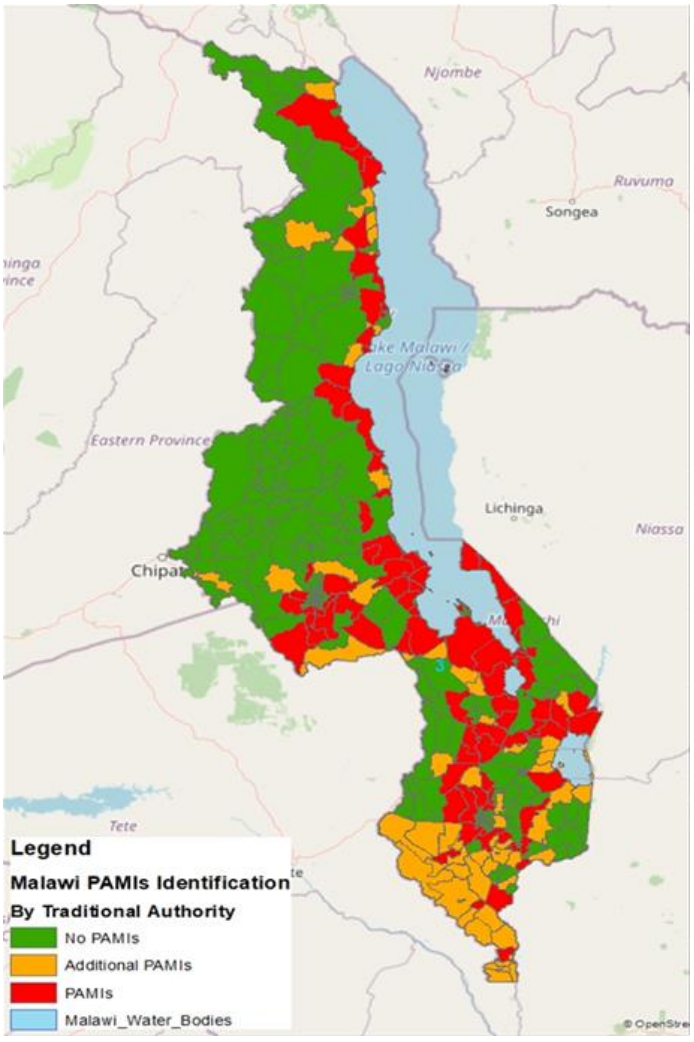
**Government of Malawi**

**Ministry of Health**

# REPORT ON IDENTIFICATION OF PRIORITY AREAS FOR MULTI-SECTORAL INTERVENTIONS FOR CHOLERA

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Secretary for Health

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Abbreviations and Acronyms

| | |
|---|---|
| AMREF | African Medical and Research Foundation |
| CDC | Center for Disease Control and Prevention |
| CTU | Cholera Treatment Centre |
| DHIS2 | District Health Information System 2 |
| DHO | District Health Office |
| GDP | Gross Domestic Product |
| GIS | Geographic Information System |
| GTFCC | Global Task Force for Cholera Control |
| IDSR | Integrated Disease Surveillance and Response |
| IOM | International Organization for Migration |
| KM | Kilometre |
| MoA | Ministry of Agriculture |
| MOH | Ministry of Health |
| MOH-HPD | Ministry of Health- Health Promotion Division |
| MoID | Ministry of Information and Digitalization |
| MoNRCC | Ministry of Natural Resources and Climate Change |
| MoT | Ministry of Tourism |
| MoTPW | Ministry of Transport and Public Works |
| MoWS | Ministry of Water and Sanitation |
| MRCS | Malawi Red Cross Society |
| MSF | Médecins Sans Frontieres |
| NCCS | National COVID-19 and Cholera Secretariat |
| NCCP | National Cholera Control Plan |
| NSO | National Statistical Office |
| OCV | Oral Cholera Vaccine |
| OHSP | One Health Surveillance Platform |
| OPC | Office of President and Cabinet |
| PAMI | Priority Areas for Multi-sectoral Interventions |
| PCR | Polymerase Chain Reaction |
| EMC | Emergency Management Committee |
| PHIM | Public Health Institute of Malawi |
| PIH | Partners in Health |
| RDT | Rapid Diagnostic Test |
| STA | Sub-Traditional Authority |
| TA | Traditional Authority |
| UNICEF | United Nations International Children's Emergency Fund |
| UP | United Purpose |
| USAID | United States Agency for International Development |
| WASH | Water, Sanitation and Hygiene |

| | |
|---|---|
| WESNET | Water and Environmental Sanitation Network |
| WHO | World Health Organization |

# EXECUTIVE SUMMARY

Malawi has been experiencing frequent cholera outbreaks since it reported the first case in 1973. The most significant outbreaks occurred in the cholera seasons of 1998/1999 and 2001/2002. The worst outbreak occurred recently in 2022/2023 with 53,020 cases and 1586 deaths (3%CFR). These outbreaks have been common around lake Chilwa in Machinga, Zomba and Phalombe, the Lower Shire in Chikwawa and Nsanje and Lakeshore districts from Mangochi up to Karonga.

Malawi is vulnerable to cholera due to poor WASH the situation which is worsened by frequent weather events, such as cyclones, storms, floods, landslides, and droughts. Four Cyclones namely Idai, Anna, Gombe, and Freddy experienced within a space of 5 years from 2019 caused serious damage to WASH infrastructure and health facilities worsening the risks and occurrence of cholera.

The WHO and GTCC launched Ending Cholera – a Global Roadmap to end cholera by 2030. To develop this plan, the MoH and WHO the country is required to come up with Priority Areas for Multi Sectoral Interventions (PAMIS). The identification of PAMIs is the initial step towards formulating the National Cholera Plan according to Global Task Force on Cholera Control (GTFCC). These are areas (Traditional Authorities) of high vulnerability that if prioritized and targeted with multi stakeholder interventions there is high potential to reduce cases and deaths.

The process of coming up with the PAMIS started in November 2023. The PAMIs were identified using the following information: -

- Data on cholera outbreaks from 2018 to 2023
- Calculated cholera priority values for all geographical units across the country
- Selection of priority areas based on priority index values for multi-sectoral interventions.

This process led to the identification 80 TAs which had experienced 86% of cases and 58% of deaths from 2018. There was a validation workshop which led to the identification of an additional 39 Tas. The TAs that had the highest priority index score of 9 based on the initial Minimum Index Score were: **Kapeni, Kuntaja, Machinjiri (Blantyre), Kachindamoto (Dedza), Chitukula, Kalumbu (Lilongwe), Mlomba (Machinga), STA Lulanga (Mangochi) Kambwiri, Maganga, Kululanga (Salima**

**The validation workshop** recommended the addition of 38 more TAs among which the priority was **Chigalu (Blantyre), Mposa (Machinga), Chilipa, Mtonda (Mangochi), Mabuka (Mulanje), Mankhambira (Nkhatabay), Malengachazi (Nkhotakota) and Masasa (Ntcheu). A total of 118 TAs have been identified as PAMIS in 20 districts in Malawi.**

The conclusion and recommendation therefore are that these are the PAMIS for Malawi for now and should be prioritized in the development of the Malawi 5 Year Plan and annual planning by all Stakeholders such as District Councils. It is also recommended that the review of the PAMIS should be ongoing process. Routine interventions should continue in all TAs regardless of PAMIS status.

# 1.0 BACKGROUND

## 1.1 Country Profile

Malawi is a landlocked country located in South-eastern Africa region. It borders Zambia to the west, Tanzania to the north and northeast, and Mozambique to the east, south and southwest. The country spans over 118,484 $km^2$ and its population was projected at 19,809,511 in 2023, where 10,210,246 (51.5%) are females, and 8,134,458 (44%) are children aged 0-14 years (NSO,2018). Malawi comprises a total of 29 health districts and councils are responsible for health services within their jurisdiction.

Malawi is one of the world's least-developed countries with agriculture-based economy. Its Gross Domestic Product (GDP) annual growth rate has dropped from 2.1% in 2021 to 0.9% in 2022(World Bank). The country faces challenges in its efforts to build and expand the economy, to improve education, healthcare, and environmental protection, and to become financially independent.

As of 2023, the average life expectancy is 58.07 years, with men having an average of 56.64 years and women 59.54 years. Although progress has been made in reducing child and infant mortality rates, the under-five mortality rate remains high, recording 56 deaths per 1000 live births in 2019. The high rate of under-five deaths is primarily attributed to the sustained mortality rate among new-borns, despite the strides that have seen the drop in child and infant mortalities.

