areas may not be able to afford the cost of travel to health centers in townships.[57,58]
- In some cases undocumented migrants may avoid health authorities for fear of deportation, leading to delayed treatment and increasing the severity of malaria and escalating the risk of transmission.
- Increasingly, countries are introducing the use of directly observed treatment (DOT) in a bid to improve efficacy by ensuring drug compliance and reducing the illegal resale of anti-malarial drugs outside of the public sector.
- Some have expressed concern that the most highly mobile MMPs may have moved on to a new location before a full course of treatment can be completed, although it is important to note that the vast majority of MMPs do not move at such a rapid pace that mobility alone would not allow them to complete a course of treatment.[59,60] However given that the MMPs most vulnerable to malaria are often extremely poor and often have limited labor rights, some MMPs may return to work as soon as symptoms subside and before completing a full course of treatment. Others may have lost their job while sick, causing them to move to a new location to search for new work and increasing the likelihood that they will not complete a course of treatment.

Approaches

GMS countries have agreed on the need to scale-up and improve the quality of EDAT activities for MMPs and have implemented a number of strategies to improve the use and uptake of EDAT to MMPs. These pilot projects are currently being implemented and are described below. Countries should monitor and evaluate these projects, and document and share experiences to enable programs to identify new EDAT strategies.

1. ***Village Malaria Workers.*** A major strategy currently being implemented by several GMS countries is the expansion of Village Health Workers (VHWs) or Village Malaria Worker (VMW) programs, including the training of VMWs to administer Rapid Diagnostic

Tests (RDTs) and EDAT. One of the key concerns surrounding MMPs is that they may be more likely to seek treatment in the private sector. The VMWs are believed to have successfully:

- engaged patients who may have previously sought treatment in the private sector, corresponding with improvement in quality EDAT[61,62].
- are well-suited to extend EDAT into border and remote communities that are currently beyond program reach.
- have long been seen as a beneficial way to expand services in resource-constrained settings, and to improve compliance by engaging a respected community member to deliver health messages and services. For example, there was a reported marked decrease of 81% in annual cases due to *P. falciparum* since 2009 coinciding with, among other factors, a rapid scale-up in VMWs and insecticide-treated bed nets in Cambodia.[63]

However VMWs must be well selected, trained and monitored. For volunteer programs to work effectively, programs must be able to:

- **train and continually engage VMWs,**
- **ensure effective supply chains for RDTs and drugs,**
- **ensure VMWs have good relationships with local clinics and health providers and clear referral processes in place.**
- In the context of drug resistance, rigorous monitoring and evaluation should be in place to **ensure that VMWs are administering treatment according to national guidelines.**

2. ***Mobile Malaria Workers.*** An extension of Village Malaria Worker programs have been the development of Mobile Malaria Workers (MMWs) to reach out to MMPs and other populations with limited engagement with the public health sector. Current examples:
   - *Cambodia* is training MMWs in the use of RDTs and DOT, has an incentive program and ongoing training processes to improve quality and consistency amongst MMWs, and has monitoring and evaluation mechanisms to evaluate the effectiveness of MMWs and eventually scale up the use of MMWs.
   - *Thailand* aims to support MMWs to actively seek out MMPs at their site of employment. Mobile health workers have delivered vital interventions in conflict-affected parts of Myanmar.

   As for VHWs, **MMWs need to be well selected, trained, supported through a performance based incentive scheme and monitored** to evaluate efficacy and to ensure MMP are following national guidelines for EDAT.
3. ***Outreach to MMPs at work.*** In addition to training volunteers to deliver EDAT and other services, there are several ways in which malaria program staff can become more proactive in seeking out and delivering EDAT to MMPs. Strengthening relationships with the private sector may improve the capacity of programs to access MMPs at worksites. For example, engaging owners of construction and agricultural worksites in target foci to

appoint a malaria contact person at each worksite. The focal point would be responsible for helping malaria program staff to administer RDTs and treatment if necessary. This aims to engage the large numbers of **MMPs who work on semi-permanent worksites such as mines, large construction projects and plantations**, while the MMPs working in smaller or informal worksites will be targeted by MMWs and other activities.

4. ***Mobile clinics.*** Another possibility is the use of mobile laboratories and clinics. The strength of the fixed-schedule malaria clinics lie in their quick, on-spot detection of the plasmodium parasite in humans[64]. **Malaria outreach services through mobile services and clinics, especially during peak transmission period, epidemics, in inaccessible areas have shown to be one of the most cost-effective case detection methods for malaria control as a supplement to Passive Case Detection through health facilities**[65]. The periodic or fixed-schedule malaria mobile clinic can run by a microscopist and an assistant who travel by motorcycle with portable equipment (microscope or RDT etc), to a specified area (a local temple, public place, border markets, check points, meeting points of migrant workers, forest trails etc) on a fixed weekly schedule. The clinic is set up in on the scheduled day, and patients for the most part come from the village itself. The day and site of the clinic are advertised through relevant media/ channels and the schedule is adhered closely to minimize disruptions.

    - In Thailand, microscopic facilities introduced through mobile malaria clinic, periodic mobile clinic or fixed schedule mobile clinic (on a fixed weekly schedule) was observed to have **low institutional costs per smear** although relatively high cost per positive case. For patients, periodic mobile clinic had **low community costs** (costs paid by patients and their families). In some circumstances, a combination of central, peripheral malaria clinics and periodic clinics was proved to be cost-effective, maximize access to malaria treatment (thus prevent malaria deaths) and minimize the community costs[66].

    - Studies in Myanmar have shown that in areas of high population mobility where the preferred access to malaria diagnostic and treatment services are not through the public health system, ie midwifes, traditional healers, informal private sector etc, **mobile clinics when introduced then became the first-choice health service provider**[67,68]. The MMA-Malaria project established fixed and mobile clinics and village volunteers. Villages were selected for mobile clinic visits based on malaria incidences and accessibility. One volunteer in each selected village was recruited for the period between the mobile clinic visits. The mobile team and volunteers provided malaria diagnosis and treatment, and confirmed malaria patients were provided with malaria-related health education by using pamphlets and long-lasting insecticide nets (LLIN)[69].

    - Institute Pasteur Cambodia has recently introduced within this concept, the use of a mobile laboratory to carry out real-time polymerase chain reaction tests in remote locations of Cambodia[70] extending high quality diagnostic services into remote areas where it has been deemed necessary to carry out active case detection to look for asymptomatic infections amongst MMPs to prevent imported malaria. Further evaluation is needed to assess how this could assist surveillance and response

activities by rapidly relaying data to the national country program and helping to develop effective active case detection strategies.

5. ***Expand migrant-friendly health services.*** Effective EDAT will be greatly strengthened by expanding health services in remote areas, and by developing migrant-friendly approaches to health care and malaria elimination.[71] This may require:

   - malaria programs to advocate to government agencies **to expand public health sector services** in remote areas,
   - engaging the private sector to develop clinics, programs and other health initiatives at locations that are critical for the containment of artemisinin resistance and elimination of malaria.
   - in parallel, there will also be a need to develop policies that support establishing "One-stop service centres" for migrants to receive information on malaria diagnosis and treatment and LLINs or other protective measures.

   A medium term solution would also be to extend access through malaria clinics, malaria posts and in the case of Thailand scaling up of new **Border Malaria Posts (BMP)** at **official and unofficial border crossing points** to improve the coverage of passive case detection where similar efforts are also made in hospitals with (a) provision of interpreter services and adequate, language-appropriate written materials; (b) delivery of culturally sensitive healthcare; (c) development of health promotion, disease prevention and disease support programmes that are culturally tailored; and (d) availability of cultural support staff both in clinical settings and the community.

6. ***Border health initiatives***. EDAT can also be strengthened by border health initiatives in areas that are of particular concern for the international transmission of malaria.[72] For example:

   - US-AID CAP Malaria has supported the development of several twin-cities programs in the GMS which aim to **facilitate the cross-border referral of patients and to strengthen cross-border collaboration at lower levels of government**.[73]
   - Cambodia and Thailand have both introduced **bi-lingual patient cards** in some border regions to help to ensure adequate treatment follow-up for MMPs who cross international borders during a course of treatment.

