MINISTRY OF HEALTH

ZANZIBAR MALARIA ELIMINATION PROGRAM

National Guidelines for Malaria Surveillance and Response in Zanzibar

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List of Abbreviations

ACD	Active Case Detection
ACT	Artemisinin-Based Combination Therapy
ADR	Adverse Drug Reaction
BCC	Behavior Change Communication
CMS	Central Medical Store
DHMT	District Health Management Team
DMM	District Materials Manager
DMO	District Medical Officer
DMSO	District Malaria Surveillance Officer
DRT	Direct Response Team
FSaT	Focal Screening and Treatment
HFBSS	Health Facility–Based Sentinel Surveillance
HMIS	Health Management Information System
HSaT	Household Screening and Treatment
IRS	Indoor Residual Spraying
ITN	Insecticide-Treated Net
LLIN	Long- Lasting Insecticidal Net
LSM	Larval Source Management
MCN	Malaria Case Notification
MCR	Malaria Case Register
MDA	Mass Drug Administration
MEEDS	Malaria Epidemic Early Detection System
MEEWS	Malaria Epidemic Early Warning System
MoH	Ministry of Health
mRDT	Malaria Rapid Diagnostic Test
MSaT	Mass Screening and Treatment
PCD	Passive Case Detection
ProACD	Proactive Case Detection
RDT	Rapid Diagnostic Test
ReACD	Reactive Case Detection
SME	Surveillance, Monitoring, and Evaluation
SOP	Standard Operating Procedures
TMA	Tanzanian Meteorological Agency

WHO	World Health Organization
ZAMEP	Zanzibar Malaria Elimination Program
ZMCP	Zanzibar Malaria Control Program

Chapter 1: Background

1.1 Epidemiological Profile of Malaria in Zanzibar

Zanzibar is one of four countries, among the 41 African countries, that was able to significantly reduce its malaria burden from 40% in 2005 to less than 1.5% in 2011–2012[1]. The reduction of malaria prevalence in the community is attributable to the implementation of approved and effective interventions, including effective treatment with the recommended artemisinin-based combination therapy (ACT), increasing coverage and usage of long-lasting insecticidal nets (LLINs), successful indoor residual spraying (IRS) campaigns, and the use of malaria rapid diagnostic tests (mRDTs) in health facilities.

According to the most current malaria indicator survey[1], the malaria prevalence in Zanzibar is less than 0.07%. The scale-up of malaria control interventions has led to a dramatic decline in malaria incidence in Zanzibar. The incidence of confirmed malaria reported by health facilities among all age groups has reduced rapidly between 2005 and 2012 from 8/1000 to 2/1000, and in children younger than 5 years from 4/1000 to 2/1000, respectively. This is complemented by admissions due to malaria, which declined from above 30% in 2003 to less than 7% in 2012. More importantly, a significant reduction has been noted in deaths attributed to malaria, from more than 100 malaria deaths per year before 2003 to three deaths in 2013.[2]

Based on these results, the Zanzibar Ministry of Health and Social Welfare has officially changed its target from control to elimination of malaria on the island.

Although community-level malaria prevalence in Zanzibar has been reduced to unprecedentedly low levels (less than 1%), the persistence of endemic malaria transmission in surrounding areas (Mainland Tanzania and Kenya) leaves these islands vulnerable to sudden outbreaks of malaria and re-establishment of perennial malaria transmission. Reliable and improved malaria surveillance and epidemic response capacity are required to maintain control and prevent malaria resurgence in Zanzibar[3]. The control measures for malaria involve the effective treatment of clinical malaria that is detected through passive surveillance, as well as the prevention of disease through highly effective coverage of vector-control interventions. The programmatic focus of control measures seeks to maintain low-endemic malaria. By contrast, the main determinant of an elimination campaign seeks to interrupt endemic

[1] Tanzania HIV/AIDS and Malaria Indicator Survey 2011-12
[2] World Health Organization, World Malaria Report 2013.

transmission and prevent its re-establishment. During the elimination phase, activities are concentrated toward the identification of residual transmission foci and intensification of efforts to eliminate the last few infections. These activities, coupled with directed vector-control efforts, will enable the detection of not only clinical cases but also asymptomatic infections that potentially perpetuate transmission.[3]

[3] Moonen B, Cohen JM, Snow RW, Slutsker L, Smith DL, Abeyasinghe RR, et al. “Operational strategies to achieve and maintain malaria elimination,” 2010;376:1592–1603,

Table 1 illustrates the differences between the control and pre-elimination stages.

Table 1: Surveillance in the Different Stages of Malaria Control and Elimination

	Control	Pre-Elimination	Elimination	Maintenance
Goal	Reduce morbidity and mortality	Halt local transmission	Halt local transmission	Prevent re-establishment of local transmission
Objective	Reduce transmission intensity	Reduce onward transmission from existing cases	Reduce onward transmission from existing cases	Reduce onward transmission from imported cases
Unit	Country	Foci	Foci/case (local and imported)	Case (imported)
Methods/Data	Health facility data (monthly)	Health facility data (weekly)/case notification	Case notifications/active and passive case detection	Active and passive case detection
Objective of Data Collection	Monitoring and evaluation (M&E); impact of control measures	Improved surveillance to avoid outbreaks	Detection and response to all new cases to avoid onward transmission	Vigilance; all new cases (imported or local) detected and addressed to prevent resurgence

The primary malaria vectors in Zanzibar were *Plasmodium falciparum,* accounting for 67.2% of cases, followed by *P.malarie* (26.2%) and mixed infection (6.6%); *P. vivax* and *P.ovale* have not been reported in Zanzibar. However, in 2010, entomological surveillance performed in seven sentinel sites indicated that the primary vectors were *Anopheles arabiensis* (89%), *An. merus* (7%), and *An. gambiae* (4%). In 2005, the primary vectors were *An. gambiae* (95%), *An arabiensis* (4%), *An. quadriannulatus* (1.3%) and *An. merus* (0%). The change in malaria vector composition in Zanzibar is presumed to be a consequence of massive use of IRS and scale-up of LLIN distribution[4].

Zanzibar is now at its malaria pre-elimination phase. A major challenge for Zanzibar is therefore to avoid resurgence of malaria, which can happen only through the maintenance of highly effective coverage of vector-control interventions and comprehensive malaria case surveillance to ensure quick response to potentially emerging epidemics.[5]

At the pre-elimination stage, the establishment of a robust surveillance system is the most important intervention to achieve elimination and prevent reintroduction of malaria. If new imported malaria cases and emerging outbreaks are rapidly detected and reported, the program will be able to mount an appropriate response and prevent large-scale resurgence. Surveillance should be considered the “eyes and ears” of a malaria program. Without these “eyes and ears,” the program will be largely powerless to stop imported malaria cases from leading to the reintroduction of local transmission and potentially devastating epidemics.

