A Malaria Elimination Guide to Targeted Surveillance and Response in High-Risk Populations

The Malaria Elimination Initiative

UCSF Institute for Global Health Sciences

shrinkingthemalariamap.org
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## Acronyms

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<th>Acronym</th>
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<tr>
<td>ACT</td>
<td>Artemisinin-based combination therapy</td>
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<tr>
<td>CHW</td>
<td>Community health worker</td>
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<tr>
<td>DBS</td>
<td>Dried blood spot</td>
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<td>ESPT</td>
<td>Entomological Surveillance Planning Tool</td>
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<td>HIV</td>
<td>Human Immunodeficiency Virus</td>
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<td>HRP</td>
<td>High-risk population</td>
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<tr>
<td>ID</td>
<td>Identifier</td>
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<tr>
<td>IRS</td>
<td>Indoor residual spraying</td>
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<tr>
<td>LLIN</td>
<td>Long-lasting insecticide treated net</td>
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<td>LSM</td>
<td>Larval source management</td>
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<td>MMP</td>
<td>Mobile and migrant populations</td>
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<tr>
<td>M&amp;E</td>
<td>Monitoring and evaluation</td>
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<tr>
<td>NGO</td>
<td>Non-governmental organization</td>
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<td>NMCP</td>
<td>National Malaria Control Program</td>
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<tr>
<td>PPS</td>
<td>Probability proportional to size</td>
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<tr>
<td>RDT</td>
<td>Rapid diagnostic test</td>
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<td>SBCC</td>
<td>Social and behavior change communication</td>
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<td>SB-RACD</td>
<td>Socio-Behavioral Reactive Case Detection</td>
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<tr>
<td>SRS</td>
<td>Simple random sampling</td>
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<td>TLS</td>
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<tr>
<td>UCSF-MEI</td>
<td>University of California, San Francisco Malaria Elimination Initiative</td>
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<tr>
<td>UPC</td>
<td>Unique Participant Code</td>
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<tr>
<td>VDT</td>
<td>Venue-day-time period</td>
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<td>WHO</td>
<td>World Health Organization</td>
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About the MEI Malaria Elimination Toolkit

The MEI Malaria Elimination Toolkit is a set of proven tools, frameworks, and guides to help malaria endemic countries accelerate progress toward malaria elimination. Developed by the Malaria Elimination Initiative (MEI) at the University of California, San Francisco (UCSF), the toolkit addresses the unique challenges faced by national malaria programs in heterogeneous transmission settings. These tools have been used successfully at the national and/or subnational levels, leading to important changes in malaria policy and practice.

The MEI Malaria Elimination Toolkit focuses on three primary areas: situation assessment, tailored responses, and program management and sustainability – with the ultimate goal of building capacity and optimizing a country or district’s ability to advance toward elimination. These tools help malaria programs understand the drivers of transmission in a target area and the readiness of the health system for elimination; decide what actions to take and how to tailor its response; and ensure efforts are well-managed and sustainably funded.

The MEI offers direct technical assistance to support the adoption, tailoring, and implementation of its tools, frameworks, and guidelines. Please contact us to learn more at mei@ucsf.edu, or visit our website at http://www.shrinkingthemalariamap.org.
Introduction

Globally, malaria deaths decreased by 60% and malaria cases declined by 37% between 2000–2015. Given the unprecedented reduction in malaria transmission, many countries are reorienting their program to eliminate the disease and will need to address the areas and populations where malaria transmission persists.

As malaria transmission declines, cases cluster in geographic areas and among populations at higher risk of infection. Malaria ‘high-risk populations’ (HRPs) are groups of people who share socio-demographic, geographic and/or behavioral characteristics that place them at higher risk of infection, such as low utilization of health services and interventions, or behaviors associated with increased exposure to Anopheles mosquitoes, the primary vector of malaria. Identifying and understanding specific characteristics of populations at high risk for malaria enables national malaria control programs (NMCPs) to select and target tailored interventions. However, NMCPs often do not have the epidemiological evidence and resources they need to determine the optimal selection and delivery of interventions for specific populations. Decreasing and ultimately reducing malaria transmission to zero among HRPs is essential to achieving and sustaining malaria elimination. However some HRPs may be harder to reach and often require special approaches to ensure all malaria infections are detected and treated.

HRPs often have limited access to quality malaria treatment and prevention because of:

- High levels of mobility, as with mobile and migrant populations (MMPs)
- Poor access to public health facilities
- Socio-economic and cultural factors (lack of financial resources, religious practices, employment that requires them to travel to remote areas, etc.)
- Potential for asymptomatic infections due to repeated exposures, which may limit care-seeking behavior
- Suboptimal outreach by malaria programs
- Limitations of traditional prevention tools in preventing outdoor biting or providing protection in temporary shelters.

As outlined in the World Health Organization’s Global Technical Strategy (2016–2030), surveillance is a core intervention required to detect outbreaks, identify programmatic and coverage gaps, assess the impact of interventions, and target a locally-tailored response. However, most malaria programs rely on passive case detection as the foundation of malaria surveillance. The quality of information in these surveillance systems varies widely and relies on parasitological confirmation of cases as well as prompt reporting and case investigation to determine likely sources of infection. Even where strong passive surveillance systems are in place, they often do not adequately capture specific HRPs who are less likely to present at health facilities or mobile populations who may be absent at follow up.