Ongoing operational challenges related to case management include increasing access to quality assured EDAT improving patient referral processes (including cross-district or internationally), ensuring adequate quality control of microscopy and RDTs, facilitating effective supply chains of RDTs and drugs, and developing processes to detect and manage drug failure. See the section on *Surveillance and Response* below for a discussion of active case detection, the detection of asymptomatic infections, response to outbreaks and emergencies, and the detecting and reporting of markers of drug resistance.

Box 2: EDAT in the context of population mobility and multidrug resistance and malaria elimination

- The **enforcement of the ban on monotherapies** in the private sector including through informal channels
- A commitment to incrementally scale up **Directly Observed Treatment (DOT) where migrants congregate and/or work sites**
- **Expanded health services** in remote and border areas
- Mobile malaria workers, malaria focal points and peer educators to **proactively** reach out to MMPs
- Engaging the private sector to **improve outreach** to MMPs at work sites
- **Mobile clinics** to extend diagnostic technology into remote areas and worksites
- Strengthening **migrant friendly health services** and border health initiatives
- **Improved health promotion and community engagement** on EDAT in areas of multi-drug resistance including ACT resistance.

3.3 Vector control

Strengthening vector control in the context of population mobility will be a major challenge facing GMS countries in coming years. Over the past decade all GMS governments have scaled-up the distribution of mosquito nets including and long-lasting insecticidal nets (LLINs) or insecticide-treated mosquito nets (ITNs). In addition, most GMS countries like in Lao Peoples Democratic Republic and Viet Nam, use focal IRS as a response to outbreak. As in many parts of the world this widespread distribution of bednets is seen as a key factor leading to the significant reductions in malaria that were achieved by all GMS countries in the past decade.

A young Mon migrant at work tapping rubber, Eastern Thailand

Challenges

However there are a number of challenges facing GMS countries with regards to vector control in general, many of which have special implications for MMPs:

- However the vector ecology of the GMS is complex. Outdoor biting and breeding vectors are difficult to target through bednets and IRS, and some vector species breed in sites that are also difficult to target through larviciding, environmental management and other measures.
- While deforestation in some cases leads to a reduction in primary vectors within forested areas, there is evidence that deforestation has also led to increases in secondary vectors that breed in open or semi-shade areas and that strongly impact upon forest-fringe

communities.[74] At the same time, changing land use is increasing human-vector contact to populations working in forest-based and forest-fringe agricultural industries.[75]

- GMS countries have a large number of outdoor biting vector species, so that there are questions surrounding the efficacy of bednets in areas with outdoor biting mosquitoes, and where vectors are emerging that bite earlier in the evening when people are still active outdoors.[76] This is a particular challenge to controlling forest malaria and malaria in forest-fringe communities, and in preventing malaria amongst MMPs working outside at night.
- There is evidence of inconsistent use of bednets and low rates for the retreatment of bednets, especially amongst MMPs.[77] In particular, there is evidence that mobile populations are less likely to use bednets while they are travelling, including while they are sleeping outdoors or in the forest where they are highly likely to be exposed to vectors.[78] While the reasons for poor uptake of prevention vary, there is some evidence that MMPs less often use mosquito nets as they prefer to travel light, as they do not have housing and therefore have nowhere to hang the net or hammock, or because they are working (and not sleeping) during the evening. In some cases MMPs leave their bednets with their families while working elsewhere, suggesting that it may be important for programs to distribute more than one bednet to MMPs, for example an additional net for use in forest huts.[79]
- Broader reasons for poor uptake of bednets amongst the broader population include heat and discomfort, a preference to sleep outdoors, working at night, a perception that there are insufficient mosquitoes to warrant a net, and the desire the lend the net to others, amongst other reasons. Similarly there is evidence that MMPs have poor or inconsistent update of other personal protection measures, such as the use of insect repellent and protective clothing. Poverty can be a barrier to using repellent.[80]

Approaches

These experiences point to the importance of strengthening health promotion in the use of bednets, hammock nets, repellent and long-sleeved clothing, especially amongst MMPs who sleep outdoors or work at night, who are currently very vulnerable to malaria. This may include:

1. Targeted BCC with MMPs. Such highly tailored strategies might be most suited for MMPs travelling alone or in small groups, or indigenous communities that in some cases respond more favorably to health education from a fellow community member. The emphasis should not just be on the provision but **promotion strategies to increase the use of hammock nets, repellents and other measures while in the forest**. Other strategies might include engaging the private sector in order to introduce a malaria focal point or peer educator at places of work. This is especially useful for engaging MMPs working at medium or large construction sites, mines, farms, and plantations. The focal point would be responsible for distributing bednets, health promotion information and encouraging the use of protective and light-colored clothing[81],[82]. (See section 3.1).
2. The distribution of **forest-packages to MMPs working in the forest**, together with basic health promotion information. Cambodia has trialed the use of a bednet loan scheme for MMPs, that is aimed at improving use of bednets and encouraging peer promotion of the use of bednets[83]. An evaluation of this scheme conducted during

in 2013 assessed access to and utilization of LLINs by migrant workers and explored reasons for non-use with 207 farm owners and 712 workers showed that farm owners were generally satisfied with the LLIN lending model. LLIN uptake among the workers was high, most (93%) had a bed net at their residence, and almost all (96%) reported sleeping under a bed net the previous night. Farm workers said they would be willing to pay a small amount for their own net, suggesting an opportunity for subsidized vouchers for LLINs[84].

3. Vector control activities should also be scaled up in forest and forest-fringe communities, in townships near major infrastructure developments, and in townships that have been identified as key nodes in mobility pathways. Such communities are strongly affected by population mobility and are at ongoing risk of malaria. Local communities in these areas are often strongly interconnected with forest-going MMPs. In some cases the people seen as MMPs may in fact live in these townships. Countries should continue to work towards the aim of **achieving universal coverage and usage of LLINs, ITNs or hammock nets, especially in these forest-fringe communities and in towns that are common transit points for MMPs.** Although bednets may not reach all MMPs, they still provide an evidence-based intervention that helps to prevent malaria amongst many population groups. Strengthened health promotion and community engagement in these townships may facilitate program access to MMPs, as well as strengthening the uptake of vector control within these communities.

4. To stay responsive to shifting vector ecology country programs should continue to build **entomological capacity, and support ongoing basic and operational research** into the control of forest malaria and outdoor biting, and continue to evaluate strategies for increasing the use of hammock nets, bednets, repellents and protective clothing by MMPs.

The reader is adviced to refer to a recent WHO publication where specific recommendations are available '*Vector control and personal protection of migrant and mobile populations in the GMS: A matrix guidance on the best options and methodologies'. WHO, SEA-MAL-280 (2015).* A summary is tabled below.

Table 1: Targeting vector control tools and personal protection measures at most-at-risk-locations (MARL) in the GMS.

Most-at-risk locations (MARL)	Vector control or personal protection measure							
	Mass preventive IRS[53]	Focal IRS	ITN/LLIN/ LLIHNs	House improve-ment	Insecti-cide-treated clothing	Insect repellent	Outdoor space spraying[54]	Larval source manage-ment[55]
Primary or secondary forest			LLIHN		√	√		
Temporary shelters in or near forests or cleared forests			LLIHN	√	√	√		
Plantations, e.g. rubber plantations, cash crops	√	√	ITN/ LLIN	√	√	√	√	√

Most-at-risk locations (MARL)	Vector control or personal protection measure							
	Mass preventive IRS[53]	Focal IRS	ITN/LLIN/ LLIHNs	House improve-ment	Insecti-cide-treated clothing	Insect repellent	Outdoor space spraying[54]	Larval source manage-ment[55]
Fixed settlements, e.g. hydropower projects	√	√	ITN/ LLIN	√		√	√	√
Highway road construction sites			LLIHN, ITN			√		
Open market places			LLIHN, ITN		√	√		
Refugee camps for displaced people	√	√	LLIN, ITN		√	√	√	
Border security check points			LLIN, ITN		√	√	√	

Box 3: Strengthening vector control amongst MMPs in the context of multidrug resistance and elimination