[4] Zanzibar Malaria Elimination Programme. 2013. Malaria Strategic Plan III 2013/14-2017/18.

[5] Beer N, Ali AS, Shakely D, et al. “High effective coverage of vector control interventions in children after achieving low malaria transmission in Zanzibar, Tanzania.” Malaria Journal, 2013;12:38.

1.2 Overview of the Zanzibar Strategic Plan

The National Malaria Strategic Plan for 2013–2018 seeks to provide the strategic framework and focus for the consolidation of current malaria gains, which sets a platform toward malaria elimination. The following objectives were identified for the period 2013–2018 as part of Zanzibar's Malaria Strategic Plan[4].

- Objective 1: Increase confirmatory testing on suspected malaria cases, using the recommended parasitological test, by 100% in 2015.
- Objective 2: Improve the treatment of confirmatory malaria cases, by adding an anti-gametocytocidal drug, from 0% in 2013 to 100% by 2017.
- Objective 3: Develop systems to maintain universal-coverage (100%) prevention measures by 2018.
- Objective 4: Expand malaria surveillance to actively detect cases and investigate confirmed malaria cases to 100% by 2018.
- Objective 5: Develop functional coordination structures for malaria elimination at three operational levels (national, district, and *shehia*) by 2018.
- Objective 6: Improve operational research to evaluate and optimize malaria intervention activities, including monitoring resistance to anti-malarials and insecticides by 100% in 2018.
- Objective 7: Increase the provision of correct knowledge and good practices toward a continuum of malaria elimination to the Zanzibar population by 90% in 2018.

1.3 Aims and Objectives of Guidelines

The main objective of these guidelines is to provide guidance for conducting malaria surveillance and response.

The specific objectives are to provide reference and guidance to the Zanzibar Malaria Elimination Programme (ZAMEP), district teams, health facility staff, and communities on:

- Conducting malaria surveillance and response at various levels;
- Providing appropriate response to notified cases;
- Detecting a malaria outbreak and initiating a rapid response and
- Setting up preparedness and capacity-building plans at respective levels.

Chapter 2: Malaria Surveillance in Zanzibar

2.1 Case Definitions

2.1.1 Malaria Surveillance

Surveillance is the ongoing systematic collection, analysis, and interpretation of outcome-specific data for use in the planning, implementation, and evaluation of public health practice.[6] The seventh report of the World Health Organization (WHO) Expert Committee on Malaria stated that malaria surveillance is "designed to discover evidence of any continuation of transmission, to establish its nature and causes, to eliminate residual foci, to prevent or cure such residual or imported malaria infections in man as would delay the ending of transmission or threaten its resumption in a given area, and, finally, to substantiate the fact that *elimination* has been achieved."

The malaria surveillance approach is one of the greatest differences between malaria control and elimination programs. During control, programs are focused on population-wide interventions and are therefore interested in broad measures of morbidity that can be captured monthly or even less frequently in a limited geographical area (sentinel sites). The type of surveillance employed in such settings is passive case detection (PCD). For instance, in Zanzibar, passive surveillance is conducted by receiving weekly and monthly data from health facilities via the Malaria Early Epidemic Detection System (MEEDS), Health Management Information System (HMIS), Health Facility–Based Sentinel Surveillance (HFBSS) and Malaria Case Notification (MCN) systems. An elimination program, however, must eventually track every individual case and needs a sensitive and efficient system, enough to detect and report those cases within 24 hours of diagnosis and to undertake household investigation within 48 hours.

In 2012, the Coconut Surveillance system was established by USAID/PMI through RTI, to build on the success of MEEDS. This system allows District Malaria Surveillance Officers (DMSOs) to actively monitor new malaria cases reported through MEEDS and to respond to individual cases at the household level.

2.1.2 Passive Malaria Surveillance

PCD is based on routine data that health facilities regularly report to high-level health authorities. Zanzibar identifies approximately 50% of all new infections through PCD. Factors such as improved case management, health-seeking behavior, and high test rates at health facilities optimize passive surveillance systems[3]. However, if these factors are not improved, PCD cannot detect enough infections to decrease ongoing transmission and work toward elimination.

Primary malaria data sources include HMIS, HFBSS, MEEDS, and MCN. ZAMEP is currently collecting data from HMIS, the HFBSS system, and MEEDS (see ***Figure 1***). The HMIS data include malaria-related indicators collected through the general patient register system. District Health Management Teams (DHMTs) collect and report these data quarterly to ZAMEP. The HFBSS system is based on HMIS indicators and collects data in the seven hospitals in Pemba and Unguja. Reports are normally collected and disseminated to the ZAMEP on a monthly basis. MEEDS involves weekly reporting of key indicators on malaria testing and malaria cases.

[6] Thacker, SB & Berkelman RL. Public Health Surveillance In The United States. 1988. Epidemiological reviews 10:(164-190)

HMIS is a data collection system specifically designed to support planning, management, and decision-making in health facilities and organizations. HMIS is one of the six building blocks essential for health system strengthening.

2.1.3 Active Malaria Surveillance

To increase the malaria surveillance in Zanzibar and detect asymptomatic cases, ZAMEP decided to implement Active Case Detection (ACD) in Zanzibar (see ***Figure 1***).

ACD is a system in which a central health authority regularly pursues data at periodic intervals, often with the intent to validate the representativeness of a passive surveillance system. An active surveillance system will likely provide more complete reporting and can identify asymptomatic individuals.[7]

Reactive case detection. rACD can be case-based (triggered when PCD identifies a case) or event-based. It will involve visits to the households of locally acquired cases, screening family members, and screening neighbors within a defined radius.[3] Zanzibar uses the MCN system to collect data for rACD.

Proactive case detection. ProACD is the screening of foci that are at high risk of malaria. This type of surveillance enables the detection of asymptomatic carriers of the parasite. Different approaches for ProACDs are discussed within ZAMEP, including screening in malaria hotspots, high-risk groups,[8] and population movement points.

Foci. Foci are defined, circumscribed localities situated in a currently or formerly malarious area containing the continuous or intermittent epidemiological factors necessary for malaria transmission. Foci can be classified as endemic, residual active, residual non-active, cleared up, new potential, new active, or pseudo.[9]

Case investigation. A case investigation collects information that allows classification of a malaria case by origin of infection—that is, whether it was imported, introduced, indigenous, or induced. A case investigation includes the administration of a standardized questionnaire to a person diagnosed with a malaria infection.

Case notification. A case notification is the compulsory reporting of detected cases of malaria by all medical units and medical practitioners, to either the health department or the malaria elimination service (as laid down by law or regulation).