To be effective, surveillance and response strategies must keep pace with changing transmission patterns. Over time, the relative importance of different HRPs in maintaining transmission, and effective methods to reach them, may change. NMCPs must adapt surveillance components, data collection methods, and interventions to effectively address transmission. NMCPs frequently request epidemiological support to identify specific attributes of HRPs, and improve tracking, access, and delivery of malaria interventions. While some HRPs are often known to programs in a general sense (such as adult males or forest goers), reliance on anecdotal evidence can overlook important variation within these broad groups.

Leveraging approaches that UCSF colleagues developed to address HIV transmission in HRPs, the MEI created the malaria HRP Surveillance and Response Guide to support NMCPs in refining their understanding of HRPs, improving the targeting of interventions, and ultimately reducing malaria transmission.

What is the HRP Surveillance and Response Guide?

The HRP Guide provides NMCPs with a set of approaches to review transmission patterns and surveillance gaps, gather detailed epidemiological evidence on risk factors and behaviors of populations likely at high-risk for malaria, adapt surveillance...
activities, track epidemiological trends in HRPs, and improve targeting of interventions.

The HRP Guide contains four modules that align with the steps of the surveillance cycle, which is a process to iteratively improve surveillance systems, identify and track the highest risk populations, and refine targeted malaria interventions. When used in sequence, the Guide’s modules aim to incorporate evidence, tracking, and targeting of HRPs in broader surveillance and response strategies.

The surveillance cycle enables NMCPs to ensure that surveillance and response strategies are based on the current evidence about how, where, and why transmission is occurring. Throughout the surveillance cycle programs should:

- Be flexible and adapt to evolving transmission dynamics
- Collect and analyze data on the risk behaviors driving the epidemic
- Review diverse sources of information to complete the picture
- Track trends in identified HRPs over time
- Collect the strategic information needed to focus the response where it will have greatest impact

The HRP Guide is comprised of four modules:

**Module 1: Planning for Targeted HRP Surveillance and Response**

Module 1 guides the step-by-step implementation of a formative review to gather, update, review, and analyze current knowledge of HRPs. It provides guidance in analyzing existing case data and qualitatively assessing characteristics and risk behaviors of potential or known HRPs. Characteristics include: travel and work patterns (seasonality, occupation, transit), social network connectivity and other factors that will help to optimize implementation of Modules 2–4.

**Module 2: Identifying Risk Factors: Case-control Study**

Module 2 provides instructions to conduct an assessment of malaria risk factors and collects data on a core set of essential indicators. The data are collected using a questionnaire administered to malaria cases and a comparison group of controls identified at health facilities. This module provides a way to identify and quantify the importance of key actionable risk factors to guide program surveillance and response. Frequently asked questions from national malaria programs.

**Module 3: Monitoring Malaria Transmission and Intervention Coverage**

This module provides guidance on implementing time-location sampling to access and survey people at specific venues and times where HRPs are more likely to be present (i.e. forest worksites or border crossing points). Module 3 supports programs to quantitatively assess the prevalence of malaria infection among HRPs in these sites and assess other key indicators such as intervention use and associated risk behaviors. Through repeat surveys using this approach, programs can monitor these indicators over time in specific HRPs.

**Module 4: Adapting Reactive Case Detection**

Socio-behavioral reactive case detection (SB-RACD) provides a framework and approach for targeted screening of specific sites and social contacts as part of routine surveillance, based on a set of risk criteria applied to the index case. Module 4 will be useful in contexts where transmission occurs away from home, such as in the forest, worksites, or travel destinations, and where household RACD is likely to have a low case yield. Implementation of this approach can improve targeted surveillance and response in known high-risk and hard-to-reach groups.
Figure 1: Generating and using evidence: steps in the surveillance cycle for targeting HRPs

- **Step 1. Assess existing and new data to identify, tailor and target interventions for HRPs**
  - Module 1: Planning Targeted HRP Surveillance and Response

- **Step 2. Establish risk factors and characterize suspected HRPs**
  - Module 2: Identifying Risk Factors Using Case-control Studies

- **Step 3. Implement ongoing surveillance to monitor trends in HRPs**
  - Module 3: Monitoring Malaria Transmission and Intervention Coverage

- **Step 4. Adapt surveillance and response strategies and continuously refine targeted interventions based on surveillance findings**
  - Module 4: Adapting Reactive Case Detection

Ongoing surveillance allows malaria programs to ensure that surveillance and prevention strategies are based on the most up-to-date transmission and operational information.

Each module in this Guide includes:
- An overview of the purpose and best uses of each tool
- A detailed operations manual
- Sample protocols
- Survey questionnaires or thematic guides for qualitative interviews and focus groups for formative assessment
- Forms, including information sheets for informed consent
- Tools to assist with site selection, sample size calculation, selection of controls, and analysis
- Links to additional references and resources

Who should use this Guide?
This Guide is for NMCP program managers, M&E officers, and their implementing partners, including non-governmental organizations, and researchers in countries with low malaria transmission.