Malawi has faced many severe weather events, such as cyclones, storms, floods, landslides, and droughts. Since 1980, the country has encountered more than 50 of these disasters[1] impacting millions of people. Specifically, within the last decade, there have been over twenty-five disasters caused by heavy rainfall, including floods, landslides, and storms. These events have shown a consistent rise in the number of affected individuals.

From 2019, Malawi experienced a series of tropical cyclones (Idai, Anna, Gombe, and Freddy). These disasters affected millions of people and caused damage to the infrastructures. For example, cyclone Freddy in 2023 affected an estimated population of 2,267,458 and displaced 659,278 individuals. The national recorded 679 deaths with 537 people still missing. The Southern region was heavily affected with Nsanje and Phalombe being the hardest-hit districts. These cyclones have caused serious damage to WASH infrastructure and health facilities which disrupted essential health services delivery and increased and worsened the risks of cholera transmission.

## 1.2 Rationale

In 2022, WHO AFRO organized a Regional Cholera Readiness Capacity Building training in Tanzania, aiming to sensitize member states about the significance of developing cholera plan for preparedness and readiness. According to GTFCC[2], countries which are targeted for cholera

[1] 'Tropical Cyclone Freddy Post Disaster Needs Assessment Government of Malawi April 2023-12_05_2023.Pdf.Crdownload'.

[2] GTFCC.

elimination are those which have not recorded a case for three years, while those countries which are still reporting cases yearly are targeted for National Cholera Control (NCC). Malawi was therefore, earmarked for the development of a National Cholera Control Plan (NCCP) by the Global Task Force for Cholera Control (GTFCC), an initiative to fight and reduce cholera transmission globally. This comprehensive plan aims to identify priorities to reduce cholera deaths by 90% and stop transmission in up to 20 countries by 2030. However, to achieve this, there was a need for coordinated and focused interventions. As such, the global roadmap requires countries to identify the PAMIs as an initial step in the development of the NCCP. This is because concentrating multi-stakeholder interventions in the identified areas, would potentially decrease the number of cholera cases and deaths. On the same note, Malawi has been classifying its cholera hotspot areas based on geographical conditions since it started reporting cholera in 1973. The cases have been reported from districts along the lake, lower shire valley and borders with other countries. Hence, this classification of hotspot areas lacked the identification of other risk factors.

Malawi used the 2023 GTFCC PAMI cholera control Excel sheet updated tool to identify PAMIs based on incidence rate, mortality rate, persistence for the past five years and vulnerability factors such as WASH coverage, cross-border, population density among others. Malawi is the first country to use the tool in Africa Unlike in the past, this approach enhances the targeting of cholera control measures to optimally allocate limited resources and ensure the effective implementation of the National Cholera Plan (NCP).

## 2.0 SITUATION ANALYSIS

### 2.1 Cholera Situation

Cholera is an acute, diarrheal illness caused by infection of the intestine with the toxigenic bacterium Vibrio cholera sero-group O1 or O139[3]. An estimated 1.3 to 4 million people around the world get cholera each year and 21,000 to 143,000 people die from it. People who get cholera often have mild symptoms or no symptoms, but cholera can manifest with a severe disease. Approximately 1 in 10 people who get sick with cholera will develop severe symptoms such as watery diarrhoea, vomiting, and leg cramps. In these people, rapid loss of body fluids leads to dehydration and shock. Without treatment, death can occur within hours[4]. The increase in natural disasters like floods has worsened the poor WASH situation and increased the occurrence of cholera outbreaks. Prevention measures include improving safe water supply, sanitation, and hygiene promotion and the targeted use of Oral Cholera Vaccine (OCV).

In Malawi the first case was reported in 1973, since then the country has experienced several outbreaks. The most significant outbreaks occurred in 1998/1999, 2001/2002, and the protracted one which started in 2021 to 2023. The 2022/2023 outbreak is the worst which registered 53020 cases and 1586 deaths, with case fatality rate (CFR) of 3.00%[5]. These outbreaks have been common around, lakeshore districts, Lake Chilwa, lower shire, Blantyre, and Lilongwe cities.

### 2.2 Cholera surveillance system

Cholera is one of the notifiable diseases in Malawi. Therefore, its surveillance is done in the context of integrated disease surveillance system (IDSR). Health facilities are the basic surveillance units and the entry point of patients into the formal health care system.

### 2.3 Case detection

The detection of suspected cholera cases largely depends on cholera case definitions that are provided in the IDSR technical guidelines and are briefly described below:

### 2.4 Suspected case

Any person 2 years or above*, presenting with acute watery diarrhoea with or without vomiting; severe dehydration; or death from these.

### 2.5 Confirmed case

Any person with diarrhoea who has V. cholera O1 or O139 isolated from their stool sample through stool culture or PCR.

OR

In outbreak areas, a suspected case with epidemiological linkage to a confirmed case.

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[3] Véronique Grouzard David Olson, Jean-François Fesselet, *Management of a Cholera Epidemic* (Mecdecins Sans Frontieres, 2017).

[4] GTFCC, 'Identification of Priority Areas for Multisectoral Interventions (PAMIs) for Cholera Elimination', 2023 <https://www.gtfcc.org/resources/identification-of-priority-areas-for-multisectoral-interventions-pamis-for-cholera-elimination/>.

[5] Government of Malawi, 'Malawi 2023 Tropical Cyclone Freddy Post-Disaster Needs Assessment', 2023, 1–102 <https://www.preventionweb.net/media/87994/download?startDownload=true>.

* Any suspected person aged below 2 years should be confirmed through laboratory and epidemiological linkage (history of contact).

### 2.6 Case registration

Once the case has been detected, it is registered at the facility in the facility register and the case line list. The case-based surveillance forms for each cholera case are also completed.

### 2.7 Case confirmation

Cholera cases are confirmed through laboratory tests with culture being the confirmatory test for Malawi. In a setting where cholera outbreak has already been confirmed, epidemiological linkage with a confirmed cholera case is used to confirm cases.

### 2.8 Reporting

Facilities send facility reports to the District Health Office (DHO) through the Integrated Disease Surveillance Response (IDSR) coordinator using the standard reporting forms provided by PHIM. District IDSR coordinator prepares and sends a district report to the national level through PHIM. Various platforms such as One Health Surveillance Platform (OHSP) and WhatsApp are used for data transmission to the next level.

### 2.9 Data analysis and feedback

Data is analysed according to person, time, and place at all levels for decision making. Health information products including situation reports are produced on regular basis for public consumption, further analysis, and global use.

### 2.10 Response

Districts and the national level activate the incident management system upon the confirmation of outbreak and guide the response activities. The activities are implemented through the pillars for comprehensive response.

### 2.11 Testing strategy

Testing strategy has evolved over time with improvements in testing capacity. Culture has been the main laboratory test for confirming cholera cases. In Malawi, testing of suspected cases using the antigen based Rapid Diagnostic Tests (RDT) is conducted in all health facilities. The tests that become positive of RDT are sent for culture test for confirmation. Cases are deemed confirmed if they are culture positive or if they are epidemiologically linked with cholera confirmed cases. Efforts to strengthen cholera laboratory testing are ongoing with support from WHO and other partners.

## 3.0 OBJECTIVES OF THE EXERCISE

### 3.1 Broad objective

The exercise was carried out to identify priority areas for multi-sectoral interventions (cholera hot spots) for cholera control.

### 3.2 Specific objectives.

- To identify priority areas based on priority index scores
- To identify additional priority areas based on cholera vulnerability factors

# 4.0 METHODOLOGY

The process was facilitated by the Ministry of Health with technical support from WHO Malawi country office and WHO-AFRO. The process had two major steps. The first step involved data entry into the GTFCC tool (see Annex 2), which included preparation of datasets, assessment of vulnerability factors, calculation and scoring epidemiologic indicators, assessment of representativeness of test data, and calculation of priority index.

The second step was the validation by stakeholders where a group of technical people were invited to review the results generated from the first step. This workshop took place in Mponela, Dowa district from 5 to 8 September 2023. Some of the technical people were representatives from the mostly affected districts. These stakeholders validated the initial PAMI list.

## 4.1 Step 1. Datasets

### 4.1.1 General

*Definition and administrative level of operational geographic units*

Administrative level 3 was selected as operational geographic unit for identification of PAMI's for cholera control. This administrative level corresponds to the Traditional Authority (T/A) level which include sub-TAs, a subdivision of a district. Although administrative level 2 (district) is the lowest level at which resources are allocated and cholera control decisions are made, the communities within the districts are not affected equally, therefore, TAs were selected as operational geographic unit for identification of PAMIs for cholera control thus identifying communities that require multi-sectoral interventions.