Imported vs. local case/induced case: An imported malaria case is due to mosquito-borne transmission and acquired outside the country. The origin of imported cases can be traced to a known malarious area outside the country to which the case has traveled. Induced malaria cases are not due to mosquito-borne transmission and may be acquired from a congenital infection or by contamination with infected blood (e.g., blood transfusion, shared syringes).[10]

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[7] *Teutsch SM*, *Churchill*. *RE*, *eds*. Principles and Practice of Public Health. Surveillance. *New York*, *NY*: *Oxford University Press*, *inc*, *2000:112-167*

[8] High-risk groups: There is no more acquired immunity in a hyper-endemic area like Zanzibar; therefore, the full population is at risk. However, groups with any form of immune suppression are considered to be at risk of developing more severe outcomes in case of a malaria infection and therefore need special attention.

[9] World Health Organization, “Disease surveillance for malaria control – an operational manual,” 2012.

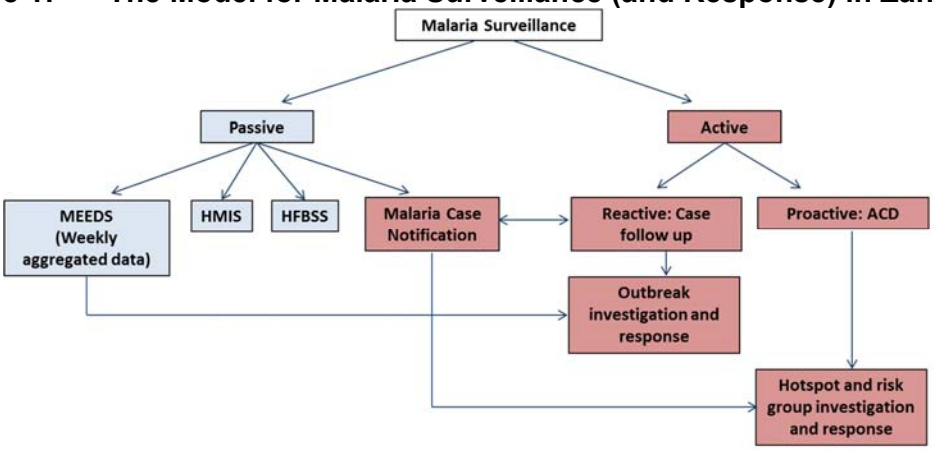
[10] Surveillance guidelines for malaria elimination and prevention of reintroduction for South Africa, 2012.

2.1.4 The Framework for Malaria Surveillance and Response in Zanzibar

The framework for malaria surveillance is not complete if it is not related to the response to passively identified cases. In Zanzibar, both passive and active surveillance trigger immediate actions such as investigation, verification, and response.

PCD includes three important steps: testing, treating, and tracking cases. Malaria-endemic countries should ensure that every suspected malaria case is tested, that every confirmed case is treated with a quality-assured anti-malarial medicine, and that the disease is tracked through timely and accurate surveillance systems to guide policy and operational decisions.[11] ACD involves reactive and proactive testing and further investigation (see ***Figure 1***). Response to abnormal transmission and eventually to all identified and investigated cases is the ultimate goal of the surveillance framework in Zanzibar.

Figure 1: The Model for Malaria Surveillance (and Response) in Zanzibar



2.2 Overview of MEEDS and MCN Systems in Zanzibar

2.2.1 Malaria Early Epidemic Detection System

Established in 2008, MEEDS helps to identify an abnormal increase (exceeding the threshold) of malaria cases based on weekly aggregated reported data.

MEEDS relies on mobile phone–based weekly reporting of malaria indicators from all health facilities (both public and private). Each week, malaria surveillance data are forwarded to a secure Web site for ZAMEP to review. The system is introduced in peripheral health facilities, which use a pre-printed weekly form to record, aggregate, and stratify (by <5 and ≥5 years) the daily number of outpatient visits and malaria test results. Weekly summarized data are entered into a customized cell phone menu and transmitted weekly to a remote server. Facility data are immediately available on a secure Web site, where ZAMEP can evaluate weekly trends in outpatient visits, malaria testing rates (patients tested for malaria/total outpatient visits), and malaria positivity rates (patients with confirmed malaria/total patients tested).[12]

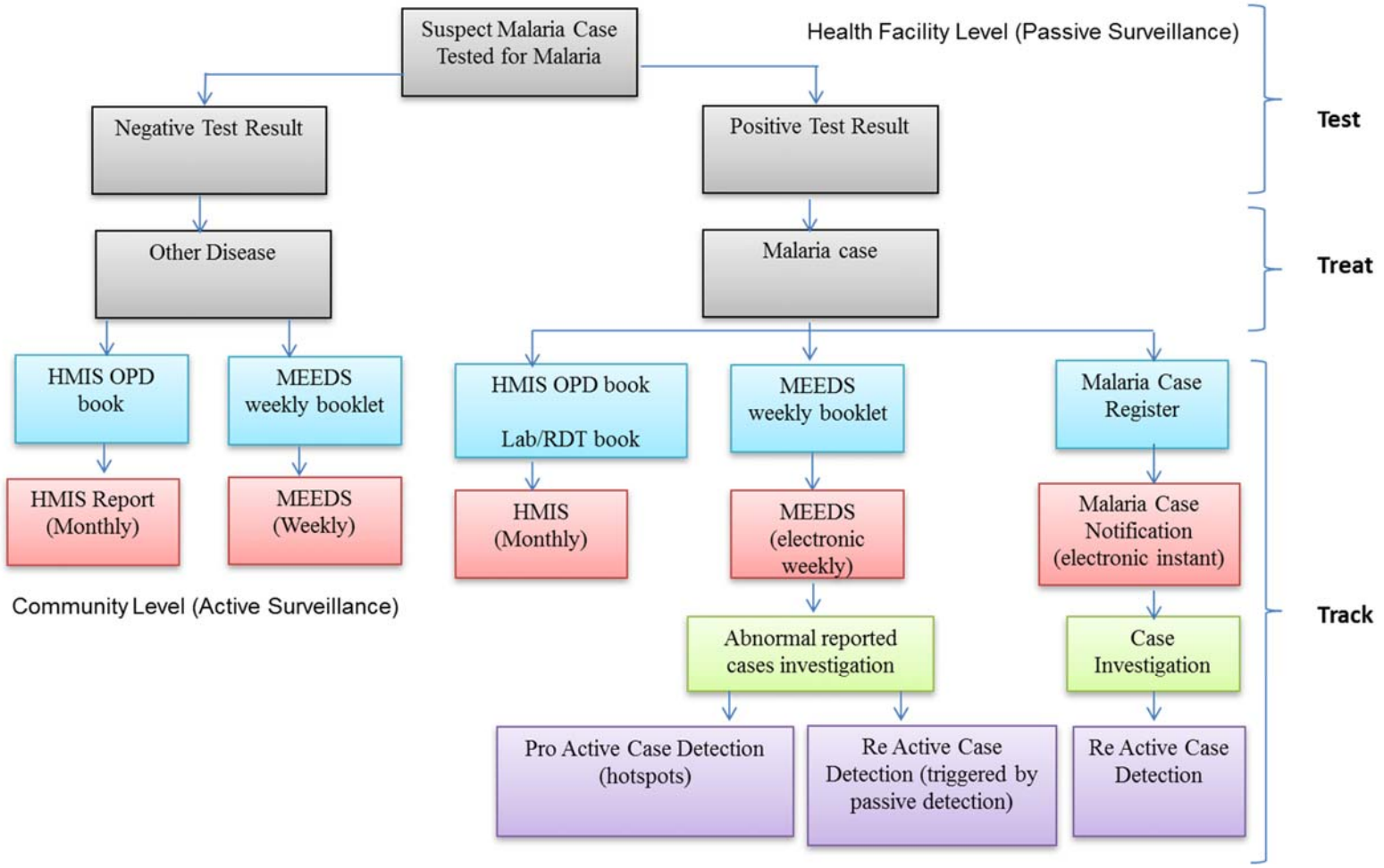
[11] World Health Organization, "Test. Treat. Track. Scaling up diagnostic testing, treatment and surveillance for malaria," 2012.

