

Republic of Zambia

Ministry of Health

Zambia National Public Health Institute

IDENTIFICATION OF PRIORITY AREAS FOR MULT-SECTORAL INTERVENTIONS FOR CHOLERA CONTROL, 2024

ANALYSIS REPORT







Contacts

For additional information on identification of priority areas for multi-sectoral interventions, kindly contact the following:

MoH: Dr. Bushimbwa Tambatamba, Director Public Health

Email: butamoh2018@outlook.com

ZNPHI: Professor Nathan Kapata, Director Emergency Management and Response

Email: nkapata@gmail.com

ZNPHI: Dr. Muzala Kapin'a , Director Disease Surveillance and Intelligence

Email: mkapina100@gmail.com

ZNPHI: Dr. Nyuma Mbewe, National Coordinator Cholera Control Program

WCO-Zambia: Dr. Otipo Shikanga, Team lead EPR

Email: otipos@who.int

GTFCC Country Support Platform Zambia: Dr. Joseph Adive Seriki, Regional Coordinator, CSP

Email: adive.seriki@ifrc.org

Foreword



Cholera has plagued Zambia for decades, deeply impacting communities, disrupting livelihoods, and posing a recurring threat to public health. This report on Priority Areas for Multisectoral Interventions (PAMIs) in cholera control is a stark reminder of the ongoing vulnerability faced by nearly half of our population. It also serves as an urgent call to action, highlighting areas across the country where inadequate water, sanitation, and hygiene conditions continue to fuel cholera outbreaks.

The 2024 findings reveal that while cholera persists as an ever-present danger, there are clear pathways to change. By identifying high-risk wards and communities, we have mapped a way forward—a collective responsibility that requires the commitment of all sectors and partners to strengthen infrastructure, enhance surveillance, and implement sustainable interventions.

The National Cholera Taskforce is committed to leading this effort, but true progress will only be achieved through the combined will and dedication of government agencies, local communities, and international partners. As we face the future, let this report inspire deeper resolve and a shared vision for a cholera-free Zambia.

Dr. Kennedy Lishimpi Permanent Secretary – Technical Services Ministry of Health

Table of Contents

Foreword	ii
Abbreviations	vi
Executive Summary	1
CHAPTER 1: BACKGROUND	2
CHAPTER 2: METHODS	12
CHAPTER THREE: RESULTS	24
CHAPTER FOUR: DISCUSSION	45
CHAPTER FIVE: CONCLUSIONS, RECOMMENDATIONS AND WAY FORWARD	47
Limitations	47
Recommendations	48
Conclusions	49
ANNEX 1 : PAMI districts in Lusaka Province	50
ANNEX 2 : PAMI districts in Copperbelt Province	51
ANNEX 3 : PAMI districts in Central Province	53
ANNEX 4 : PAMI districts in Eastern Province	54
ANNEX 5 : PAMI districts in Luapula Province	55
ANNEX 6 : PAMI districts in Northern Province	57
ANNEX 7 : PAMI districts in Southern Province	58
ANNEX 8 : PAMI districts in Muchinga Province	59
ANNEX 9 : PAMI districts in Northwestern Province	60
ANNEX 10 : PAMI districts in Western Province	61
ANNEX 11 : List of Contributors to PAMI Data analysis and validation process	
ANNEV 4.2. Distance from DAAN data callection and validation meatings with line ministries	

ANNEX 1 2: Pictures from PAMI data collection and validation meetings with line ministries

List of Tables

Table 1: Definitions of Data by National Cholera Control Program Geographic Unit1	13
Table 2: List of vulnerability factors considered 1	16
Table 3: Calculation of epidemiological	
indicators	
Table 4: Scoring of the epidemiological indicators for each geographic unit	21
Table 5: Stakeholders represented during PAMI data analysis and	
validation	
Table 6: Overview of data used for calculating priority index for PAMI identification 2	24
Table 7: Epidemiological indicator score and threshold	25

iii

Table 8: Assessment of representativeness of cholera Table 9: Key parameters stratified by priority index Table 10: Number of geographic units selected as initial PAMIs and associated Table 11: Summary of vulnerability factors and scores by Table 12: List of additional PAMIs based on Table 13: Combined list of final PAMIs by province, district and Table 14: Proportion of Districts in Lusaka Province with PAMI wards50 Table 15: Proportion of Districts in Copperbelt Province with PAMI Table 16: Proportion of Districts in Central Province with PAMI wards53 Table 17: Proportion of Districts in Eastern Province with PAMI wards......54 Table 20: Proportion of Districts in Southern Province with PAMI wards......58
 Table 21: Proportion of Districts in Muchinga Province with PAMI wards

 59
 Table 22: Proportion of Districts in Northwestern Province with PAMI wards.....60 Table 23: Proportion of Districts in Western Province with PAMI wards.....61