- Scaling up the distribution of bednets or hammock nets to 100% coverage in areas of multi-drug resistance including ACT resistance **depending on population and vector dynamics**
- Distributing **forest-packages** to forest goers, including hammock nets, repellent and information on the benefits of wearing protective clothing and using bednets and repellents consistently
- Engaging the private sector to **establish malaria focal points within workplaces** associated with malaria risk. Train work-based volunteers to promote and distribute nets and encourage MMPs to use measures such as protective clothing
- Encouraging or requiring employers of MMPs on medium and large scale projects to provide **housing that reduce vector exposure for workers sleeping on-site**
- Strengthening IEC/BCC using methods such as **positive deviance, peer educators, and mass media** that is pictorial or culturally and linguistically appropriate
- Implementing **IRS at worksites in high transmission areas**, wherever housing is sufficient for this to be feasible
- Strengthening vector control in forest-fringe communities and in sites that are **identified sources or transit points for MMPs**
- Initiating **community-driven vector control** in forest-fringe communities
- Supporting ongoing research and development into **innovative approaches to the control of outdoor breeding and outdoor biting vectors**
- Maintaining **entomological capacity** within country programs
- Implementing ongoing operational research to **evaluate the impact of vector control interventions, including the uptake of vector control by MMPs.**

3.4 Surveillance and response

Challenges

Progress and Remaining challenges of malaria surveillance in GMS countries:

Progress	Remaining challenges
• GMS countries are increasingly using similar case definitions allowing comparison between countries, provinces and districts in the GMS • an increasing proportion of suspected patients is accurately tested • monthly and annual estimates of the number of confirmed malaria cases; the proportion of confirmed malaria cases that are P. falciparum; and the number of deaths attributed to malaria • improvements in completeness and delays in reporting along with computerized databases and solutions for data entry and analysis	• to support specific and timely decision a local level • routine malaria data are deriving from passive case detection in public health facilities only with little involvement of private health-care facilities and private providers within the system • persisting low health-care coverage and access in remote locations; access to basic health services by mobile populations and migrant workers in some countries • unequal distribution and varying levels of reporting from public health facilities • lack of systematic inclusion of data from other sources such as community malaria workers, private practitioners, traditional healers, shopkeepers, faith-based organizations, and self-treated cases

Approaches

From a strict malaria surveillance and response viewpoint and towards achieving objectives in malaria elimination, the most important issue for a national malaria programme is to define what proportion of their malaria burden is attributable to MMP, and to which MMP groups. The enabling environment in the context of MMPs would include:

1. **Strong health systems and health workforce** are key to drastically reducing both the disease burden and the potential for disease transmission, and, in the context of MMPs and malaria, enable the creation of systems that facilitate the adoption and roll-out of innovative new tools and strategies within the shortest possible timeframe.
2. **Community surveillance** through a network of both volunteers and workers in various settings/environments where MMPs reside/engaged in employment. These networks should be linked to the formal health systems in both service delivery, monitoring and reporting and where relevant, incentives considered.

3. **MMP policies** in the form of existing laws, policies, and legal frameworks (health, labour and immigration) of a particular country as well as other documentation as they relate to or affect the access of migrants (internal, inbound and outbound) to health services, particularly those for malaria.

4. **MMP strategies.** National Malaria Control Programs should identify and incorporate in its planning/strategies, non-health government agencies, key private sector actors, key development actors involved in rural development processes. This would have the objective of having among others, (i) specific suggestions for employers of MMPs to build collaboration in allowing program access to worksites (ii) Memorandum of Understanding for cross-sectoral cooperation in containing drug resistant malaria and malaria elimination (iii) a statement of support for agencies working to improve processes for documented border crossing, making legal migration channels more efficient and accessible to poor migrant workers, and for agencies working to improve labor conditions of migrant workers.

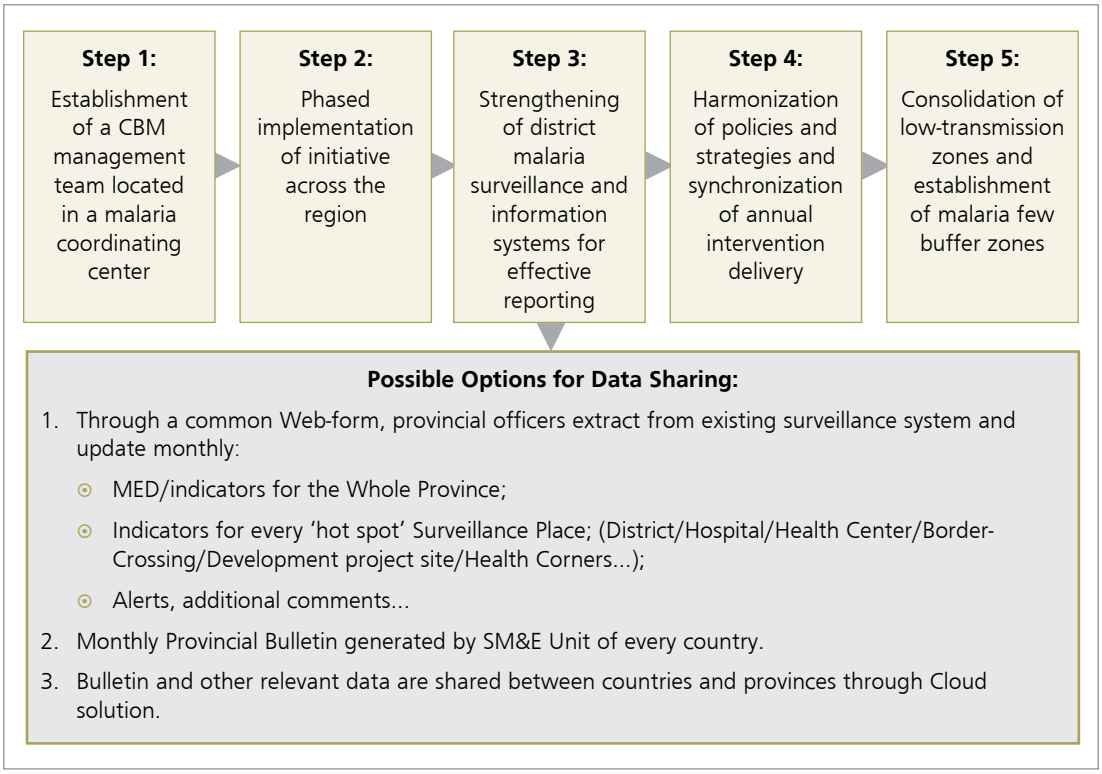
5. **Malaria as a notifiable disease**. This should pertain to countries or group of neighboring countries officially engaged towards malaria elimination and prevention of re-introduction of malaria, malaria (confirmed) should be considered as a "notifiable disease" by all health care providers within and across countries" whatever patients' origin and citizenship.

   In the context of having a 'MMP sensitive' surveillance system within overall program/ health surveillance systems (individual countries in GMS and the sub region as a whole) two important considerations are suggested:

   (i) the definition and set up of the minimum essential data for surveillance *(Figure 4)*; and

   (ii) a cross border malaria (CBM) surveillance and response mechanism.

6. **CBM initiatives**. With the focus increasingly shifting towards malaria elimination, the need for regional CBM initiatives has become of paramount importance in ensuring that the risk of malaria parasite importation is greatly reduced[85]. From the viewpoint of malaria elimination it is important to trace positive and MDR cases across borders, synchronization of key interventions, standardized surveillance, information collection and reporting between all participating countries. Effective management and delivery of a CBM initiative comprises five steps as illustrated below:

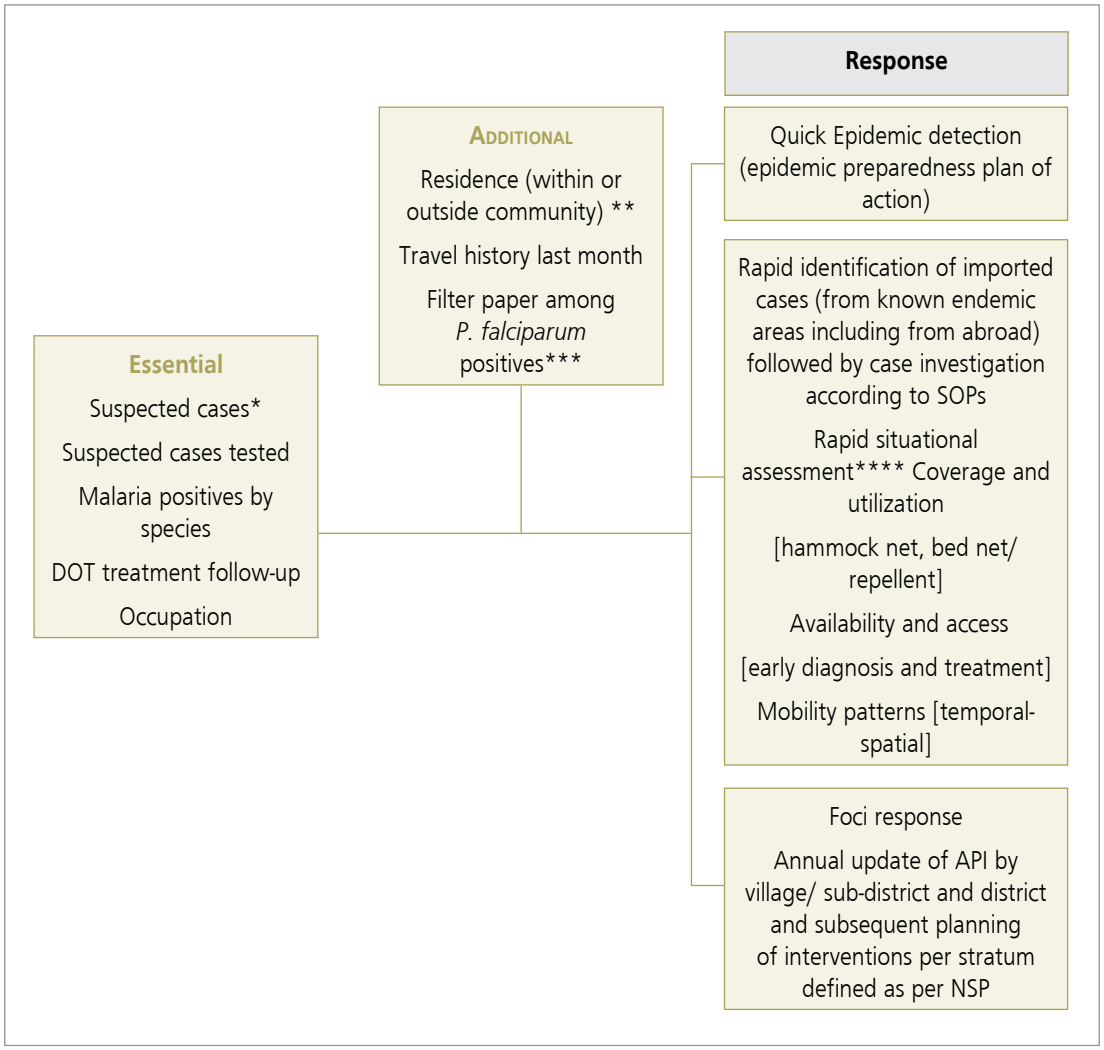


Adapted from Cross-Border Malaria Control An operational manual for joint cross- border malaria control and elimination programs, (draft, WHO 2012)

Suggested basic principles to strengthen malaria surveillance/information system and response within CBM initiatives:

- standardization of case definitions, minimum essential data (see *Figure 4*) and targets to be used in the districts on both sides of the border and agreement on formats and timing of monthly/quarterly and annual reports.
- annual updating of the target populations by various malaria risk groups by the lowest administrative level within the border districts
- existing passive reporting from all health units and community health workers/field malaria workers are recorded in registers with periodic checks for accuracy and completeness.
- weekly and monthly surveillance reports from all health reporting units or sentinel sites are used to monitor early warning for outbreaks and trigger a rapid response to contain through agreed SOPs, any expansion of transmission or contain secondary spread from an index malaria case.
- operational programmatic tracking of the malaria commodities delivered/utilized and in stock and the estimated coverage of the target populations.

Figure 4: Surveillance and response in the context of MMPs and malaria elimination: Building an effective local, national and supranational response from the most essential and routinely generated information: A suggested basic reporting system at peripheral level (at client contact)



* ideally standardized definition needed across countries based on clinical algorithms

** ideally village or at least subdistrict/district

*** first to be implemented in large MMP clusters potentially in big factories, farms, industries, etc.

**** PRA= Participatory Rural Appraisal, rapid KAP= Knowledge, Attitude and Practice; FG=Focus Group; IDI= in depth interview;

Ideally, the list of surveillance data to be shared should be short with only key relevant items directly linked to or triggering practical field actions according to standard operating procedures (SOPs). This short list should include national malaria reporting format and database, capturing both public and private (formal/informal, where relevant). The list should be easy to manage electronically through basic or feasible SMS/database and feedback mechanism.

Where feasible, this can also include essential stock reporting (RDT/ACT) to trigger rapid replenishment.

3.5 Program capacity development

Another vital and often overlooked element surrounding population mobility is to identify the program capacity development that will be needed for national malaria programs to implement a response to population mobility and malaria elimination. This will require programs to build capacity to overcome operational challenges, and to build technical skills as approaches to malaria elimination change. The capabilities of such an empowered human resource are described in *WHO's Strategy for malaria elimination in the Greater Mekong Subregion (2015–2030):* Leadership and management in the malaria programme (pg. 33).

Challenges

Some of the operational challenges that programs face in addressing population mobility include:

- difficulties expanding program reach into remote areas;
- challenges surrounding data sharing, the identification of definitions and priorities and the coordination of responses across borders;
- difficulties in initiating and managing cross-sectoral work with non-health government agencies; questions surrounding how to motivate and engage the private sector;
- the monitoring and surveillance of pilot projects and innovative strategies to work with MMPs; and advocacy to ensure donor flexibility and sufficient resourcing for programs.

Technical challenges that are closely related to population mobility point to the need to generate good epidemiological information through thorough case and foci investigation in identification of at risk groups of people and geographical areas and at risk. In malaria elimination context this translates to capacity to have good surveillance workers, entomological capacity, and to build skills in the use of GIS and mapping technologies to integrate data on population movements into spatial data on malaria transmission. Although there is growing consensus that countries should undertake new activities to address population mobility, many of these activities require new skills, partnerships with actors beyond the malaria community, and may simply present a challenge to resource-constrained country programs with multiple competing priorities.

Approaches

In order to ensure that countries are able to take action on this important issues, it is important for countries to clearly identify their priority areas for action, for example through multisectoral involvement such as those already developed by Myanmar, Cambodia and Thailand's strategic plans for elimination. Ideally:

1. the MMP needs are within a human resource development plan that harmonizes or is integrated with overall health services (part of health reform, decentralization, restructuring etc) and involve cross-training of the healthcare workforce.

2. maintain a core technical group of adequately trained professionals with the necessary epidemiological expertise to address the new elimination challenges including those involving social, environmental and population (MMP) changes and dynamics.

3. Collaborative approaches in training could focus on the below:

Advocacy and intersectoral collaboration	Skills on: • effective communication, • how to conduct effective meetings/trainings/workshops, presentations, advocacy sessions for audiences both within and outside the health sector, • engaging in effective dialogue with private sector, business owners, development projects and non-health sectors, • developing a business case tailored to the local context • etc
Management of malaria in mobile and migrant populations	Skills on: • participatory rural appraisal (PRA) especially for field workers • initiating 'migrant friendly' services' in health facilities • establishing intersectoral networks • etc

4. It will be essential for country programs to identify the capacity building, funding and staffing needs these activities require and to document, design innovative solutions and communicate these needs to regional countries, the WHO, donors and other relevant partners.