*Definition of analysis period*

The priority index calculation was based on retrospective data collected over the last five and half years from January 2018 to September 2023, corresponding to 295 weeks. The GFTCC recommends that the analysis period should involve retrospective data of five to 15 years and that any analysis periods shorter than five years may be considered only when data is not available over longer periods.

### 4.1.2 Priority index

*Sources of data for calculation of priority index*

Table 1 shows the category of data for calculation of the priority index, data collected by geographical unit, periodicity, and the data source. In brief, the data team comprised of experts from PHIM and WHO. The team used the following secondary data for each operational geographic unit for each year of the analysis period: estimated population, number of reported cholera cases (suspected, probable, and confirmed), number of reported cholera deaths (suspected, probable, and confirmed), number of weeks with at least one reported cholera case (suspected, probable and confirmed), and vulnerability factors.

Table 1: Category of data for calculation of priority index

| Category | Data by NCP operational geographic units | Periodicity |
|---|---|---|
| **Administrative** | List of NCP operational geographic units (T/A) | Most recent |
| | Geographic units in geospatial vector data format for geographic information system (shape file) | 2022 |
| **Demography** | Population | Annual |
| **Surveillance** | Number of reported cholera cases (suspected, probable and confirmed) | Weekly |
| | Number of reported cholera deaths (suspected, probable and confirmed) | Weekly |
| **Test for cholera** | Number of tests conducted (RDT and culture) | Weekly |
| | Number of those tested positive (RDT and culture) | Weekly |

*List of operational geographic units*

The list of geographic units was obtained from the attribute table of the geographic information system file of operational geographic units. The team compared the list of names in the attribute table of the geographic information system file and in the cholera case line list and correct names of geographic unit(s) and identifier as needed. A common unique geographic identifier which uniquely identifies each geographic unit was used as key to join the data table (containing indicators and index values) with the attribute table in a geographic information system software to create a map of priority index values by geographic units. A unique GIS Place Code was already available for this purpose and was used to uniquely identify each operational geographic unit. During the analysis the operation unit geometry names were checked to make sure that there were no changes overtime.

*Population data by operational geographic unit*

Data on yearly estimated population by operational geographic unit were obtained from the National Statistical Office[6] which provides yearly mid-year population projections. The NSO population estimates are based on extrapolation from the 2018 population census.

*Surveillance data*

As regards surveillance, data was collected on the following variables of interest:

1. Number of cholera cases (suspected, probable, and confirmed) per week
2. Number of cholera deaths (suspected, probable and confirmed) per week

[6] National Statistical Office, '2018 Malawi Population Census: National and District Population Projections 2018-2050', 2020.

3. Number of weeks with at least one reported cholera case (suspected, probable and confirmed) by operational geographic unit per week

As an initial step, basic information was gathered on cholera (i.e., cholera surveillance framework, case definitions, surveillance data flow from local level to central level, performance indicators of cholera disease surveillance). This information was valuable to interpret the epidemiologic indicators.

Surveillance data was collected for the ongoing cholera outbreak from the national cholera line list. Districts were contacted to gather historical data on cholera outbreaks for the period between 2018 and 2021. It was noted that cholera outbreaks were reported every year spanning the analysis albeit other years reporting fewer cases. Therefore, the data for all years of analysis period were included in the dataset. Data for all years in the analysis period were found and verified with the districts and the dataset was deemed complete. It was checked that if the case was reported then the number of reporting weeks should not be zero.

*Cholera test positivity data*

Data was collected on the following variables to facilitate the calculation of cholera test positivity:

1. Number of weeks with at least one suspected case tested for over the analysis period
2. Number of suspected cases tested for over the analysis period
3. Number of probable and confirmed cases for over the analysis period
4. Number of weeks with case(s) tested positive.

Cholera testing strategy changed overtime in the analysis period, reflecting improvements in testing capacity over time. For instance, at the time of data collection in September 2023, the strategy required that all suspected cholera cases be tested by RDT. Culture was only done on samples with positive RDT cases. In addition to cholera case confirmation by culture, confirmation of cases was also done through epidemiology link (when the suspected case had a history of linkage with a confirmed case).

The workflow of data exchange between laboratories and cholera surveillance system was in place. The specimen for testing was collected from the suspected case at the treatment unit/centre where the case was being managed. For RDTs, the samples were tested onsite, and the results were recorded in the register and case notes. IDSR coordinators were responsible for recording the test result in the case line list. From the Cholera Treatment Unit (CTU) or Cholera Treatment Centre (CTC) samples were transferred to the nearest laboratory. The results were communicated back to the district lab focal person for onward transmission of test results to the CTU through the district IDSR coordinator. At this point the results were recorded in the case line list. Therefore, data was obtained to calculate testing positivity from the line-list. All testing methods were considered equally in the calculation of the test positivity indicators. If multiple testing methods were used (or multiple samples are tested) for a given suspected case, the corresponding suspected case was considered only once in the calculation of this indicator (numerator and denominator). Since the line list was used as the data source for testing data, it was not required to link surveillance data to testing data.

*Management of missing data*

The comparison of priority areas according to the priority index implies that epidemiologic and testing information is available for all the operational geographic units and all years over the

analysis period. It was noted that cholera data for 2018 and for years from 2021 to 2023 were readily available compared to data for 2019 and 2020. Therefore, to minimize the missing data, checks were made with the surveillance focal points at the national and district levels to retrieve the missed data.

#### 4.1.3 Vulnerability factors

*List of vulnerability factors*

The following vulnerability factors were considered for the assessment of the operational geographical units. Only those factors deemed relevant in the country context were considered for assessment and have been listed in table 2.

Table 2: List of vulnerability factors

| **Component** | **Indicator Name** |
|---|---|
| Cross boarder | Located adjacent to cross-border cholera affected areas or identified PAMIs |
| Flood | Physical exposure to flood |
| Cyclone | Physical exposure to storm surges |
| Vaccine administration | Population received OCV more than three years ago |
| Climate Change | Areas at high risk of extreme climate and weather conditions |
| Density | - Areas with high population or overcrowded settings<br>- Frequent mass gatherings |
| WASH | - Areas with more than 30% of the population with access to unimproved water facility type<br>- Areas with more than 50% of the population with access to unimproved sanitation facility type<br>- Areas with more than 50% of the population with no handwashing facility on premises |

*Data sources for vulnerability factors*

Vulnerability data was discussed during the stakeholders meeting. Stakeholders from WASH, environmental health, disaster management, cholera vaccination, agriculture among others were invited from each health zones: Northern, Central West, Central East, Southeast and Southwest. Vulnerability factors were gathered from different sources such as districts reports, online sources including Google map. Expert opinion was used to validate the data on vulnerability based on their experience and familiarity with the health zones.

*Method for assessing vulnerability factors*

To ensure objective and standardized assessment, definition for each selected vulnerability indicator was explained. Each team then assessed each unit against a set of vulnerability factor. The assessment involved assignment of a score of Yes or No for the presence or absence of the vulnerability, respectively.

## 4.2 Step 2. Priority index scoring

### 4.1.1 Principle

GTFCC guidance recommends that each operational geographic unit is scored with a numeric priority index. The priority index is calculated by combining four indicators: incidence, mortality, persistence, and cholera test positivity. These indicators are derived from epidemiologic and cholera testing data over the analysis period. The outcome of step 2 is a data table, where indicators and population data, indicator scores, and the priority index are assigned to each operational geographic unit in the country.

### 4.1.2 Determine appropriate cholera test positivity indicator

*Calculate weekly testing coverage*

The weekly testing coverage indicator determines whether the representativeness of testing allows for test positivity indicators to be included in the calculation of the priority index. Depending on the value of the weekly testing coverage indicator, the positivity rate, or the number of weeks with cases tested positive may be included as test positivity indicators. If the representativeness of testing is determined to be insufficient (<80%), test positivity indicators is excluded altogether.

The weekly testing coverage was calculated for each geographical unit using the automated Excel based tool developed by GTFCC. Instructions were followed step by step as per GTFCC instructions (see annex 2 to 4).

*Assess cholera testing representativeness*

Cholera testing representativeness was assessed using the automated GTFCC Excel tool as described above. This was based on the weekly testing coverage indicator. In brief, if testing coverage is equal to or greater than 50% in at least 80% of geographical units then testing representativeness is deemed acceptable. On the other hand, if the weekly testing coverage is less than 50% but > 0% in at least 80% of geographical units then the testing representativeness is deemed sub-optimal. However, if weekly testing coverage is > 0% in less than 80% of geographic units, the testing representativeness is deemed insufficient.