[12] Zanzibar Malaria Control Program (ZMCP), 2010.

Each week, health facilities in Zanzibar forward this data to a secure Web portal that the stakeholders review. This system enables the surveillance monitoring team to detect a malaria epidemic outbreak within 2 weeks of onset and helps them determine what actions to take when a sudden increase in malaria transmission occurs. All health facilities (both public and private) in Zanzibar are using MEEDS. Details of the steps involved in the MEEDS system are available in the Malaria Surveillance Standard Operating Procedures (found in separate document).

Data generated from case investigations and reactive case detections can be mapped with passive surveillance data and can be used to identify risk factors for transmission and targets for malaria control interventions (see Figure 2).

Figure 2: Testing, Treating, and Tracking Malaria Cases



2.2.2 Malaria Case Notification

MCN—locally known as the Coconut Surveillance system—was established in 2012 to build on the success of MEEDS. The MCN system involves the use of the Malaria Case Register (MCR) to record more detailed information about confirmed malaria cases that the DMSO follows up on individually. Figure 3 shows an overview of the steps involved in the MCN system. Further details are available in the Malaria Surveillance Standard Operating Procedures.

The DMSO routinely follows up on each malaria case that health facilities report. The responsibilities of these officers are to receive case notifications from health facilities, carry out a home visit, and send a report. In defined cases, the DMSO will screen all family members of an index case and all neighbors in a defined radius around the patient household (reactive case detection).

2.2.3 Recording Malaria Cases

Figure 2 documents the information flow of each potential malaria case. Patients with a test result are recorded into the HMIS and MEEDS registers by the health provider. Additional information about each confirmed malaria case is recorded in the MCR by the health provider. The following summarizes the booklets used to record data from MEEDS and MCN surveillance systems:

OPD book. The Ministry of Health (MoH)—HMIS—routinely provides standard OPD register books to all health facilities, whose workers fill them out daily.

Lab/RDT book. All patients tested for malaria—either by using microscopy or malaria rapid diagnostic test (mRDT)—and their results are recorded in specific books by the laboratory technician.

Weekly MEEDS summary. ZAMEP provides standard booklets—Surveillance, Monitoring, and Evaluation (SME)—that the in-charge health facility fills out, including a daily summary of six indicators derived from the OPD register and lab/mRDT book.

Malaria Case Register. ZAMEP has introduced the MCR in all health facilities in Zanzibar. The register remains at the health facility and contains the following parameters: case number, date of testing, name, age, sex, address, treatment prescribed, travel history, travel destination, household number, and comments. The MCR provides an ideal platform for malaria case investigations.

2.2.4 Malaria Epidemics Early Warning System

Early warning systems can be defined as the monitoring of climatic indicators, population vulnerability factors, and environmental factors to detect whether epidemic-conducive conditions already exist at a given time and place.[13] The aim of the Malaria Early Warning System (MEWS) is to gather evidence for an early and targeted response to an epidemic.[14]

WHO defines three main assumptions for a successful MEWS:

- Sufficient information about past events needs to be available.
- Information needs to be quantified as numerical data.

[13] Najera JA, "Prevention and control of malaria epidemics," Parassitologia, 1999; 41(1-3):339-47.

[14] World Health Organization, "Malaria epidemics: forecasting, prevention, early detection and control. From policy to practice," 2003.

- Past patterns are highly likely to continue into the future.

Population Vulnerability

The most important step in a vulnerability assessment is the identification of areas at risk of epidemics, based on climatic factors and the incidence of previous malaria epidemics. Vulnerability in case of malaria can change over time, including the following factors[15]:

- Change in malaria epidemiology
- Change in seasonal rainfall patterns
- Migration
- Breakdown in control activities
- Drug resistance of the parasite
- Environmental changes that increase the risk of transmission
- Presence of hotspots— These are geographically discrete households or groups of households that maintain malaria transmission throughout the year at significantly higher rates than their surroundings.
- Presence of hotpops— These are demographically discrete groups (populations) that maintain malaria transmission at higher rates than the surrounding population.

Climatic Indicators

Climatic indicators can predict the timing of an upcoming malaria epidemic. Generally, the combination of increased temperature and rainfall increases the risk of an epidemic. Based on weekly reporting of malaria cases, Zanzibar experiences a predominantly seasonal transmission pattern, especially after the long rainy season (April–June). As the Tanzanian Meteorological Agency (TMA) routinely collects rainfall data, those data can easily be used for the prediction of malaria epidemics.

Factors Related to the Vector

The most important factor related to the vector is the change in weather patterns. Heavy rains increase the number of breeding sites and therefore increase the vector density. Heavy rains following a dry year are especially considered a trigger factor for the development of a malaria epidemic[14,15].

Other factors considered are 1) new and more efficient vectors, 2) vector-control breakdowns, and 3) insecticide resistance.