4 Special issues facing the Greater Mekong Sub-region

4.1 Rural economic development and shifting land use: Building cross-sectoral collaboration to eliminate malaria

Rural economic development is a major driver of population mobility in the region and is closely wound up a number of issues that shape malaria transmission and that add complexity to the elimination of malaria. Much of this expansion in rural development and population mobility has resulted from the policies of government and aid agencies, and the rapid growth of private sector investment in the region over the past decades.[1]

In December 2011 GMS leaders adopted the GMS Strategic Framework 2012-2022, which emphasized the strengthening of pan-GMS economic development around the three major economic corridors that cross-cut the region. In addition, the development of a number of new railway links and highways including the Asian Highway Network, and the trans-Asian railway, including the Singapore-Kunming rail link, will continue to facilitate travel across GMS countries and accelerate the speed with which populations, and therefore potentially malaria parasites, may travel between GMS countries and from the GMS to neighboring regions.[2,3]

Challenges

Such economic growth and infrastructure development has many positive public health impacts including improved access to existing health services. However, this development has also contributed to:

- the expansion of populations into areas that remain endemic for malaria. Large numbers of migrant workers are employed by small and large-scale projects such as hydropower schemes, mines, logging, rubber and palm oil plantations. These activities attract inward migrant labor while also contributing to large outward flows of people and resources throughout the region.[4] Many areas that were previously remote are now connected to highways and broader mobility systems. In addition to exposing migrant workers to malaria, these rural development projects may also influence vector ecology and behavior, and increase risk for forest workers, ethnic minorities living in the forest and forest-fringe communities.[5,6,7]
- In some cases, malaria transmission is complicated by the rise of unregulated economies such as illegal logging, small-scale mining, and the smuggling of natural resources such as timber. Such unregulated activities often develop in the same localities as major rural development projects, which provide roads and pathways for mobility for people and goods. These situations may affect both the MMPs engaged in the illegal activities, the workers in legitimate development projects in the same region, local communities and communities further afield that are connected to the site through population movement. For example in the Lao PDR, in one of its southern province, a malaria outbreak in 2011-2012 was associated with rapid growth in unregulated logging. Soldiers and regular forestry workers present in the district were also at high risk of malaria. There are currently many similar examples in all GMS countries of major rural development projects that are under construction that attract large population movements and that have a range of impacts on local economies, livelihoods and land use.

Opportunities

While presenting a challenge to the elimination of multi-drug resistant malaria in the GMS, such rural development also presents many opportunities for national programs to integrate public health measures into infrastructure projects and development planning. It is essential that malaria programs:

1. engage employers of migrant workers to gain access to infrastructure and agricultural projects in order to implement **work-based interventions.** This may include the development of peer educators, health focal points or volunteers to carry out health

promotion activities such as BCC at work, and to implement vector control if the physical surroundings make vector control feasible. Health focal points could seek out new workers and ask about their **travel histories**. Migrant workers arriving from areas with confirmed drug resistance should be **screened** and treated if necessary. Ensuring access to quality EDAT is essential.

2. Ministries and private sector actors overseeing such development projects should be engaged and briefed on the malaria risks associated with the project, the public health importance of providing **housing for workers** of sufficient quality to reduce exposure to vectors, and the importance of facilitating **basic health services** for workers sleeping on-site. **Malaria risk assessments** should be carried out if a project is planned for development in an area with confirmed drug resistance, and relevant partners engaged to provide steps to mitigate this risk.

3. With the aim of rapidly eliminating drug resistant malaria it may be more productive to prioritize an engagement with the larger, legitimate development projects and the local communities and smaller industries operating within the same districts as these illegal economies. In the first instance, **malaria programs will likely achieve more rapid gains if they scale up malaria prevention and EDAT to all at populations in close proximity to large rural infrastructure projects and in districts where complex illegal economies have been implicated in malaria transmission**. This will engage a much larger number of people at risk of malaria, and is more likely to lead to sustainable program gains by strengthening engagement with communities, private sector actors and lower levels of government within these districts. In addition, it is possible that the undocumented MMPs carrying out illegal activities have some connections with local communities, and some may be reached through intensified program activities within the broader district in which they operate rather than targeted interventions.

4. At the same time however, programs should begin to develop relationships with non-health government agencies and private sector actors to work towards the **development of a Memorandum of Understanding (MoU) for cross-sectoral collaboration** in eliminating malaria. To work towards this, programs should approach and brief relevant government and private sector agencies on the malaria risks associated with shifting land use, invite key representatives to meetings, and work towards a high level meeting to gain a MoU on cross-sectoral collaboration. This MoU would help to achieve a range of aims such as:

    - data sharing on mobility to inform planning,
    - allowing malaria elimination authorities access to MMPs at work, or
    - advocating for the implementation of malaria risk assessments for all major rural development projects in areas of multi-drug resistance including ACT resistance as priority.

5. **Evidence to demonstrate the clear economic advantage of malaria investment (building a business case)** needs to be presented *(Multisectoral Approach to Malaria, RBM/UNDP, 2013).* Opportunities for integrating malaria in financing mechanisms for other non-health sectors that impact malaria. In doing this, it will be important to realize that there is no one-size-fits-all solution for private sector engagement in

country elimination plans; rather, the right actions must be identified per sector and per company based on comparative advantage and strengths. One method that can be initiated in Myanmar, is to conduct a thorough mapping exercise of companies and their geographic/population catchment areas (*Figure 5* illustrates). Countries should also explore how **financing opportunities in non-health sectors can be leveraged for malaria**, for example, the potential of using revenues from extractive industries investments.

6. A few countries in the GMS have documented Public Private Partnerships/Mix (PPP/PPM) initiatives for diagnosis and treatment as well as prevention. Often the 'win-win' approach is tried but not to the true sense. In this regards two recommendations can be proposed:

   (i) Country malaria elimination programs develop **a PPP/PPM legislative framework** to clarify how private sector should work with government/public sector entities and work in consultation with stakeholders and in-country partners, as initiated in Myanmar through its accreditation scheme with companies and other non-state actors;

   (ii) National programs should include in their elimination plans participatory research or other methods to **determine the different incentives for other sectors to contribute to malaria control and elimination** *(Multisectoral Approach to Malaria, RBM/UNDP, 2013).*

4.2 Conflict, disaster and forced displacement

Some common concerns are that mobile populations cannot be located by programs, may lack access to health services, may avoid health authorities, and may use unofficial border crossings so that they are more difficult to engage through border malaria posts.[1] Although sometimes ad hoc or unpredictable (as in the sudden displacement of populations during conflict or following disaster), many human population movements are driven by long-term social and economic processes, and can be understood and forecast with a great degree of certainty.[2] Indeed many population movements are the result of government planning.[3,4]

While many countries in the region have ongoing security issues, ongoing conflict in parts of some countries is of particular concern in the context of drug resistant malaria. For example, in Myanmar, which also has the highest burden of malaria in the GMS and produces the largest numbers of cross-border migrants, including migrant workers and forcibly displaced persons,[5] malaria programs have great difficulty accessing rural populations in conflict-affected areas where health services have been significantly undermined by conflict, including in areas where drug resistance has been confirmed.[6,7] Volunteer mobile health workers have been successfully mobilized in conflict zones but this is very dangerous for the volunteers and raises additional ethical questions.[8] As rural development increases, Myanmar may in the future become a more significant site attracting migrant labor from across the region, including migrant workers on major construction projects that are located in areas that have confirmed drug resistance and where security is an issue.

Figure 5: Developing corporate social responsibility (CSR) programs for improved health which includes malaria prevention and treatment through a menu of options relating to the nature of business

Box 4: Building cross-sectoral collaboration to eliminate malaria

- Identify **non-health ministries** most relevant to addressing malaria (e.g. agriculture, roads and transport, labor, mining, water, military, immigration, tourism). Heads of National Malaria Control Programs and Ministries of Health to brief Ministers of non-health government agencies on malaria risks associated with their portfolios.
- Identify **key private sector actors** relevant to country priorities (e.g. major infrastructure projects, employers of migrant workers in relevant locations). Prepare written briefs on drug resistant malaria and malaria elimination and a business case for key private sector actors. Prepare specific suggestions for employers of MMPs to build collaboration in allowing program access to worksites.
- Identify **key development actors** involved in rural development processes that impact on malaria (eg, Asian Development Bank, ASEAN, funders etc).
- Hold high level meeting with Health and non-health Ministers, major private sector representatives and key development partners to work toward **Memorandum of Understanding for cross-sectoral cooperation** in containing drug resistant malaria and malaria elimination.
- Issue a statement of support for agencies working to improve processes for documented border crossing. This should state the health benefits to all of **making legal migration channels more efficient and accessible** to poor migrant workers.
- Issue a **statement of support for agencies working to improve labor conditions of migrant workers**. This statement should state that providing adequate housing and health services to migrant workers will help the region to address malaria.
- Trade and industry sectors should be involved in developing corporate social responsibility (CSR) programs for improved health which includes malaria prevention and treatment. There is a need for **clearer guidance on the type of services companies could provide** (e.g. awareness, vector control, case management, surveillance), which could be achieved **through a menu of options relating to the nature of business** *(Malaria Forum on Corporate Sectors and Non-State Actors Response to the Threat of Artemisinin Resistance in Myanmar, Nov 25-26, 2013)*

Migrant workers entering a conflict zone are likely to be working in highly exploitative conditions and face a very high risk of malaria.[9] The lead government agencies and private sector investors overseeing large infrastructure development projects in conflict zones where drug resistance is also present should be actively engaged and encouraged to take on a duty of care to ensure that they provide site access to malaria control authorities. Such infrastructure projects should support adequate housing and on-site health care for migrant workers.