*Determine test positivity indicator to be included in the priority index*

The GTFCC recommends that the positivity indicator to be included in the priority index be determined based on cholera test representativeness. The determination of positivity indicator was done using the GTFCC provided Excel tool that automates the determination of positivity indicator based on the test representativeness. The determination is based on the following criteria:

If the representativeness of cholera testing is **acceptable**, the positivity rate is used as the cholera test positivity indicator. The positivity rate is scored in four classes as described in Table 3 and a positivity rate score ranging from 0 to 3 points is attributed to each operational geographic unit.

If the representativeness of cholera testing is **suboptimal**, the number of years with cases tested positive is used as the test positivity indicator (Figure 2). The number of years with case(s) tested positive is scored in three classes as described in Table 4 and a score ranging from 0 to 2 points is attributed to each operational geographic unit. The maximum score is lower than that of other indicators because it is less reliable.

If the weekly testing coverage is > 0% in less than 80% of geographic units, the representativeness of cholera testing is **insufficient** for inclusion in the priority index (Figure 2). Only three indicators will then be used to calculate the priority index (i.e., incidence, mortality, and persistence) and reinforcement of routine testing for cholera shall be planned in the NCP with high priority.

In the case of our PAMIs identification exercise, data for testing was only available for few geographical units and therefore the testing coverage was > 0% in less than 80% of the units. Hence the representativeness of testing was insufficient for testing positivity indicator to be included in the priority index.

| Weekly testing coverage | Cholera test positivity indicator | Score | | | |
|---|---|---|---|---|---|
| | | 0 point | 1 point | 2 points | 3 points |
| *Acceptable* | **Positivity rate** | 0% | ≤ 10% | > 10% and ≤ 30% | > 30% |
| *Suboptimal* | **Number of years with case(s) tested positive** | 0 | 1 | > 1 | Not applicable |
| *Insufficient* | **Not applicable** | Not applicable | Not applicable | Not applicable | Not applicable |

Figure 1: Scoring of cholera test positivity indicator[7]

#### 4.1.3 Calculation of epidemiological indicators

The calculation of epidemiological indicators including incidence, mortality, and persistence was automated using an Excel based tool developed by GTFCC. The definitions and calculation for indicators are provided in Table 3

[7] GTFCC.

*Table 3: Epidemiological indicators and definitions*

| Indicator | Calculation and definition |
|---|---|
| Incidence | **Calculation**<br>Cholera incidence rate in an operational geographic unit is calculated by dividing:<br>- the total number of cholera cases (including suspected cases and cases tested positive) reported in the unit over the analysis period<br>by<br>- The cumulative person-time (i.e., the sum of population of the geographic unit for each year over the analysis period), then multiplied by 100,000. |
| | **Definition**<br>This indicator is the number of cholera cases reported per 100,000 person-years over the analysis period. |
| Mortality | **Calculation**<br>Cholera mortality rate in an operational geographic unit is calculated by dividing:<br>- the total number of deaths attributed to cholera reported in the unit over the analysis period<br>by<br>- The cumulative person-time (i.e., the sum of the annual population over the period), then multiplied by 100,000. |
| | **Definition**<br>This indicator is the number of deaths attributed to cholera reported per 100,000 person-years in the unit over the analysis period. |
| Persistence | **Calculation**<br>Cholera persistence in an operational geographic unit is calculated by dividing:<br>- the number of weeks with at least one reported suspected cholera case over the analysis period<br>by<br>- the total number of weeks over the analysis period |
| | **Definition**<br>This indicator is the percentage of weeks with at least one reported suspected cholera case in the unit over the period of interest. |

#### 4.1.4 Scoring of epidemiologic indicators

*Calculation of distribution thresholds (median and 80th percentiles of respective distributions)*

The 50$^{th}$ and 80$^{th}$ percentiles of incidence, mortality, and persistence distributions thresholds were automatically calculated in the GTFCC excel based tool. The distribution thresholds (median and 80th percentile) were calculated out of the operational geographic units where at least one cholera case (suspected, probable, and confirmed) was reported over the analysis period.

*Scoring of epidemiological indicators for each geographical unit*

The scoring of epidemiologic indicator for each geographic unit was also done in GTFCC excel based tool. Epidemiologic indicators (i.e., incidence, mortality, persistence) were scored in four categories based on the 50th (median) and the 80th percentiles of their respective distributions. A score ranging from zero to three points was attributed to each geographic unit for each epidemiologic indicator. Table 4 below describes the criteria that was used to describe epidemiologic indicators.

*Table 4: Score values by epidemiological indicators*

| **Epidemiologic Indicator** | **Score** | | | |
|---|---|---|---|---|
| | **0 Point** | **1 Point** | **2 Points** | **3 Points** |
| **Incidence*** | No case | > 0 and < median | ≥ median and < 80th percentile | ≥ 80th percentile |
| **Mortality*** | No death | > 0 and < median | ≥ median and < 80th percentile | ≥ 80th percentile |
| **Persistence*** | No case | > 0 and < median | ≥ median and < 80th percentile | ≥ 80th percentile |

*Calculation of priority index*

The priority index was calculated for each operational geographic unit by summing the scores of the indicators as follows:

Priority Index = Incidence score + Mortality score + Persistence score

NB. The test positivity score was not included in the calculation of priority index because the weekly testing coverage was not sufficient i.e., less than 80% of geographical units had a testing coverage of greater than 0%. This limitation arose due to the case definitions that include epidemiological link when an outbreak has been confirmed in a geographical unit which does not require confirmatory culture testing.

### 4.3 Step 3. Stakeholder validation of initials PAMIs

The detailed list of stakeholders involved in validation exercise is annex 1

## 5.0 RESULTS AND INTERPRETATION

The PAMIs identification exercise are presented according to the following sequence of sub-sections: Priority index and Stakeholder validation information and district cholera history.

### 5.1 Priority index

### 5.2 Data overview

Table 5 shows an overview of data that was used for calculating priority index for geographical units for identification of PAMIs. A total of 421 T/As, representing 100% of all geographical units in Malawi were included in the analysis. The period of analysis covered five and a half years from January 2018 to September 2023. Of total geographical units, 244 (58%) units had recorded at least one Cholera case during the analysis period. Fifty-two thousand nine hundred cases with 1,165 deaths (case fatality rate of 2.2%) were recorded over the period of analysis. Of the 4, 133 suspected cases tested, 76.2% came out positive.

*Table 5: An overview of data used for calculating priority index for PAMIs identification in Malawi.*

| **Data description*** | |
|---|---|
| Number of NCP operational geographic units | 421 |
| Study period: start year | 2018 |
| Study period: end year | 2023 |
| Study period: number of years | 6 |
| Number of NCP operational geographic units with at least one case | 244 |
| Total number of cases | 52,900 |
| Total number of deaths | 1,165 |
| Overall case fatality | 2.2% |
| Total number of suspect cases tested ** | 4,133 |
| Total number of suspect cases tested positive ** | 3,002 |
| Overall positivity rate ** | 72.6% |

* The totals are calculated for the entire set of geographical units over the study period

** Regardless of the testing method applied

### 5.3 Epidemiologic indicators score thresholds

The epidemiological indicators score thresholds feeds into the calculation of priority index for each geographical unit. Table 6 lists the epidemiological indicator score thresholds. Incidence had the highest median (13.82) over the analysis period.

*Table 6: Epidemiological indicators score threshold.*

| Epidemiological indicator score threshold | | |
|---|---|---|
| Incidence (100,000 pers. y-1) * | Median | 13.82 |
| | 80th percentile | 67.08 |
| Mortality (100,000 pers. y-1) * | Median | 1.27 |
| | 80th percentile | 2.61 |
| Persistence (% of weeks with ≥ one case) * | Median | 3.1 |
| | 80th percentile | 7.5 |
| * Calculated out of geographic units with indicator value >0 | | |

5.4 Assessment of representativeness of testing

The assessment of testing representativeness showed that only 26% of geographical units had the weekly testing coverage of equal or greater than 50%. Therefore, the positivity rate could not be included in the calculation of priority index. Similarly, only 57% geographical units had the weekly testing coverage of greater than 0%. Hence, the level of representativeness of testing was insufficient to include a test derived indicator in the priority index (Table 7).