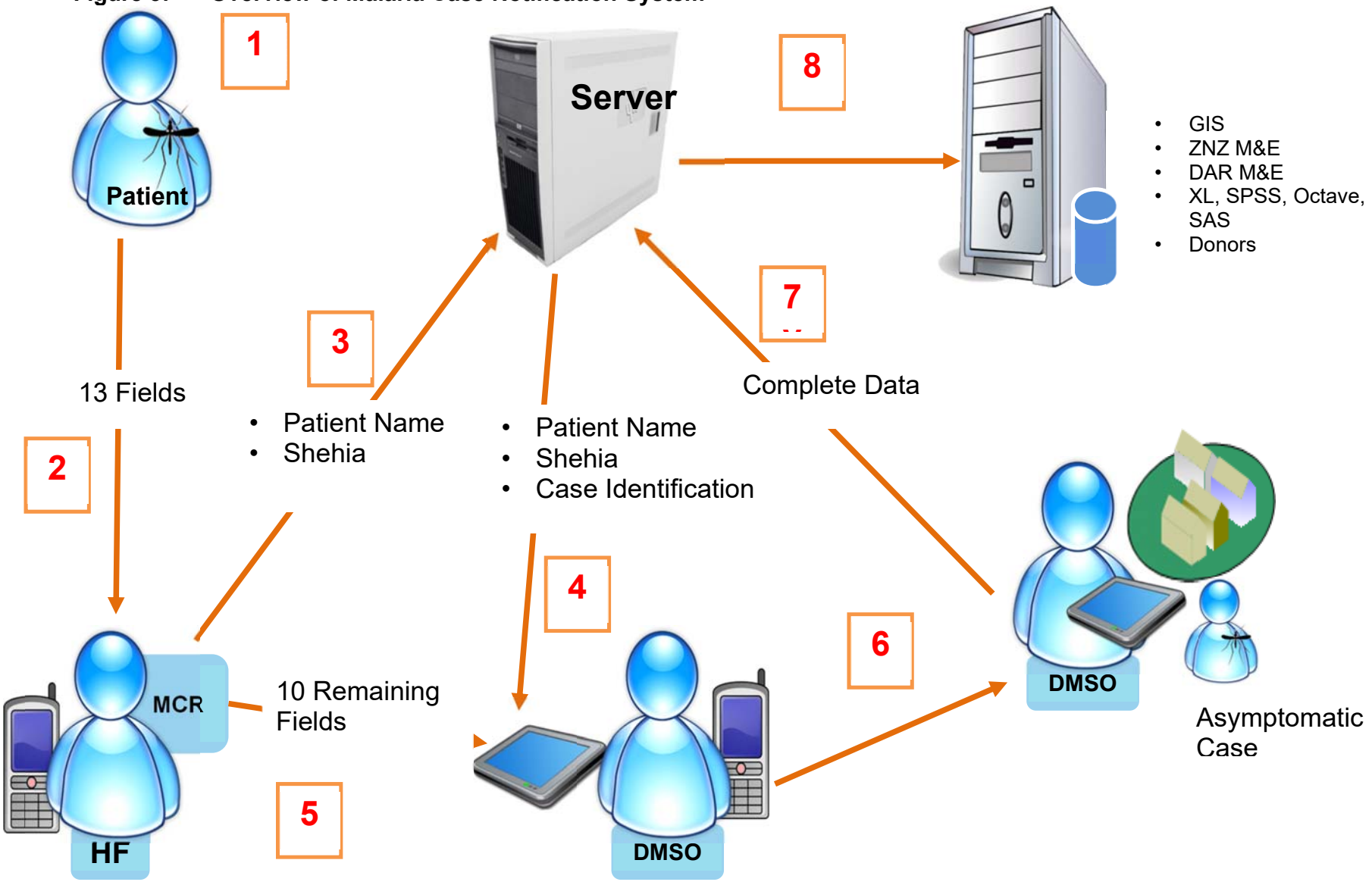
WHO identifies four main assumptions for a successful early epidemic detection system:

- Punctual data collection and notification
- Representative data collection
- Prompt data analysis

[15] World Health Organization, A framework for field research in Africa. Malaria Early Warning Systems. 2001.

- Functional data interpretation, dissemination, and use

Figure 3: Overview of Malaria Case Notification System



2.3 Epidemiological Thresholds

According to WHO, an epidemic threshold is *the critical number or density of susceptible hosts required for an epidemic to occur. The epidemic threshold is used to confirm the emergence of an epidemic so as to step-up appropriate control measures*.[16]

To define an epidemic threshold in a certain area, data must be available for some years and the population should have been stable within this time. However, if the disease burden changed significantly within these years, the definition of a precise threshold will not be possible and an epidemic situation will be more practically defined by the rapid increase in numbers, a high case-fatality rate, and the fact that existing health services are overwhelmed.[3]

An *alert threshold* is the critical number of cases that sound an early warning, draw attention, or call for close monitoring of the trend to help understand the clear picture of transmission within 7 days.

An *alarm threshold* is the critical number of cases that trigger specific investigative responses, followed by actions to interrupt or intervene within 7 days.

Because the calculation of an epidemic threshold needs a minimum of 5 years' worth of data (without a significant change in malaria transmission patterns), WHO suggests using alternative strategies. In Zanzibar, the epidemiological thresholds have been set based on the MEEDS data, as ***Table 2*** shows.

Outbreaks are detected at the *shehia* and village level in all districts in Zanzibar. An epidemic threshold has been set for each level, comparing the number of malaria cases over 2 consecutive weeks. If the number of confirmed cases that the health facility reports exceeds the threshold level, this is considered abnormal and an investigation process is implemented by the district malaria response teams. In Zanzibar, if the number of confirmed malaria cases at the *shehia* level exceeds 10 cases per week, an epidemic alert is triggered for that *shehia*, and if the number of cases at the village level exceeds 5 cases per week, an epidemic alert is triggered for that village and an investigation will be implemented by the district malaria response teams. On the other hand, if the number of cases exceeds 10 cases for 2 consecutive weeks at the *shehia* level, and 5 or more cases (all ages) for 2 consecutive weeks at the village level, an epidemic alarm is triggered

[16] http://www.who.int/hac/about/definitions/en/

Table 2: Epidemic Thresholds at different levels in Zanzibar

	Data Type	Alert	Alarm	Action
District	Weekly reporting	Statistical method based on weekly data	Statistical method based on data	Investigate whether cases are focal and intervene
Health Facility	Weekly reporting	≥10 cases in all age groups within a week OR ≥5 cases under-five years	If for 2 consecutive weeks, the number of cases at health facility remains ≥10 (all ages) OR ≥5 cases under-fives	Investigate whether cases are focal and intervene
Shehia	Malaria case notification and household follow-up	≥10 cases in all age groups within a week OR ≥5 cases under-fives	10 or more cases (all ages) for 2 consecutive weeks OR ≥5 cases under-fives	Investigate and consider *shehia*-wide response (MSaT)
Village	Malaria case notification and household follow-up	≥5 cases in all age groups within a week	5 or more cases (all ages) for 2 consecutive weeks	Investigate and consider village-wide response (FSaT)
Household	Malaria case notification	Health facilities notify all cases	Cases not followed up within 48 hours	Case household screening and treatment (HSaT)

2.4 Epidemic Detection

The MEEDS and MCN data help detect an outbreak in malaria cases so that ZAMEP/DHMT can generate an action plan to prevent further malaria transmission. The data helps to identify any risk factors for transmission and targets for malaria prevention. Because the MCN provides real-time surveillance data, ZAMEP/DHMT uses it to detect any outbreaks and make decisions on the outbreak response plan. This includes decisions regarding time and location for investigating sudden increases in transmission, whether an active case detection should be initiated, and whether a more comprehensive coverage of malaria interventions needs to be applied.