4.3 Processes for security personnel, civil servants and special groups

In addition, there are a number of other special groups that should be part of the broader agenda in the GMS. All countries should ensure they have processes in place to prevent, detect and treat malaria in soldiers and other security personnel. This includes security personnel active in forest and border areas, especially in areas of multi-drug resistance including ACT resistance, and soldiers embarking on military training visits and exchanges. Processes should be in place to prevent and treat malaria in peacekeeping forces that are deployed to Africa both before deployment and upon return *(reference being updated: United Nations (1999) Medical Support Manual for United Nations Peacekeeping Operations (2nd edition)*. For example, Cambodia is introducing PCR testing for soldiers before and after deployment on missions to Africa. Countries should also establish special processes to protect civil servants at increased risk of malaria including border and immigration officials and forest rangers. The line managers of these civil servants in non-health agencies may also be a source of important local information and help programs to establish cross-sectoral collaboration at lower levels of government.

Box 5: Special issues in the context of malaria elimination:

Conflict, disaster and forced displacement

- Countries likely to receive persons forcibly displaced by conflict or disaster should ensure displaced persons have access to adequate malaria prevention and health care, that **agencies (within government, civil societies/NGOs and UN) responsible for managing displaced persons are briefed on drug resistance, and that neighboring countries have processes in place to respond to any outbreaks or emerging drug resistance**.
- All GMS countries should **incorporate a malaria component into broader risk reduction strategies** in case of outbreak of violent conflict, or unexpected population displacements resulting from natural disasters.

Security personnel, civil servants and special groups

- All countries should ensure they have processes in place **to prevent, detect and treat malaria in soldiers and other security personnel** (in-country and if involved in UN peace keeping/humanitarian deployments); as well as for civil servants who may occupationally be at increased risk for malaria.

5 Migrant policy frameworks

GMS countries' legal and policy framework related to the health of inbound migrants is very limited. In addition, the existing lack of data on health problems of migrants in the GMS hinders the development of an appropriate approach to improve the health of migrants. There is, however, growing acknowledgement among the GMS governments of the importance of improving the protection offered to outbound migrant workers abroad, especially regarding access to healthcare.

5.1 Gaps and opportunities on health laws and policies

Gaps

- Existing policies and legal frameworks are not conducive to inclusive approaches and do not advocate for removing barriers in order for migrants and mobile populations to access quality health services. Too many migrants experience language, cultural and socio-economic issues that limit their access to health services.
- Furthermore, in most countries it was reported that many migrant populations were not informed of their rights; even documented migrants may not be aware of the policies in place and health services available to them.
- In general, no motivation or perceived need can be seen in the GMS countries to address health issues of international migrants as there is a clear lack or ambiguity of migrant-inclusive laws or policies. Internal migration also remains widely under-documented.
- The GMS countries are a long way from achieving Universal Health Care that would ensure that citizens or immigrants, documented or undocumented migrants and formal or informal workers could access to health services without suffering financial hardship.

Opportunities

Current initiatives in some GMS countries to revise labour and immigration laws present opportunities for inclusion of migrants in countries' health services and Social Security systems, which would help reaching Universal Health Coverage in the region.

5.2 Gaps and opportunities on labour laws and policies

Gaps

- While some MoUs or laws include provision of healthcare for outbound workers, there seem to be a widespread gap in the implementation of such regulations.
- Gains have "been largely employer-driven, with migrants dependent on their employers for effective implementation of the process and access to their rights upon gaining a regularized status".

Opportunities

1. An improvement in access to formal migration mechanisms that guarantee decent work, labour rights, and comprehensive health entitlements for all migrants is required. This could be carried out **by strengthening bilateral migration mechanisms and implementing effectively the existing MoUs** being possible as a result to reduce the cost and complexity of migration and to ensure migrant workers access without penalty or restriction to national health insurance schemes in the GMS (where available).
2. Overall, it would be beneficial **for all MMPs –including international migrants- if Labour Ministries reviewed national migration and health policies to provide an optimum package of malaria prevention and treatment services for all migrants regardless of legal status.** With adequate research, evidence and resourcing for engagement, the inclusion of migrants in social protection mechanisms could be promoted through the corporate social responsibility concept.

3. Although only Viet Nam has signed the ILO Convention on Occupation (it effectively entered into force on 16 May 2015), the remaining GMS countries have, although limited, some sort of OSH regulations. This allows the **opportunity to include malaria interventions in these OSH regulations, mainly in those for work sectors with exposure to malaria** because of geographical reasons such as logging, mining, rubber plantations, and several agricultural works; or because of mobility reasons such as truck drivers, road construction crews and groups who serve them.

5.3 Gaps and opportunities on malaria policies

Gaps

Although all GMS countries have adopted national malaria strategies following the different WHO resolutions, in all of them with the exception of Thailand's, Migrants or 'Migrant and Mobile Populations' was usually referring exclusively to internal migrants excluding or not specifying if inbound migrants were included under this term. The implementation of national malaria programmes has faced several challenges in the Region in the design, resource availability and implementation of services to reach MMPs[6,7,8].

Opportunities

1. Most countries are in the process (as of the time this document is written), to update the strategies for 2016–2030 following the recommendations of *WHO Global technical strategy for malaria 2016–2030*. This provides the **opportunity to ensure specific mention of inbound migrants will be included in the updated national plans, and that their rights to access quality diagnosis and free-of-charge treatment will be guaranteed.**
2. As there have been several communication campaigns[1] using strategic behavioural and inter-personal communication tools in the region, which have been well received by MMPs, this prevention strategy could be further implemented. **More mobile health clinics2 to reach remote communities could be introduced**. In addition, **informal providers** are often the first contact point for those seeking health services in remote rural areas; training them could improve the treatment of malaria in the region.
3. There is a significant opportunity to contribute to malaria elimination by **incorporating malaria evaluations in Health Impact Assessments (HIA)**. For instance, the construction of dams, may provide increased breeding sites of disease vectors; thus, malaria impact assessment of these projects should be considered. The 2009 Chiang Mai Declaration on HIA highlighted the role of the EPs in promoting HIA in Asia. In addition, some GMS countries adopted legal frameworks and policies imposing HIA for some infrastructure development. All these laws could be used to advocate for policies imposing risk assessments of

   (a) workers' exposure to Malaria; considering resettlement and movement within malaria areas which may have limited access to health services; and,

   (b) projects that may provide increased breeding sites of disease vectors. This approach is already being supported by the USAID program "PREVENT"[3], where they developed guides for incorporating risk assessments of emerging infectious diseases in HIA.

4. The World Conference on Social Determinants of Health in 2011 recognized that addressing health in other public policies would be crucial to the achievement of successful health outcomes and supported the 2009 WHA resolution endorsing a 'health in all policies' (HiAP) approach. To achieve concrete health outcomes, **multiple stakeholders from non-health fields must be engaged in order to systematically incorporate health issues into the myriad of relevant national security, labour, migration, and economic development policies**"[4]. At a regional level, these are summarized in Table 2 below.