Assessment of representativeness of cholera testing *

| | |
|---|---|
| Step 1 | |
| Number of operational geographic units with weekly testing coverage ≥ 50% | 64 |
| Percentage of operational geographic units (with at least one case) with testing coverage ≥ 50% | 26.2% |
| Is weekly testing coverage ≥ 50% in at least 80% of the operational geographic units of the country? | No |
| Level of representativeness of testing | See step 2: check if weekly testing coverage is > 0 in at least 80% of geo. Units |
| Inclusion of positivity rate score into the priority index | No inclusion of the positivity rate score, see next step 2 |
| | |
| Step 2 | |
| Number of operational geographic units with weekly testing coverage > 0% | 139 |
| Percentage of operational geographic units with testing coverage > 0% | 57.0% |
| Is the weekly testing coverage > 0 in at least 80% of the operational geographic units of the country? | No |
| Level of representativeness of testing | Insufficient |
| Inclusion of the num. of years with case(s) tested positive score into the priority index | No test-derived score included in the priority index |

"NA: not applicable
* Regardless of the testing method applied"

5.5 Priority index scores

Table 7 shows the result of analysis after entering data in the GTFCC tool on incidence, mortality, and persistence. Since three epidemiologic indicators instead of four were used in priority index calculation, the priority index values score ranged from zero to a maximum value of nine.

The priority index value score of 6 in table 4 cumulatively represents 86.2% of the total number of cholera cases, 81.5% of the total cholera deaths reported from 2018 to 2023 in 28,2% of the total population. After analyzing all the parameters, this score was observed to be representative enough and was recommended to be the threshold in the determination of geographical units to be PAMI. From the Table 4, the score of 6 in the index value cumulatively represents 80

geographical units. Since a Traditional Authority is the approved geographical unit and based on the priority index score, 80 TAs were finally endorsed to be the PAMIs.

*Table 7: Table of key parameters stratified by priority index value*

| Summary table of key parameters stratified by priority index values | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Assessment of representativeness of cholera testing | | | | |
| | | | | | | | | | | Level of representativeness of testing | | | Insufficient | |
| | | | | | | | | | | Testing indicator score included into the priority index | | | Not applicable | |
| Priority index values | Number of geographic units | Cum. number of geographic units | Rel. % of num. of geographic units | Total population | Rel. % of population | Cum. % of population | Num. of cases | Rel. % of num. of cases | Cum. % of num. of cases | Num. of deaths | Rel. % of num. of deaths | Cum. % of num. of deaths | Average of positivity rate | Mean of number of years |
| 9 | 18 | 18 | 4.3% | 1,151,125 | 6.2% | 6.2% | 21,516 | 40.7% | 40.7% | 491 | 42.1% | 42.1% | 49.7 | 2.6 |
| 8 | 17 | 35 | 4.0% | 1,243,569 | 6.7% | 12.8% | 12,989 | 24.6% | 65.2% | 191 | 16.4% | 58.5% | 43.4 | 2.3 |
| 7 | 27 | 62 | 6.4% | 1,858,668 | 9.9% | 22.8% | 7,826 | 14.8% | 80.0% | 196 | 16.8% | 75.4% | 40.9 | 2.2 |
| 6 | 18 | 80 | 4.3% | 1,014,212 | 5.4% | 28.2% | 3,264 | 6.2% | 86.2% | 72 | 6.2% | 81.5% | 37.8 | 2.1 |
| 5 | 37 | 117 | 8.8% | 2,220,193 | 11.9% | 40.1% | 4,248 | 8.0% | 94.2% | 84 | 7.2% | 88.8% | 57.2 | 2.1 |
| 4 | 33 | 150 | 7.8% | 2,042,848 | 10.9% | 51.0% | 1,948 | 3.7% | 97.9 | 68 | 5.8% | 94.6 | 52.9 | 1.8 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 36 | 186 | 8.6% | 1,990,364 | 10.7% | 61.7% | 774 | 1.5% | 99.4% | 32 | 2.7% | 97.3% | 34.5 | 1.6 |
| 2 | 58 | 244 | 13.8% | 3,044,082 | 16.3% | 78.0% | 335 | 0.6% | 100.0% | 0 | 0.0% | 97.3% | 41.5 | 1.3 |
| 0 | 177 | 421 | 42.0% | 4,118,679 | 22.0% | 100.0% | 0 | 0.0% | 100.0% | 31 | 2.7% | 100.0% | 3.5 | NA |
| **Total** | **421** | | **100.0%** | **18,683,737** | **100.0%** | | **52,900** | **100.0%** | | **1,165** | **100.0%** | | **27.4** | **1.8** |

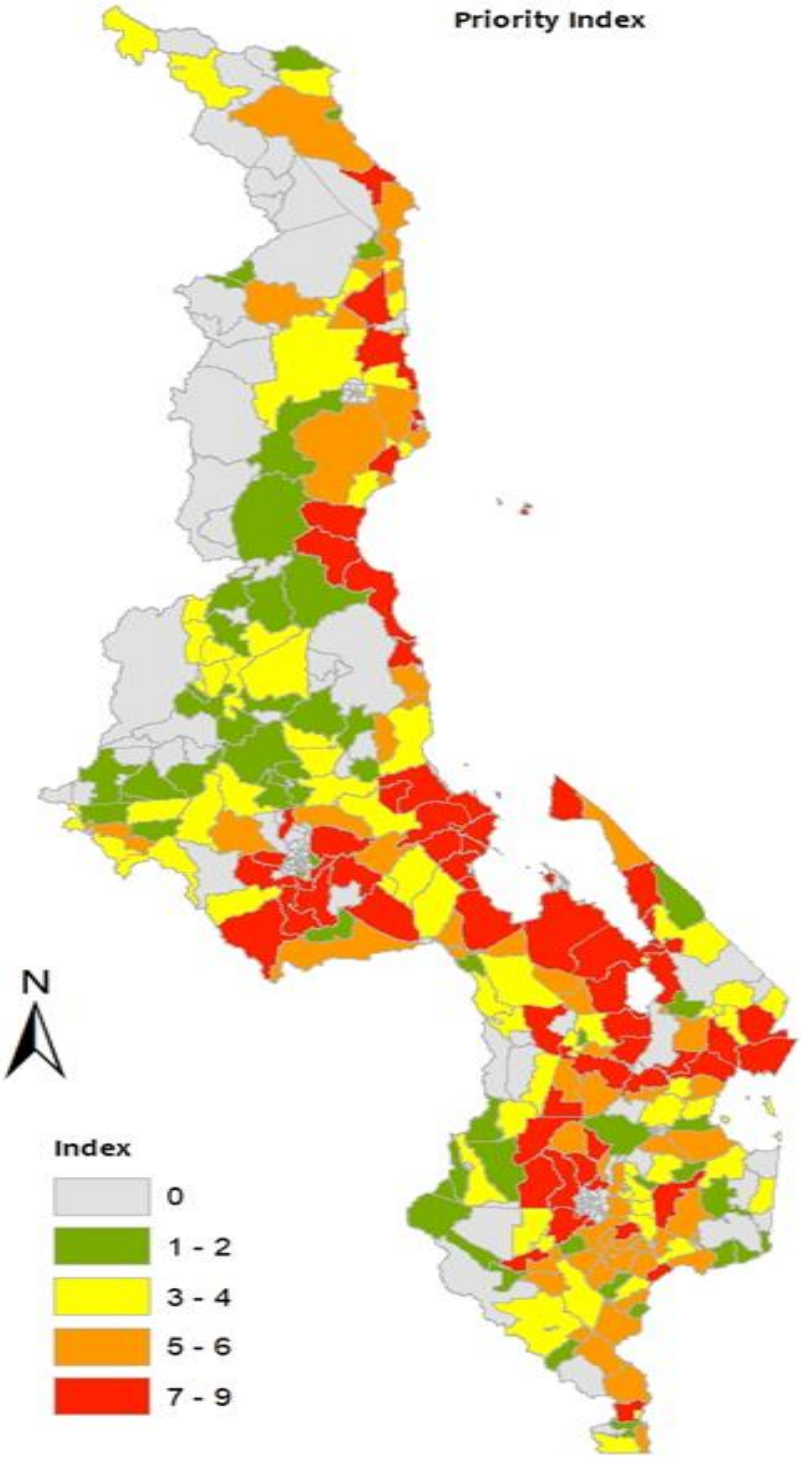



*FIGURE 2:Map of NCP Operation Geographic Unit by Priority Index Values*

5.6 Stakeholder validation

5.7 Priority index threshold

Stakeholders selected the value of priority index threshold through consensus based on impact and feasibility. The threshold value was selected so geographical units with 86.2% of cholera cases in the analysis period are prioritized for multi-sectoral interventions. (Table 4) Therefore, the priority index value of six (6) was selected as a threshold so that all geographical units with priority index of 6 and above are included in the priority areas for multi-sectoral interventions.