On a weekly basis, ZAMEP performs analysis on the data obtained from the MEEDS and MCN systems, as Figure 2 shows, to determine any abnormal increase (exceeded thresholds) in malaria cases in a geographical area. Refer to the Malaria Surveillance Data Analysis and Interpretation handbook for further details on how to analyze data obtained from the surveillance systems and how to use the epidemiological threshold to detect an epidemic.

2.5 Epidemic Notification

The ZAMEP outbreak notification system relies on the cases reported through MCN and MEEDS. Once an epidemic is detected, malaria outbreak notification can be initiated at three different levels. These include:

- Health facility. Health workers report via phone calls or SMS on the observed abnormality of malaria cases at the respective health facility, simultaneously to ZAMEP central offices and their respective DHMTs.

  Advantages: Faster initiation of response to outbreak due to notification at first level
  Assumptions: Training of simple surveillance techniques to health staff

- **District.** The District Medical Officer (DMO) receives one text message per week, containing all MEEDS indicators, from his or her catchment Primary Health Care Units (PHCUs). With this information, the DMO can detect an abnormality in malaria burden and start the response by ensuring that enough RDT and ACT stock is available and inform the respective PHCU at the national level.

  Advantages: Malaria diagnostic and treatment stock and supply can be organized early
  Assumptions: Functioning notification through cell phone

- **National.** The national level uses two approaches to notify about outbreaks. First, a strong communication with the DHMTs is established, and second, all data collected through the MCN and MEEDS is accessible in real time on a Web page. Timely analysis and interpretation of this data helps to detect an upcoming outbreak.

  Assumptions: Functioning data dissemination system

2.6 Epidemic and Events Log

The epidemic and events log is a feature of the Coconut Surveillance system and logs all malaria cases detected at the health facility. This log is used to confirm the emergence of an epidemic so as to step up appropriate control measures. It provides information about whether the numbers of cases at the facility, *shehia*, village, and district level have exceeded the threshold level to trigger an epidemic alert or alarm. It also provides information about what action and solution the SME officer undertook at the national level. The epidemic and events log is filled whenever an epidemic has been confirmed.

2.7 Epidemic Investigation

The district levels, in close collaboration with the national/zonal level, are responsible for the investigation of a rapid response to a malaria outbreak in Zanzibar. Each outbreak investigation consists of two parts. First, the district response team (DRT) conducts investigations at health facilities and implements ACD in the affected community. Second, outbreak mitigation and evaluation occurs at the national/zonal level. Please refer to the District Response Team Handbook for detailed roles and responsibilities of every stakeholder for investigating an epidemic.

Chapter 3: Surveillance Response Actions

3.1 Types of Surveillance Response Actions

If one village or *shehia* exceeds the defined malaria epidemic cutoff for Zanzibar, a rapid response must be initiated to minimize malaria morbidity and mortality in the affected community. There are three levels of surveillance response, according to the magnitude of the outbreak: case-based, event-based in areas of hotspots, and event-based in areas where epidemics occur. ***Table 3*** summarizes these levels of response.

Table 3: Type of Response and Respective Interventions/Activities

	Type of Response		
	Case-Based Response (MCN)	**Event-Based Response (Hotspot/Cluster)**	**Event-Based Response (Epidemic)**
Scope	Household follow-up of all detected and notified cases	Response in defined geographic areas where temporal spatial clustering of cases occurs	Response in areas where malaria epidemics (outbreaks) occur
Criteria for Response	All notified malaria cases	Malaria hotspot Cluster of malaria cases: at least five index cases reported in village/sub-*shehia* within a period of 7 days	Epidemic thresholds exceeded (at district/health facility level)
Geographic Area	Index case households	Village/sub-*shehia*	Depends on the extent of the malaria outbreak (shehia, district, or zone)
Response Activities	Household testing Behavior Change Communication (BCC) leaflet LLIN coupon Locating breeding sites and mapping	Focal Screening and Treatment (FSaT) BCC LLIN distribution Larval Source Management (LSM) Focal IRS Mass Drug Administration (MDA)	Mass Screening and Treatment (MSaT) BCC LLIN distribution LSM IRS MDA

3.2 Epidemic Response

Based on the information of the technical team, ZAMEP will select a proper intervention strategy. The first important step is to inform the population about the current situation. This should be the responsibility of a person at the national level, who is precisely informed about the situation and has media skills and good knowledge about malaria.

The District Malaria Response Teams (DMRTs) of every district have been trained to respond to outbreaks and to implement disease control measures. The teams are composed of members such as DMOs, DMSOs, clinical officers/nurses, health

promotion officers, environment health officers, district administrators, and meteorological officers. The District Response Team Handbook details the responsibilities of the team members.

After an outbreak is confirmed, an epidemic response takes place, which involves implementation of interventions by different teams as described below. The District Response Team Handbook discusses the detailed roles of each component.

- **Case Management.** Ensure that enough manpower is available to respond to the outbreak and enough medical supplies and treatment drugs are available.
- **Vector Control**
  - *Long-lasting insecticidal nets*— assess the availability of LLINs for at-risk households and consider top-up net distribution.
  - *Larval source management*— Study the environment to investigate the cause of the increase in mosquito population, such as water bodies or bushes that could serve as breeding areas for larvae. Such areas need to be treated for vector control. The vector control unit is also responsible for IRS at households.
  - *Entomology*—Study the mosquito density and the various species of mosquitoes present in the environment.
- **Behavior Change Communication.** Contact and inform the districts of the epidemic, and educate the people in the affected villages about the disease and prevention strategies.
- **Surveillance, Monitoring, and Evaluation.** Review all the data and detect any abnormal increase (thresholds exceeded) of malaria cases.
- **Diagnostics.** Use mRDTs to diagnose malaria cases and ensure that the health facilities have enough stocks and manpower. Confirm all positive mRDT results by taking slides for microscopy (species identification and parasite density).

3.3 Post-Epidemic Evaluation

After the occurrence of a malaria outbreak, it is important to evaluate possible reasons and evaluate the success of the conducted intervention to prevent upcoming epidemics and to improve strategic planning. The post-epidemic evaluation should assess all levels of the health system to identify problems encountered in the early warning, early detection, prevention, and control of malaria epidemics. For a full assessment of the post-epidemic situation, the following information should be gathered.