Technical assistance is available to support the tailoring and implementation of all MEI tools. Please visit our website and contact us for more information: shrinkingthemarialmap.org/contactus.
How is the HRP Surveillance and Response Guide used?

Each module of the Guide contains instructions on the methods to gather and analyze the necessary information that will inform a more resilient surveillance and response platform. Not all countries will need to implement all modules and Figure 2 can be used to identify which modules of the Guide are most pertinent to the program.

Follow the operations manual for each module and use the results to inform targeted response interventions for HRPs. Note that implementation of the suggested modules is dependent on local circumstances. Modules were written in alignment with WHO guidelines.

How do I navigate this tool?

Programs should first consult the WHO Surveillance, Monitoring, and Evaluation Manual and related tools to assess the state of their surveillance systems.

Programs should then select specific sites for initial implementation of the toolkit based on considerations in Box 1.

Where capacity exists, the HRP toolkit should be used in conjunction with the MEI’s Entomological Surveillance Planning Tool (ESPT) to plan entomological sampling in areas with potential HRPs.

Box 1. Site/location considerations

When determining whether a site/location is well-suited for use of the HRP toolkit, consider areas with some of the following characteristics:

- Locations of ongoing transmission where there are known HRPs with intervention gaps
- Areas with unknown HRPs but where populations are frequently exposed to malaria risk, whether or not substantial numbers of cases are observed through the health system
- Areas where there are many private health providers, or other health services not incorporated into national surveillance systems
- Areas of high mobility, including ports and border regions
- Areas with specific industries potentially associated with malaria risk (e.g. mining, forest plantations, etc.)
- Areas where there are known mobile, migrant, ethnic minorities, or other vulnerable populations (i.e. including internally displaced populations, border crossing populations, etc.)
- Locations where the primary risk factors for malaria transmission include occupational exposure and other behaviors outside of households
- Areas where levels of malaria infection, risk behaviors, personal protective measures, access and utilization, and patterns of testing and treatment-seeking among HRPs is unknown
Figure 2. Do I have HRPs in my region/country?

**Triggers/basis for assessment:**

**Unknown/suspected HRPs**

**Known HRPs**
(e.g., mobile and migrant populations, forest-workers)

**Module 1**
Planning for targeted HRP surveillance and response when HRPs unknown

**Module 1**
Planning for targeted HRP surveillance and response when HRPs known

**Passive surveillance**
Strengthen existing systems including: 1) outreach to remote and marginalized populations, 2) diagnosis and 3) rapid investigation and reporting at fine spatial scale

**Exploratory investigation**
Identify risk factors and HRPs

**Module 2**
Malaria risk factor assessment for:
- Identification of risk factors and target populations
- Infection sources/sinks
- Intervention gaps
- Prioritization of HRPs for interventions

**Targeted surveillance for hard-to-reach populations**
Track parasite prevalence, risk behaviors and intervention uptake

**Module 3**
Targeted surveillance using time-location sampling at:
- Border crossings
- Worksites
- Military bases
- Markets/truck stops
Targeted entomological surveillance at worksites*

**Module 4**
Targeted screening of specific sites and social contacts based on risk criteria applied to the index case
Targeted entomological surveillance at worksites*

**Targeted response**
- Identify potential partnerships with NGOs, professional associations and/or private sector
- Use peer driven interventions using referral methods similar to those described in Module 3
- Targeted delivery of interventions to HRPs using methods in Modules 3 and 4, including chemoprophylaxis
- Vector control at transmission sites

Procedures in each module of the exploratory investigation and in surveillance for hard-to-reach populations should be implemented according to the estimated risk and information gathered during the preparation phase. The process must be adapted in real time and take into account surveillance results as well as additional external information.

*Optional procedure
Key messages for the HRP Guide

To maximize impact and achieve elimination, malaria programs must adapt to changing transmission dynamics in elimination settings by identifying populations at highest risk of infection and appropriately tailoring and targeting surveillance and response strategies.

The HRP Guide aims to support programmatic decision-making at different stages of knowledge about local HRPs through information gathering, evidence generation and adapting reactive case detection guidelines.

Targeted surveillance approaches can be resource intensive, including labor and technical expertise for adapting designs and analysis, so collaboration with both research and implementation partners is key.

The HRP Guide identifies opportunities to integrate entomological data collection with epidemiological data to guide action.

The HRP Guide highlights that HRP surveillance should be iterative and adaptive since malaria transmission is dynamic; constant adjustments should be made to reevaluate which populations are at highest risk and tailor methods to deliver surveillance and response, to ensure maximum impact (See Figure 1).

The HRP Guide outlines a strategy to integrate data collection into routine surveillance at health facilities, to identify HRP characteristics and key actionable risk factors for malaria (Module 2).

The HRP Guide provides methods to target malaria testing and data collection to locations (such as worksites) in order to generate representative estimates of malaria burden, transmission patterns, and prevention gaps in HRPs (Module 3).

The HRP Guide provides program-friendly approaches to adapt reactive case detection for HRPs, to improve case-detection rates and targeted surveillance (Module 4).