5.8 Initial list of PAMIs

Table 5 shows the initial list of PAMIs. A total of 80 PAMIs were selected bases on priority index value with the threshold set at 6, representing 19% of all geographical units. About 5,268,814 (28.2%) people were living in these geographical units as of the 2023. These geographical units had recorded 45,600 (86.2%) of Cholera cases and 58 (81.5%) deaths over the analysis period. (Table 4)

*Table 8: Number of geographical units selected as initial PAMIs and associated population, number of cases and deaths*

| Indicator | N (%) |
|---|---|
| NCP operational geographic units selected as initial PAMIs | 80 (19) |
| Population and percentage of population living in these units | 5,268,814 (28.2) |
| numbers and percentages of cholera cases and cholera deaths reported in these units over the analysis period | 45,600 (86.2) |
| numbers and percentages of cholera deaths reported in these units over the analysis period | 58 (81.5) |

*Table 9: Initial list of PAMIs*

| District | Geographic Unit (TA) | Priority Index |
|---|---|---|
| Balaka | STA Phalula | 8 |
| | TA Amidu | 8 |
| | TA Chanthunya | 6 |
| | TA Kalembo | 8 |
| | TA Msamala | 8 |
| | TA Nkaya | 6 |
| Blantyre | TA Kapeni | 9 |
| | TA Kuntaja | 9 |
| | TA Kunthembwe | 7 |
| | TA Lundu | 7 |
| | TA Machinjiri | 9 |
| | TA Makata | 6 |
| | TA Somba | 8 |
| Chikwawa | TA Katunga | 7 |
| | TA Ngowe | 6 |
| Dedza | TA Kachindamoto | 9 |
| | TA Kamenya Gwaza | 6 |
| | TA Kaphuka | 7 |
| Karonga | TA Kyungu | 6 |
| | TA Mwirang'ombe | 7 |
| | TA Wasambo | 6 |
| Likoma | TA Mkumpha | 7 |
| Lilongwe | TA Chadza | 7 |
| | TA Chimutu | 7 |
| | TA Chiseka | 7 |
| | TA Chitukula | 9 |
| | TA Kalumba | 9 |
| | TA Malili | 7 |
| | TA Masula | 7 |
| | TA Mazengera | 8 |
| | TA Njewa | 9 |
| | TA Tsabango | 9 |
| | TA Chadza | 7 |
| Machinga | STA Nchinguza | 7 |
| | STA Nsanama | 7 |
| | TA Chikweo | 7 |
| | TA Kawinga | 7 |
| | TA Liwonde | 6 |
| | TA Mlomba | 9 |
| Mangochi | STA Lulanga | 9 |
| | TA Chimwala | 7 |
| | TA Chowe | 8 |

| | | |
|---|---|---|
| | TA Makanjila | 6 |
| | TA Mponda | 8 |
| | TA Namabvi | 7 |
| | TA Nankumba | 9 |
| Mulanje | STA Tombondiya | 7 |
| | TA Juma | 8 |
| | TA Nthiramanja | 6 |
| Neno | TA Symon Likongwe | 7 |
| Nkhatabay | TA Malanda | 7 |
| | TA Malenga Mzoma | 6 |
| | TA M'bwana | 7 |
| | TA Mkumbira | 8 |
| | TA Timbiri | 7 |
| | TA Zilakoma | 9 |
| Nkhotakota | STA Kalimanjira | 6 |
| | TA Kafuzila | 8 |
| | TA Kanyenda | 7 |
| | TA Mphonde | 8 |
| | TA Mwansambo | 6 |
| Nsanje | TA Malemia | 8 |
| | TA Mlolo | 6 |
| | TA Nyachikadza | 6 |
| Ntcheu | TA Makwangwala | 8 |
| Rumphi | TA Mwankhunikira | 8 |
| Salima | TA Kambalame | 7 |
| | TA Kambwiri | 9 |
| | TA Kalonga | 9 |
| | TA Khombedza | 8 |
| | TA Kuluunda | 9 |
| | TA Maganga | 9 |
| | TA Mwanza | 9 |
| | TA Ndindi | 8 |
| | TA Pemba | 7 |
| Thyolo | TA Bvumbwe | 6 |
| | TA Chimaliro | 7 |
| | TA Nanseta | 6 |
| | TA Mwambo | 6 |

Note: priority index value threshold set at 6. Minimum possible score is 0 while maximum possible score is 9

5.9 List of additional PAMIs

Additional PAMIs were identified based on vulnerability factors. These additional PAMI had the priority index value of below 6. A total of 38 geographical units were added as new PAMI. Table 6 lists the additional PAMIs, their priority index and vulnerability factors.

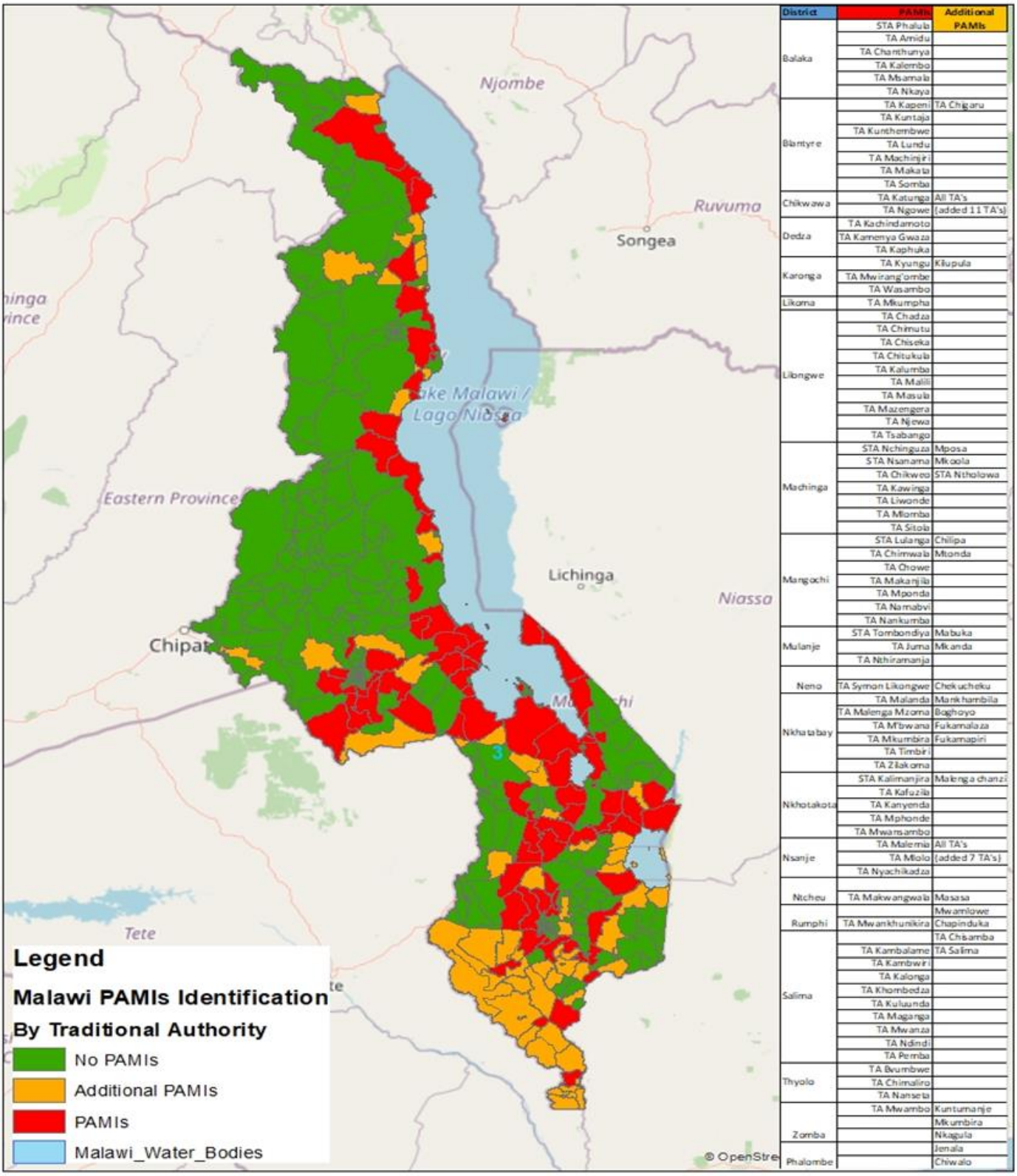
*Table 10: list of additional PAMIs based on vulnerability factors*