3.3.1 Adequacy of Forecasting and Early Warning System

Information about meteorological events should be available at regional and national levels and should also be communicated to district health offices. ZAMEP/DHMT should research and investigate local meteorological reports and other vulnerability indicators to assess whether they were or could have been of use. These include:

- Meteorological reports indicating normal or abnormal situations (rainfall, temperature)
- Drought and famine

- Migration of non-immunes
- High incidence of other diseases
- Data or opinions on the efficacy of anti-malarial drugs and insecticides
- Environmental changes (dams, agricultural projects)

3.3.2 Adequacy of Epidemic Detection, Preparedness, and Response

Identifying both the strengths and drawbacks of the epidemic response is vital to building on the former and taking appropriate corrective actions on the latter. The investigation should primarily focus on how efficient the system was in confirming the epidemic situation, the status of preparedness (e.g., availability of drugs, insecticides, financial resources, manpower, logistics, and transportation), the timing and impact of intervention measures, resource usage, efficiency, and the participation of the community and other partners.

To evaluate the causes of an outbreak, DMRT need to conduct entomological investigations. These activities include the following procedures:

- **Resistance monitoring status**. Collect adult mosquitoes or first-generation mosquitoes from the larva-rearing process and test them with the susceptibility assay against insecticides currently in use, including *Lambda-cyhalothrin* for IRS, *deltamethrin* for treated and conventional nets, and *permethrin* for LLINs.
- **Bioassay test**. Collect samples of conventional nets, insecticide-treated nets (ITNs), and LLINs collected from the community. This test will indicate gradual decrease in toxicity of insecticide employed for treatment of nets and IRS.
- **Larvae searches**. Conduct the dipping method to sample larvae of *Anopheles* mosquitoes from surrounding water habitats. The collected larvae will be reared to adulthood in the insectary where species identification will occur. All potential *Anopheles* mosquito-breeding habitats will be mapped by the vector control unit. The findings will be correlated with the adult sampling outcome.

The national entomological representative is responsible for conducting these activities with his or her team.

3.3.3 Evaluating the Overall Response to the Epidemic

To evaluate the success of the outbreak intervention, ZAMEP decided to collect and analyze the following outcome indicators[17]:

- **Time to treatment**—Within 24 hours of the onset of symptoms
- **Percentage of patients developing severe disease**—The number of cases of severe malaria (more specifically, *cerebral malaria*)
- **Flattening of falling epidemic curve**—Measuring whether the epidemic has been identified early and whether conducted interventions were successful

[17] World Health Organization. Field guide for malaria epidemic assessment and reporting, 2004.

- **Case fatality rate**

Chapter 4: Malaria Outbreak Preparedness, Prevention, and Control

4.1 Preparedness Checklist

A preparedness checklist for situation analysis has been developed by ZAMEP in close collaboration with RTI, to ensure that a country is prepared for a malaria outbreak. (See Appendix 1.) It entails a policy, management, and support system review for the prevention and control of malaria epidemics.

Major Areas to Be Investigated:

- Forecasting and preventing epidemics, including malaria
- Preparedness, early detection, and control of epidemics, including malaria

Objectives:

- To review the national health goals, policies, and strategies on epidemics
- To assess the institutional framework and capacity for epidemic preparedness and response
- To assess the design and implementation of an early warning system for forecasting and preventing epidemics, including malaria

4.2 Preparedness Plan

Commodities

In each site, there will be sufficient supplies to enhance testing and treatment capacity. The commodities will include: 1) mRDTs, 2) all categories of ACT 3) diagnostic consumables, 4) a clinical thermometer and 5) essential medicines for the management of adverse drug reactions (ADRs).

Stock Management

Each team will have a sub-stock of a smaller quantity of the commodities. The sub-stock should cover a period of at least 14 days. The site must also maintain a maximum stock of commodities to ensure an uninterrupted supply of the above-mentioned list of commodities. The site shall communicate with the Central Medical Store (CMS) to get the required supplies.

The District Materials Manager (DMM) will be responsible for collecting the rapid response stock kit from the CMS, including requesting, properly handling, and keeping good records. Each request from the district level to the CMS should follow the normal procedures. However, the DMM can place an emergency order at any time if such a need arises.

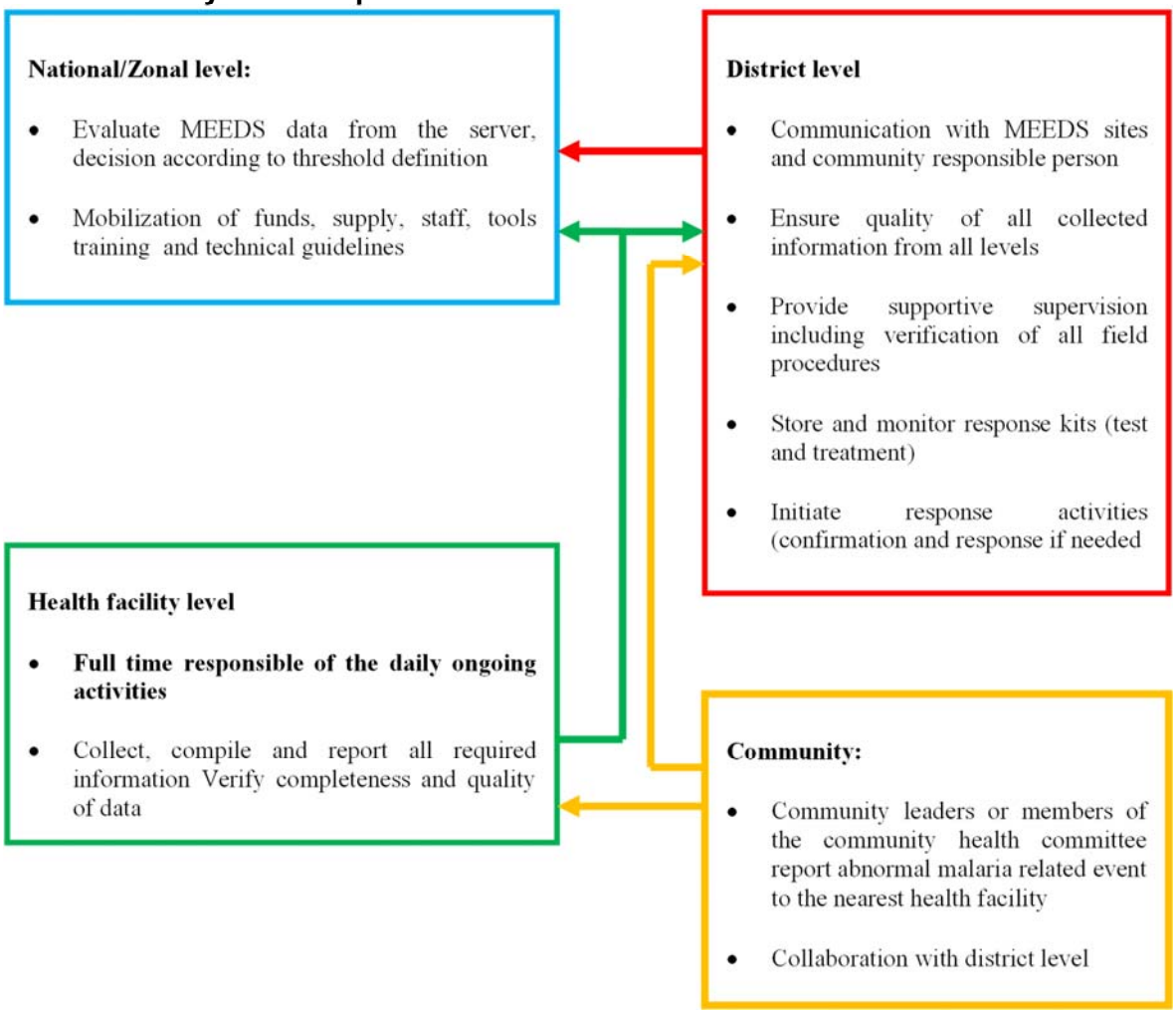
In additional to the above-mentioned list of commodities, the site shall remain stationary for routine and daily office uses.