Table 2: Policy recommendations for addressing the health of migrants at the regional level

Type of migrants	Short-term recommendations	Long-term recommendations
Internal migrants	• Amend laws which restrict access to health services depending on hospital or residence registration • Ensure that strategies promoting health service delivery consider specific factors affecting sustained use of health services in both the public and private sectors • Ensure inclusive social protection mechanisms and universal health care coverage	• Develop national plans to build health infrastructure that can deliver services to remote, hard-to-reach populations • Ensure inclusive social protection mechanisms and universal health care coverage
Inbound migrants	• develop policies which support establishing "One-stop centres" for migrants to provide information on malaria and distribute LLINs • Modify laws which restrict access to health services depending on hospital or residence registration • Engage the private sector: employers of labour migrants should provide migrants with health and labour rights information in appropriate language • Establish national health information systems which include migrant health indicators by increasing border-crossing screening and disaggregated data collection • Agree on a definition of MMPs that includes inbound migrants to be consistently used throughout the policy framework of each country • Conduct a review of migration, labour and health policies at the national level to insure policy coherence and adequate distribution of government budgets to health programmes • Ensure inclusive social protection mechanisms and universal health care coverage	• Insure that both health and labour laws include inbound migrants and are implemented without discrimination • Facilitate the portability of social security benefits across ASEAN • Develop GMS guidelines on minimum standards for social protections schemes such as mandatory health insurance for migrants • Ensure "Health in All Policies" (HiAP), in particular in immigration and labour policies[1]

[1] HiAP – Health in All Policies is an approach to public policies across sectors that systematically takes into account the health implication of decisions, seeks synergies, and avoids harmful health impacts in order to improve population health and health equity (WHO, 2013; Helsinki Statement of Health in All Policies [WHA67.12])

Type of migrants	Short-term recommendations	Long-term recommendations
Outbound migrants	• Improve implementation of the Strategy for malaria elimination in the GMS 2015-2030 (WHO) regarding availability of mobile malaria teams in wherever migrants spend time, including key transit points. • Strengthen cross-border dialogue and collaboration • Ensure inclusive social protection mechanisms and universal health care coverage	• Facilitate the portability of social security benefits across ASEAN • Amend Labour laws to include compulsory pre-departure trainings which provide information on access to health services in destination countries and malaria prevention measures. • Include voluntary malaria testing as part of migrant medical assessments. • Develop national coordinated strategies to reach those intending to migrate through irregular channels (transit points, border areas, work places, media) in order to ensure that they receive pre-departure advice and information on health services, malaria, social security etc • Strengthen and implement formal bilateral migration between GMS States to improve access to formal migration mechanisms.

Type of migrants	Short-term recommendations	Long-term recommendations
All migrants	• Improve implementation of Strategy for malaria elimination in the GMS 2015-2030 (WHO) regarding the availability of mobile malaria teams in wherever migrants spend time, including key transit points. • Promote and strengthen multi-sectoral and inter-ministerial collaboration to develop interdisciplinary educational programmes for migrants • Increase collaboration of regional financial institutions and multilateral development banks. • Improve monitoring and surveillance of migrant's health by establishing systems which collect regional health migration data including migrant health indicators and malaria trends. • Conduct periodical mapping of malaria trends (including for internal and undocumented migrants) • Conduct malaria risk assessments particularly for migrants involved in logging, mining, rubber plantations, agricultural work, transport of goods, and road construction sectors • Develop a model similar to that proposed by JUNIMA[2] to document situation of access to treatment for migrants such as scorecards in order to follow-up on GMS countries' commitment towards malaria elimination • Integrate migrants' perspective when formulating oncoming health and labour policies by improving active participation of migrant communities in policy formulation	• Include all migrant workers in Social Security schemes[3], in social protection mechanisms and in Corporate Social Responsibility • Establish a welfare fund or special insurance scheme for migrant workers to cope with contingencies • Develop policies towards UHC considering three channels of service delivery to achieve it: public, private and community based[4]. • Advocate to include all types of migrants in the Post-2015 Development Agenda.. • Inclusion of the Health of all migrants, displaced populations and refugees in post-2015 development agenda • Advocacy for Increase ratification of international instruments, in particular ILO Conventions No. 97, No 102, No 143, No 155, No 181, No 188, and No 189; the *Refugee Convention*, and the *International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families* • Be guided by the 2030 Transformative Agenda for Sustainable Development Goals (Goals 3, 8 and 10) • Be guided by the WHA 61.17 Resolution on Health of Migrants particularly on its key operational frameworks

[2] JUNIMA proposed a model to document the situation of migrants' access to HIV treatment based on (1) document existing experiences of migrants accessing to treatment; (2) develop a 'scorecard'/comparative framework on treatment access for migrants in the six countries in the GMS: and, (3) develop cross border service delivery models that address diagnostic, adherence and resistance.

[3] Inclusion of migrant workers in social security schemes can be advocated more efficiently to governments through showing economic benefits of inclusion. Facts that support this proposed action can be found in the "Handbook on the extension of social security coverage to migrant workers". International Social Security Association, 2014.

[4] Strategy for Malaria Elimination in the Greater Mekong Subregion (2015-2030). WHO

6 Conclusions

Although population mobility is a major challenge facing the GMS, countries are already well underway to finding innovative ways to engage mobile populations, and to intensifying established evidenced-based interventions to scale up activities in areas of multi-drug resistance including ACT resistance under the GMS ERAR framework, and recently, to align national strategic plans to the GMS malaria elimination strategy (2015 - 2030) including rapid elimination of *P. falciparum*. GMS countries have begun to develop a number of innovative approaches to reach out to MMPs and target essential commodities like LLINs, improve access to EDAT. **The monitoring and evaluation of these activities is essential** in order to identify successful strategies for addressing MMPs at the country level that may be suitable for replication in neighboring countries. The results of these evaluations should be available online, and discussed at regional meetings to support the development of strategies across the GMS.

Moving beyond a focus on MMPs as a demographic group and approaching mobility as a system involving multiple stakeholders and a range of geographical locations will allow programs to map the spatial dimensions of mobility systems and malaria burdens to identify ways to engage a MMPs. This will also help to strengthen program activities in border communities and forest-fringe communities that are impacted by population mobility.

At the same time as delivering targeted interventions, **programs should intensify regular program activities towards elimination within all** areas of multi-drug resistance including ACT resistance. Strengthening health promotion will be vital to improve the uptake of bednets and other malaria prevention and treatment activities by MMPs, while programs may also need to identify new approaches to controlling forest-fringe malaria. Taking a more migrant-friendly approach to population mobility will help to improve engagement with MMPs and ensure quality EDAT. Population mobility presents a major operational challenge to countries, and it is important that programs **identify the human and financial resources they will need to respond to population mobility** and to advocate for sufficient resources to funders and international development partners.

One of the key recommendations is the importance of **building effective cross-sectoral collaboration with non-health government agencies and the private sector**. Population mobility in the GMS is intrinsically wound up in shifting land use and the rapid economic development that is occurring in the region, and programs should aim to develop an official cross-sectoral commitment to working collaboratively to eliminating malaria in the GMS. By engaging non-health and private sector partners as partners in elimination, GMS countries will be in a strong position to develop proactive interventions to halt the spread of drug resistance and to eliminate malaria from the GMS by 2030.

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Annex 1

Country definitions and sub-categories of migrant and mobile populations

	Myanmar	Cambodia	Thailand	Lao PDR	Viet Nam	China (Yunnan)
Source	Myanmar Artemisinin Resistance Containment Framework 2011.	MMP Strategy, 2013[a]	Ministry of Public Health[b]	National Malaria Control programme and Ministry of Labour and Social Welfare	National census	
Local population		Permanent resident in the area for more than 1 year		Permanent resident in the area with official household registered.		Permanent resident in the area included in household register
Migrant	For the purpose of containment of resistant malaria parasites, a migrant is anyone who moves out from their permanent residence and stays in a malaria endemic area for whatever purposes with regards to targeting malaria intervention.	Resident in the area for more than 6 months and less than 1 year.	M1 – migrants are in Thailand > 6 months, majority of whom are presumed to have registered with the Ministry of Labour , registration gives them the right to remain in Thailand for a prescribed period of time (typically 1–2 years) and enables them to access the formal Thai healthcare system.	Resident, who moves out from their permanent residence over 6 months or 1 year to stay or work in other area with official leaving and working premises [from Ministry of Labour and Social Welfare and Ministry of Home Affairs].	A person is a migrant if the current place of residence at the time of survey and the place of residence 5 years prior were not the same commune (i.e. smallest administrative unit).	Malaria cases: person with clear evidence of getting infected in another area, especially for the cases who stayed in a malaria endemic area 1 month before onset.