List of Figures

Figure 1: Map of Zambia with administrative units and position in A	Africa3
Figure 2: Cholera Cases and Case Fatality Rate in Zambia 1977-2024	6
Figure 3: Cholera hotspot mapping by ward based on previous GTFCC metho	od 20217
Figure 4: Districts reporting cases during the 2023/2024 cholera outbreak	8
Figure 5: Zambia MAP with final PAMIs 2024	
Figure 6: Zambia MAP with final PAMIs and highlighted priority provinces	
Figure 7: Zambia MAP districts with priority areas for multisectoral interventions	40
Figure 8: Map of PAMIs in Lusaka Province	50
Figure 9 Map of PAMIs in Copperbelt Province	51
Figure 10: Pictures of poor WASH status in Copperbelt Province	52
Figure 11: Map of PAMIs in Central Province	53
Figure 12: Map of PAMIs in Eastern Province	54
Figure 13: Map of PAMIs in Luapula Province	55
Figure 14: Pictures of vulnerability factors in Luapula Province	56
Figure 15: Map of PAMIs in Northern Province	57
Figure 16: Map of PAMIs in Southern Province	58
Figure 17: Map of PAMIs in Muchinga Province	59
Figure 18: Map of PAMIs in Northwestern Province	60
Figure 19: Map of PAMIs in Western Province	61

Abbreviations

CDF	Constituency Development Fund
DMMU	Disaster Management and Mitigation Unit
GDP	Gross Domestic Product
GTFCC	Global Task Force on Cholera Control
IDSR	Integrated Disease Surveillance and Response
MCEP	Multisectoral Cholera Elimination Plan
MLGRD	Ministry of Local Government and Rural Development
MGEE	Ministry of Green Economy and Environment
MOH	Ministry of Health
MWDSEP	Ministry of Water Development and Sanitation
NCP	National Cholera Control Plan
OCV	Oral Cholera Vaccine
OVP	Office of the Vice President
PAMI	Priority Area for Multisectoral Interventions
PCR	Polymerase Chain Reaction
WASH	Water, Sanitation and Hygiene
WDC	Ward Development Committees
WHO	World Health Organization
ZNPHI	Zambia National Public Health Institute

Executive Summary



Although Zambia has made some progress towards its goal to eliminate cholera by 2025, the country continues to face significant cholera risks, exacerbated by environmental factors and inadequate access to safe water and sanitation, evidenced by the recent 2023/2024 outbreak. Previous cholera hotspot mapping was done in 2018 and again in 2021, identifying 20 districts as the primary cholera hotspot districts. Recent outbreaks highlight a heightened

vulnerability in many districts. Further compounding these vulnerabilities, the drought declared this year, affecting primarily 84 districts has escalated water scarcity. These overlapping crises increase the likelihood of cholera outbreaks, underscoring the need for a rapid and sustainable response to reduce the impact of cholera in high-risk areas.

A prioritization process using GTFCC tools for identifying Priority Areas for Multisectoral Interventions (PAMIs) revealed a significant increase in cholera risk areas between 2021 and 2024. High-risk wards rose from 46 wards in 20 districts in 2021 to **240 wards in 54 districts in 2024.** The 240 wards identified in the final list of PAMIs (both initial 212 PAMIs with priority index greater than and equal to 6, and the additional 28 PAMIs with extenuating vulnerability factors) represent 54 districts of the 116 districts in the country. The PAMI identification exercise has outlined how **5,116,360 million Zambians** live at risk of cholera—about **28% of the national population**, up from 2.1 million in 2020, reflecting slow progress in cholera control. Districts and wards with Moderate and Low risk must also be monitored closely for continued cholera prevention activities to ensure that the next iteration of the PAMI identification process will not result in additions to this final list.

The Government of the Republic of Zambia has prioritized decentralisation as a major driver for attaining development, reducing poverty and supporting job creation through citizen engagement and participation at the local level. Provincial cholera control taskforces will be empowered to effectively implement decentralization strategies, ensuring robust local-level cholera control and prevention efforts. This current PAMI mapping, down to the ward level will align with local developmental efforts with cholera control priorities, allowing every Zambian a say in mitigating their risk factors within their domicile. Resource mobilization efforts for PAMIs will prioritize domestic funding sources, including Constituency Development Funds (CDF) and other local financing avenues, to ensure sustainable support. Efforts will seek matched or doubled support from international WASH sector donors. This strategy aligns with both Zambia's Vision 2030 and the Global Task Force on Cholera Control's Roadmap to 2030.

Professor Roma Chilengi Director General Zambia National Public Health Institute

CHAPTER 1: BACKGROUND

Zambia has been actively implementing the Multisectoral Cholera Elimination Plan (MCEP) 2019-2025, targeting the reduction and eventual elimination of cholera through comprehensive multisectoral strategies. The mid-term evaluation of this plan has revealed that significant milestones have been achieved towards the cholera elimination target by 2025. However, challenges remain, particularly in Water, Sanitation, and Hygiene (WaSH) particularly, in cholera hotspot areas. The adverse impacts of climate change have compounded these challenges, leading to more frequent, prolonged, and severe outbreaks. Consequently, the country has seen the extension of cholera outbreaks to new areas characterized by high incidence and mortality rates, and disruption of routine health services, and livelihood. These factors have necessitated a strategic shift from cholera elimination to cholera control aimed at reducing the cholera burden before transitioning to elimination. Therefore, the 2019-2025 MCEP is being updated to concentrate on control rather than elimination.