4.3 Roles and Responsibilities of Teams and Units

Zanzibar malaria epidemic prevention and control is built on four levels. Each level has specified responsibilities to ensure that an upcoming outbreak can be detected at an

early stage and an epidemic can be prevented.[18] Figure 4 shows those levels. The District Response Team Handbook outlines the detailed roles and responsibilities.

Figure 4: Responsibilities of Each Level Involved in the Early Detection System of Epidemics



[18] These responsibilities have been developed according to "Systems for the early detection of malaria epidemics in Africa," World Health Organization, 2006.

Appendix: Preparedness Checklist

Name of Zone		
Name of District		
Desk Reviewer/Interviewer		Date

POLICIES – NATIONAL

1. Is there a national/local health policy document? …… Y/N

   If YES,

   What is the date on the document, and which period does it cover?

   .....

   Does it cover the prevention and control of epidemics, including malaria?.....Y/N

   If YES,

   State the national/local policy on prevention and control of malaria epidemics:

   .....

   .....

   .....

   .....

2. Is there an inventory of diseases of epidemic potential in the country? Y/N

   If YES,

   State which ones and their epidemic thresholds:

   .....

   .....

   .....

   .....

MANAGEMENT SYSTEMS

3. Is there a unit within the local Ministry of Health responsible for prevention and control of epidemics/disasters?.....Y/N

   If YES,

   What is it called and what is its location, composition, and contact address?

   .....

   .....

   .....

   .....

4. Are other experts outside the Ministry of Health closely involved with the work of this unit (e.g., meteorological services)?.....Y/N

   If YES,

   Which outside experts exactly, and what is the nature of the collaboration with the Ministry of Health epidemics/disasters unit?

   .....

   .....

   .....

5. Has an emergency task force been established?.....Y/N

   If YES,

   What are the criteria for the task force to be called together?

   .....

   .....

   .....

   .....

   List the task force members, their functions, and their contact addresses:

   (1).....

   (2).....

   (3).....

   (4).....

   (5).....

   (6).....

   (7).....

   (8).....

(9).....

(10).....

6. Has a retrospective analysis of previous malaria epidemics in the country/locality been performed as part of the overall process of malaria stratification? .....Y/N

   If YES, attach the final document.

7. Has mapping of malaria epidemic–prone areas been performed as part of the overall process of malaria stratification? .....Y/N

   If YES, attach the most detailed and up-to-date maps.

   Do the maps clearly identify the areas/villages and populations at highest risk, the years of the most recent epidemics, and the main risk factors?.....Y/N

   Do the maps identify and localize the specific curative and preventive services available to the population at risk?.....Y/N

8. What is the estimated population at risk of malaria epidemics in the country/district?

   Absolute number of people.....

   Percentage of the total population in the country/locality.....

9. Has an early warning system been developed to predict malaria epidemics?.....Y/N

   If YES,

   What kind of system? .....

10. Is an early detection system for epidemics in place? .....Y/N

    If YES,

    What indicators/tools are being used?

    .....

    At which level(s)?

    .....

    What is the most peripheral (health) unit involved?

    .....

    Give a frank impression of its current functionality and possible bottlenecks:

    .....

    .....

    .....

11. Describe the notification chain for suspected epidemics:

    .....

    .....

    .....

    .....

    .....

12. Is an initial assessment and verification of a suspected epidemic always carried out in a systematic and timely manner following agreed-upon guidelines? .....Y/N

    If YES, attach the guidelines/reporting format and a recent report.

13. Have control options been defined for the different high-risk areas and their cost-effective timing in relation to the onset of an epidemic?.....Y/N

    If YES, attach an overview.

14. Are there national strategic plans/guidelines and training modules for the prevention and control of malaria epidemics? .....Y/N

    If YES, attach copies of each.

15. Has a preparedness plan of action been devised and shared with all parties involved in epidemic warning, detection, and response?.....Y/N

    If YES, attach a mailing list of the most recent preparedness plan of action.

SUPPORT SYSTEMS

16. Are trained human resources available for the control of epidemics?.....Y/N

    If YES, give overview of the categories of staff and the number in each category:

    (1).....

    (2).....

    (3).....

    (4).....

    (5).....

    (6).....

    (7).....

Are all these people still in place?.....Y/N

17. Number of core trainers trained at the national/district level in epidemic preparedness and control:

    .....

Are all these people still in place?.....Y/N

18. Are dedicated financial resources available?.....Y/N

    If YES,

    At which level? .....

    Amount? .....

    Percentage of the overall budget for malaria control activities: .....

19. Are emergency stocks in place (give localities for each) for the following?

    i) Anti-malarial drugs for uncomplicated and severe malaria (type, quantity):

    .....

    .....

    .....

    .....

    ii) Laboratory supplies (type and quantity):

    .....

    .....

    .....

    .....

    iii) Hospital supplies (type and quantity):

    .....

    .....

    .....

    .....

    iv) Insecticides (type and quantity):

    .....

    .....

    .....

    .....

    v) Vector control supplies and machinery (type and quantity):

.....

.....

.....

.....

vi) Insecticide-treated nets (type and quantity):

.....

.....

.....

.....

20. Priority research needs for epidemic prevention and control:

.....

.....

.....

.....

Conclusion:

Overall Assessment

Satisfactory?.....Y/N

IF YES: When is the next assessment due ? .....

IF NO: What steps will be taken to improve, by whom and when?

.....

.....

.....