| **District** | **Geographic Unit (TA)** | **Vulnerability factors** |
|---|---|---|
| Blantyre | TA Chigaru | Use of unsafe water from the Shire River, poor sanitation coverage and high population density and location along major travel routes with transportation hubs |
| Chikwawa | Ngabu | Border district, areas along Shire Valley are prone to flooding, inadequate water supply coverage due to saline water, areas with high-risk population and Hard to reach areas (hard to access population) |
| | Chapananga | |
| | Lundu | |
| | Maseya | |
| | Katunga | |
| | Kasisi | |
| | Makhwira | |
| | Ndakwera | |
| | Mlilima | |
| | Masache | |
| | Ngowe | |
| Karonga | Kilupula | Areas prone to flooding, low water supply coverage, locations adjacent to cross-border cholera affected areas or PAMIs and location along major travel routes with transportation hubs |
| Machinga | Mposa | Low water supply coverage and poor sanitation and hygiene coverage |
| | Mkoola | |
| | STA Ntholowa | |
| Mangochi | Chilipa | Low water supply and sanitation coverage |
| | Mtonda | |
| Mulanje | Mabuka | Low water supply and sanitation coverage |
| | Mkanda | |
| Neno | Chekucheku | Poor access to safe water supply and poor sanitation coverage |
| Nkhatabay | Mankhambila | Poor water supply and sanitation coverage |
| | Boghoyo | |
| | Fukamalaza | |
| | Fukamapiri | |

| | | |
|---|---|---|
| Nkhotakota | Malenga chanzi | Low safe water supply and sanitation coverage |
| Nsanje | Ndamera, | Cross-border, areas along Shire Valley are prone to flooding, inadequate water supply coverage due to saline water, and areas with high-risk population |
| | Chimombo | |
| | Nyachikadza | |
| | Mlolo | |
| | Tengani | |
| | Malemia | |
| | Mbenje | |
| | Ngabu | |
| | Makoko | |
| Ntcheu | Masasa | Flood prone area |
| Rumphi | Chapinduka | Hard to reach area |
| Salima | TA Chisamba | Low water supply and sanitation coverage |
| | TA Salima | |
| Zomba | Kuntumanje | Poor access to safe water supply and flood prone area |
| | Mkumbira | |
| | Nkagula | |
| Phalombe | Jenala | Flood prone area and saline water |
| | Chiwalo | |

### 5.10 Final list of PAMIs

The initial list of PAMIs based on priority index value was combined with the additional list of PAMIs based on vulnerability factors to generate the final list of PAMIs. A total of 118 PAMIs were included in the final list of PAMIs for Cholera control. (Figure 3)




| District | PAMIs | Additional PAMIs |
|---|---|---|
| Balaka | STA Phalula | |
| | TA Amidu | |
| | TA Chanthunya | |
| | TA Kalembo | |
| | TA Msamala | |
| | TA Nkaya | |
| Blantyre | TA Kapeni | TA Chigaru |
| | TA Kuntaja | |
| | TA Kunthembwe | |
| | TA Lundu | |
| | TA Machinjiri | |
| | TA Makata | |
| | TA Somba | |
| Chikwawa | TA Katunga | All TA's |
| | TA Ngowe | (added 11 TA's) |
| Dedza | TA Kachindamoto | |
| | TA Kanenya Gwaza | |
| | TA Kaphuka | |
| Karonga | TA Kyungu | Kilupula |
| | TA Mwirang'ombe | |
| | TA Wasambo | |
| Likoma | TA Mkumpha | |
| Lilongwe | TA Chadza | |
| | TA Chimutu | |
| | TA Chiseka | |
| | TA Chitukula | |
| | TA Kalumba | |
| | TA Malili | |
| | TA Masula | |
| | TA Mazengera | |
| | TA Njewa | |
| | TA Tsabango | |
| Machinga | STA Nchinguza | Mposa |
| | STA Nsanama | Mkoola |
| | TA Chikweo | STA Ntholowa |
| | TA Kawinga | |
| | TA Liwonde | |
| | TA Mlomba | |
| | TA Sitola | |
| Mangochi | STA Lulanga | Chilipa |
| | TA Chimwala | Mtonda |
| | TA Chowe | |
| | TA Makanjila | |
| | TA Mponda | |
| | TA Namabvi | |
| | TA Nankumba | |
| Mulanje | STA Tombondiya | Mabuka |
| | TA Juma | Mkanda |
| | TA Nthiramanja | |
| Neno | TA Symon Likongwe | Chekucheku |
| Nkhatabay | TA Malanda | Mankhambila |
| | TA Malenga Mzoma | Boghoyo |
| | TA M'bwana | Fukamalaza |
| | TA Mkumbira | Fukamapiri |
| | TA Timbiri | |
| | TA Zilakoma | |
| Nkhotakota | STA Kalimanjira | Malenga chanzi |
| | TA Kafuzila | |
| | TA Kanyenda | |
| | TA Mphonde | |
| | TA Mwansambo | |
| Nsanje | TA Malemia | All TA's |
| | TA Mlolo | (added 7 TA's) |
| | TA Nyachikadza | |
| Ntcheu | TA Makwangwala | Masasa |
| | | Mwamlowe |
| Rumphi | TA Mwankhunikira | Chapinduka |
| Salima | | TA Chisamba |
| | TA Kambalame | TA Salima |
| | TA Kambwiri | |
| | TA Kalonga | |
| | TA Khombedza | |
| | TA Kuluunda | |
| | TA Maganga | |
| | TA Mwanza | |
| | TA Ndindi | |
| | TA Pemba | |
| Thyolo | TA Bvumbwe | |
| | TA Chimaliro | |
| | TA Nanseta | |
| | TA Mwambo | Kuntumanje |
| Zomba | | Mkumbira |
| | | Nkagula |
| Phalombe | | Jenala |
| | | Chiwalo |

*FIGURE 3: Map Showing Initial PAMI and additional PAMI*

## 5.0 RECOMMENDATIONS AND CONCLUSION

In view of the completion of the process of identified the PAMIS the recommendations are as follows:

- Strengthen data collection using the operation units of Traditional Authorities across the countries.
- Since the priority index depend on the collection retrospective data for about five year or fifteen years there is need to strengthen record keeping for cholera data for period of five years across the country.
- Strengthen the use of environmental health district report which is available in the District Health Information System 2 (DHIS2)
- Conduct a sanitation survey for all the PAMIS to list down the vulnerability factors
- The implementation for Oral cholera vaccines should be according to the geographical operation of TAS for easy monitoring of the impact.
- List of PAMIs along the borders should be shared with the countries for monitoring and joint interventions.
- Validation of PAMIs should be done by the affected councils during the process.

**Way Foward**

- The 118 TAs are the official list of the PAMIS for Malawi, the list should be updated every five years
- The MoH and stakeholders should use the PAMIS in the development of the 5 Year Cholera Control Plan
- The PAMIS needs to be disseminated to all stakeholders for use when planning Cholera control interventions in Malawi.
- The PAMIS should be reviewed periodically as new vulnerability data emerge or existing data changes
- Routine WASH interventions should continue in all areas regardless of PAMIs
- IDSR system should continue to be used to investigate and respond to cholera outbreaks regardless of the PAMIS

## Conclusion

The exercise was carried out with a broad objective of identifying Priority Areas for Multi-Sectoral Interventions (PAMIS) for cholera control in Malawi. This is in view of a drive by the Ministry of Health, the WHO and GTFCC to control Cholera in Malawi and other Countries by 2030. The process analysed cholera data and the vulnerability factors in 244 TAs in Malawi.

A Minimum Index Score of 6 was used and 80 TAs qualified. This was a rigorous process which has identified the areas where over 85% of cases and around 60% of deaths have been occurring in the past 5 years. after validation and conducting additional 49 TAs qualified to be added giving a total of 118 TAs that are in the PAMIS.