	Myanmar	Cambodia	Thailand	Lao PDR	Viet Nam	China (Yunnan)
Mobile population	Any person who moves from one area to another (whether internally or externally) usually for a short period of time (less than 1 month).	Resident in the area for less than 6 months.	M2 – migrants are in Thailand for less than 6 months, these people are mobile migrants and they are usually not registered with the Ministry of Labour, this means that they are residing in Thailand illegally, they do not have any claim to utilize the Thai health care system (other than the services provided by malaria clinics) and they can be arrested and deported at any time.	Any person who moves from a registered village to another area for the purpose of working or residence within 1 month up to a 6-month period.		Any person who moves from household registered area to another area for the purpose of residence or working (whether internally or externally).
External migration	Refers to moving across international borders.			Refers to non-Lao resident moving officially across local or international check points to work or stay in any area of Lao PDR		Refers to people moving across international borders
Internal migration	Movement from one area (province, district or municipality) to another within one country			Refers to Lao resident moving officially to stay or work temporarily in other area of the same country		Movement from one area (province, district or municipality) to another within the same country
Easy-to-reach migrants	Within 5 km of a health centre.			Refers to both internal and external migrants who stay or work with local authority/company, which is documented by the Ministry of Labour and Social Welfare.		

	Myanmar	Cambodia	Thailand	Lao PDR	Viet Nam	China (Yunnan)
Intermediate to reach migrants	Within reach of VMWs or MMWs.					
Hard-to-reach migrants	Living and working in the hard-to- reach (or) unreached areas of health service delivery either by public or private sector. They may be small groups of 5–10 people or may be any number.			Refers to both internal and external migrants who stay or work unofficially or are undocumented by the provincial Labour and Social Welfare Department and/ or Ministry of Labour and Social Welfare.		
Visitors (from abroad to the country)		Person admitted for short stays for purposes of leisure, recreation, holidays; visiting friends or relatives; engaging in business or professional activities. Visitors include excursionists, tourists and business travellers, visiting relatives who might spend 1 or 2 nights in or near the forest. Examples: ecotourism, family event.		Refers to any person who is not resident of the area but stays temporarily (within 4 weeks of the period) for any purpose.		

	Myanmar	Cambodia	Thailand	Lao PDR	Viet Nam	China (Yunnan)
Seasonal workers	Agricultural activities occurring during plantation season, rubber tapping season and gold mines usually in the forest fringes and foothill areas.	Agricultural activities occurring during planting season (end of dry season) and harvesting season (end of rainy season), usually in foothills, plains, valleys. Examples: farming/chamkar, rubber, cassava plantations.		Refers to any person, who is not a local resident, who moves during the harvest season (end of rainy season) to other areas for specific season of agricultural or industrial work.		
Defined separately based on malaria vulnerability index, Population Movement Framework, ecosystems and exposure index		Construction/ mine worker, forest workers, and security personnel				

Annex 2

Mobile population groups, challenges and opportunities for the GMS malaria programmes

Speed and type of mobility	Population groups	Challenges	Opportunities	Possible interventions
Limited mobility but perceived as hard to reach	Border communities Daily crossers Remote communities Ethnic minorities Forest-fringe communities	Access to adequate services in remote region Proximity to forest Exposure to vectors due to poor quality housing and/or work Language or cultural barriers to services Poverty Cross-border harmonization and data sharing Perceived mistrust of authorities	Location of communities established Understanding of communities and risk factors Mobility likely to be culturally normalized Community ties are point of access Local knowledge of breeding sites etc can assist program micro-stratification	Strengthening health services in border and remote areas Develop migrant-friendly health services Multi-lingual or culturally specific health promotion may be necessary Mobile clinics, malaria volunteers and/or laboratories Twin-cities programs or buddy health clinics Effective community engagement
Seasonal or medium-term mobility	Forestry workers Seasonal agricultural workers Construction workers Fisherfolk Plantation workers Rubber tappers	Often high exposure to vectors, especially if night work Access to adequate services due to remoteness May sleep outdoors or in poor quality housing May accept risk of malaria if seen as necessary for protecting livelihoods Access to services for non-citizens	Relatively slow movement allows for interventions Seasonal migration patterns well understood Construction sites and plantations easily located Clearly identifiable target group Links to other points in mobility system can be identified Have personal incentive as most likely to be directly affected by malaria Work-based risk point to engage private sector	Targeted prevention, diagnosis and treatment activities Targeted interventions timed with seasonal activities/breeding cycles Mobile clinics, malaria volunteers, and/or laboratories Peer educators Interventions at all points in mobility system Engage private sector, especially employers Effective community engagement

Speed and type of mobility	Population groups	Challenges	Opportunities	Possible interventions
Rapid, continual population movement	Transport drivers Highly porous border regions Tourists and business travelers	Speed of mobility may impede treatment and follow-up	Path of mobility can often be forecast	Interventions at key nodes mobility systems (border towns, market towns) Engage employers and private sector Community engagement in porous border regions
Rapid ad hoc population displacement following disaster or conflict	Disasters cross-cut all demographic groups Internally displaced persons in Myanmar	Timing and direction of mobility less predictable Competing priorities of displaced persons Shifting priorities of government and funding agencies May be exacerbated by environmental changes, infrastructural damage and/or other disease outbreaks	Strengthens emergency response systems	Ensure disaster risk reduction incorporated into national strategies Establish communication channels for cross-sectoral collaboration prior to emergencies Build capacity for rapid response to outbreaks Advocacy for long-term political commitment even as competing issues emerge Develop migrant-friendly health services Mobile malaria workers and mobile clinics used to reach internally displaced persons in Myanmar
Special groups	Soldiers Border officials Forest rangers Civil servants in forested, remote or endemic areas	Requires cross-sectoral collaboration Possible sensitivity around data sharing	Within scope of government planning, employed by government agencies Forest rangers/border officials may add knowledge to programs	Build capacity for cross-sectoral collaboration Establish mechanisms for at-risk civil servants and soldiers Incorporate into national control/ elimination strategies
Population mobility beyond GMS countries **(including to/from Sub-Saharan Africa, India and Bangladesh)**	Migrant construction workers to/ from neighboring regions Peacekeeping troops and soldiers posted abroad International tourists and business travelers Refugees	Migrant workers from Bangladesh, India, beyond the GMS Travel across areas with differentiated malaria risk - immunity Risk of transporting drug-resistant parasites to Bangladesh, India, Africa or other regions	Can be forecast and factored into planning Opportunity to strengthen cross-sectoral engagement Opportunity to engage other regions to support elimination in the GMS	Health risk assessments and services in place at major construction projects Develop migrant-friendly health services Processes in place for soldiers, international tourists from endemic countries, and documented refugees

The emergence of multidrug-resistant malaria in the Greater Mekong Subregion (GMS) has been identified as an emergency issue that may have catastrophic consequences on the future of malaria elimination in the GMS as well as globally. In recognition of the need for a cohesive regional response, GMS countries have committed to a shared goal of eliminating malaria from the GMS by 2030 working within the framework of the Strategy for Malaria Elimination in the Greater Mekong Subregion 2015–2030.

Population mobility has been identified as a key concern in the context of multidrug-resistant malaria; and in a region of highly porous borders where the majority of intra-Mekong migration occurs through informal channels, addressing the health needs of migrant populations has never been more critical. Migration in the GMS is strongly associated with shifting land use, including large-scale rural infrastructure projects and agricultural industries that attract migrant labour and influence human-vector contact. Migrant workers are highly likely to be exposed to high-risk work in forests or on construction sites but are frequently unable to access quality health-care services and may resort to self-treatment with substandard antimalarial drugs with potentially serious consequences for their own health and for drug resistance.

Governments and development partners are now called upon to recognize that containing multidrug resistance and eliminating malaria in the GMS will require a future-oriented and multisectoral approach including non-health ministries, private sector and development partners. In addition, it will require programmes that include targeted activities to reach out to mobile and migrant populations; interventions that are timed with seasonal mobility; development and scale-up of migrant-friendly health services; and strengthening of programme activities to engage mobile populations. Ultimately, addressing health in other public policies as part of a 'health in all policies' (HiAP) approach would be crucial to achieving successful health outcomes where multiple stakeholders from non-health fields must be engaged to systematically incorporate health issues into relevant national security, labour, migration and economic development policies.

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