6.0 ANNEX

**Annex 1**: List of Stakeholder participated in the validation.

**PARTICIPANTS LISTS**

| NO. | NAME | ORGANIZATION | POSITION | TELEPHONE NUMBER |
|---|---|---|---|---|
| 1. | Mtisunge Yelewa | MOH - PHIM | Chief Epidemiology Officer | 0995436220 |
| 2. | Bridon M'baya | NCCS | Coordinator | 0995883117 |
| 3. | Lovely Ntaba | Dept of climate change and meteorological sector | meteorologist | 0991364104 |
| 4. | Samuel Gamah | MOH-CHSS | PHCO Repp MBC | 0999221931 |
| 7. | Mphatso Mussa Gama | MOH-Planning | Chief economist | 0994210100 |
| 8. | Ivy Chilingulo | MOH-QMD | QMO | 0881225851 |
| 9. | Henderson Lomosi | MOH-Curative and medical rehabilitation | Chief Ems officer | 099552675 |
| 10. | Chikondamo Kapanda | National covid-19 and cholera secretariat | Chief Technical Officer | 0888382745 |
| 11. | Jabulani Thadzi | MWS | SCE | 0888697447 |
| 12. | Alvin Chidothi Phiri | MOH-HES | SHPO | 0991041916 |
| 13. | Donald Zimba | Min of information | Information officer | 0884979235<br>0997900245 |
| 14. | Lucious Ziba | MOH-PHIM | Principle lab officer | 0994609515 |
| 15. | Peter Kajadu | Marine | Principle per operations officer | 0999589904 |
| 16. | Thanasius Sitolo | MOWS | CAISO | 0999275963 |
| 17. | Wiseman Chimwaza | PHIM | CEO | 0888353592 |
| 18. | Hamid Mponda | WHO | EHS | 0991717113 |
| 19. | Banda Watson | PHIM | Data officer | 0991441795<br>0882965247 |
| 20. | Charles Chimonya | MOH-HTSS | Chief pharmacist | 0992117070 |
| 21. | Kingsley Manda | National Statistical Office | Principle statistician | 0888375498 |
| 22. | Alisa Bita | WHO | Data officer | 0888558418 |
| 23. | Davison D Khumbanyiwa | Dept of fisheries | Chief of fisheries officer – MGS | 0999249632 |
| 24. | Angella Kamera | WHO | Surveillance | 0888779907 |
| 25. | Shaibu Safalie | PHIM | Surveillance | 0996934414 |
| 26. | Holystone Kafanikhale | MOH EHS | CEHO | 0999851089 |
| 27. | Moses Mguda | MOH\PHIM | IWN | 0993751484 |
| 28. | Elizabeth Chingayipe | WHO | Infectious Hazards Management Officer | 0992364552 |
| 29. | Dr. Randy Mungwira | WHO | Surveillance | 0999301834 |
| 30. | Dr Getrude Chapotera | WHO | Country Preparedness and IHR | 0881765802 |

| NO. | NAME | ORGANIZATION | POSITION | TELEPHONE NUMBER |
|---|---|---|---|---|
| | | | Officer | |
| 31. | Yamikani Chilipo | WHO | Surveillance | |
| 32. | Emmanuel Mbawa | Lilongwe DHO | EHO | |
| 33. | Marvel Nakanga | Lilongwe DHO | District water officer | 0999270206 |
| 34. | Tamara Mtenthaonga | Dedza DHO | IDSR Coordinator | 0999798820 |
| 35. | Anderson Botomani | Dedza DHO | EHO | 0999032720 |
| 36. | Wezzie Chongwe | Nkhata Bay DHO | WASH EHO | 0992030627 |
| 37. | Paul Kanyangama | Nkhata Bay DHO | CO | 0884613800 |
| 38. | Ronnex Nguwo | Nsanje DHO | IDSR Coordinator | 0999622406 |
| 39. | Fred Minyaliwa | Nsanje DHO | DEHO | 0995400554 |
| 40. | Chrissie Chabwera | Blantyre DHO | SHPO | 08883882345 |
| 41. | Quenis Nkhonjera | Zomba DHO | Lab tech | 0996094474 |
| 42. | Matthew Kagoli | MOH-PHIM | PHIM Director | 0999899441 |
| 43. | Josephy Suliwa | Blantyre DHO | Clinical Officer | 0884304433 |
| 44. | Reuben Chikadza | Salima DHO | DEHO | 0994208183 |
| 45. | Hudon Zunda | Salima DHO | Driver | 0995763676 |
| 46. | Angella Nyongani | Salima DHO | HPO | 0888596995 |
| 47. | Dickson Kazembe | Zomba DHO | EHO | 0998206606 |
| 48. | Glycialinnie Mapulanga | MATAMA | Dir of programs | 0999484749 |
| 49. | Gebremicheal Molla Ayene | Africa CDC | Field coordinator | 0988546549 |
| 50. | Christel Sausser | I-TECH | EOCTA | 0994140432 |
| 51. | Wongani Chambali | Save the Children | WASH Specialist | 0888870960 |
| 52. | Mayankho Magalasi | WHO | Lead IT | 0888245790 |
| 53. | Rossaine Daudi | Self-Help Africa | WASH Project Manager | 0995524236 |
| 54. | Ovixlelxa Bunya | WHO | COMS | 0999930280 |
| 55. | Nelly Yatich | WHO | EPR Flagship Coordinator | 0992780627 |
| 56. | Briron M'baya | OPC | NCCC | 0995883117 |
| 57. | Mira Khadka | UNICEF | Health Specialist | 0993290095 |
| 58. | Young Samanyika | Amref Health Africa | Project Manager | 0999557170 |
| 59. | Jimmy Harare | Partners in Health | ACHO | 0888671212 |

**Annex 2:** GTFCC cholera inputs dataset template.

2023-gtfcc-pami-cholera-control-input-dataset-template.xlsx (live.com)

Annex 3: Cholera control excel tools

2023-gtfcc-pami-cholera-control-excel-tool.xlsx (live.com)

Annex 4: GTFCC Cholera Control user guider.

2023-gtfcc-pami-cholera-control-guidance.pdf

Annex: 4 Final list of Priority Areas of Multi-Sectoral Interventions (PAMI)

***Table 11: Final List of PAMI***

| **District** | **# Of T/A** | **Final list of PAMI's in Malawi that was validated; List of T/A** |
|---|---|---|
| Nsanje | 9 | Ndamera, Chimombo, Nyachikadza, Mlolo, Tengani, Malemia, Mbenje, Ngabu, and Makoko. |
| Chikwawa | 11 | Ngabu, Lundu, Chapananga, Maseya, Katunga, Kasisi, Makhwira, Ndakwera, Mlilima, Masache, and Ngowe. |
| Blantyre | 7 | Kapeni, Kuntaja, Machinjiri, Somba, Kunthembwe and Lundu and Makata. |
| Balaka | 6 | Phalula, Amidu, Kalembo, Nsamala, Chanthunya and Nkaya. |
| Nkhatabay | 10 | Malemba Mzoma, M'bwana, Malanda, Mkumbira, Timbiri, Zilakoma, Boghoyo, Fukamalaza, Mankhambira, and Fukamapiri. |
| Nkhotakota | 6 | Kalimanjira, Kafuzila. Kanyenda, Mphonde, Mwansambo and Malemba Chanzi. |
| Dedza | 3 | Kachindamoto, Kamenyagwaza, Kaphuka. |
| Karonga | 4 | Kyungu, Mwirang'ombe, Wasambo and Kilupula. |
| Likoma | 1 | Mkumpha. |
| Lilongwe | 10 | Chadza, Chimutu, Chiseka, Chitukula, Kalumba, Malili, Masula, Mazengera, Njewa and Tsabango. |
| Machinga | 10 | Chikweo, Nsanama, Kawinga, Liwonde, Mlomba, Sitola, Mposa, Nchinguza, Mkoola and Mtholowa. |

| | | |
|---|---|---|
| Mangochi | 9 | Lulanga, Chimwala, Chowe, Makanjira, Mponda, Namabvi, Namkumba, Chilipa and Mtonda. |
| Mulanje | 5 | Tombondiya, Juma, Nthiramanja, Mabuba and Mkanda. |
| Neno | 2 | Symon and Chekucheku. |
| Ntcheu | 2 | Makwangwala and Masasa. |
| Rumphi | 3 | Mwankhunikira, Mwamlowe and Chapinduka. |
| Salima | 11 | Chisamba, Salima, Kambalame, Kambwiri, Karonga, Khombedza, Kuluunda, Maganga, Mwanza, Ndindi, and Pemba. |
| Thyolo | 3 | Bvumbwe, Chimaliro, and Nanseta. |
| Zomba | 4 | Mwambo, Kuntumanje, Mkumbira and Nkagula. |
| Phalombe | 2 | Jenala and Chiwalo. |

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