As Zambia plans to launch the revised MCEP now called the National Multisectoral Cholera Control Plan (NMCCP), cholera hotspots must be updated using the new GTFCC method, "the GTFCC method for identification of Priority Areas for Multisectoral Interventions (PAMIs) for Cholera control¹. This report outlines the process of identifying the PAMIs, a critical step in developing/updating the National Cholera Control Plan aiming to optimize limited resources and focus on populations at risk of cholera through short- and long-term investments.

General Country Profile

Zambia is a landlocked and land-linked country located in Southern Africa and covers a total surface area of 752,612 square kilometres of which 9220 Km² is water. The country is located at latitude -13.1338968 (range -8.22 to -18.08) and longitude 27.8493328 (range 22.00 to 33.70). Administratively, Zambia is divided into 10 provinces with 116 districts. It borders eight countries namely, the Democratic Republic of the Congo (DRC), Tanzania, Malawi, Mozambique, Zimbabwe, Botswana, Namibia and Angola (Figure 1).

¹<u>https://www.gtfcc.org/resources/identification-of-priority-areas-for-multisectoral-interventions-pamis-for-cholera-control/</u>



Figure 1: Map of Zambia showing its administrative units and position in Africa

Zambia lies on the Central African Plateau with an altitude range of 1000 to 1600 meters above sea level. The plateau landscape is divided by two main river systems; the Zambezi and its main tributaries, Kafue and Luangwa and the Chambeshi-Luapula river system, which is part of the Congo River basin. The altitude range of Zambia gives it a moderately cool sub-tropical climate.

On average, monthly temperatures range from a minimum of 10°C (between June to July) to a maximum of 30°C (between October and November). There are three seasons: the hot wet (November-April), cool dry (April-August) and hot dry (August-November). The hot wet season has rainfall variations from 700 mm in the south to 1500 mm in the north. The southern, western and eastern parts of the country are prone to droughts while occasional flooding occurs in the Northern parts of the country. The natural vegetation in Zambia is predominantly savanna woodland which is dominated by the oak-like miombo woodlands. These woodlands are home to elephants, rhinos, giraffes and other diverse wildlife².

Zambia's economy has historically been focused on copper mining. However, in line with the Eighth National Development Plan (7NDP), the country is undertaking economic diversification to exploit other resources such as promoting agriculture, gemstone mining, tourism and hydropower generation to reduce dependence on the copper industry³.

² Ministry of Environment and Natural Resources, <u>National Biodiversity Strategy and Action Plan, 2015</u>

³ Zambia Development Agency

Basic Socio-demographic, Socio-economic and Epidemiological indices

According to the Zambia Statistics Agency (formerly Central Statistical Office), the projected population for Zambia in 2024 is estimated at 20,861,735 with 49% males and 51% females. Zambia is one of the highly urbanized countries in sub-Saharan Africa with 40% of the population living in urban areas.

The country has made an international commitment to protect refugees by signing various international conventions on refugees. Since the 1960s, the country has been host to thousands of refugees and other people of concern (asylum seekers, stateless persons, and internally displaced people). As of 2014, Zambia hosted approximately 57,000 refugees from Angola, Democratic Republic of the Congo and Rwanda⁴.

In 2020, life expectancy in Zambia was projected to be 53.0 years for males and 57.8 5years for females, with an overall life expectancy of 55.3 years⁵. Zambia attained GDP per capita of US\$ 1,350 in 2017 with an annual growth rate of 4.1%, placing the country in the low-middle-income nation bracket⁶.

The World Bank has re-classified Zambia to low-income status from lower middle income, for the 2023 financial based on the Gross National Income (GNI) per capita estimates recorded in 2021 and it entails that the county's average gross national income (GNIs) is less than US\$1, 005 per person annually⁷. Copper exports are the main driver of the Zambian economy. Because copper export prices fluctuate, basic needs at the household level and the development of community infrastructure for water and sanitation are challenged.

Major strides have been put up to build healthcare facilities as well as increase the healthcare staffing. **Life expectancy at birth (years)** has **improved by** \blacktriangle **16.5 years** from 44.5 years in 2000 to **61** years in 2021. The life expectancy for males is 58.7 and females is 63.1(Zambia). The mortality rate for 2022 is **6.72 deaths per 1000 people**, a decline from 6.97 deaths per 1000 people in 2021. The mortality rate, under-five children per 1,000 live births was reported at **55.6 %** in 2022, according to the World Bank Collection of Development Indicators⁸

Indicator	2024 Estimates
Population (millions)	20,799,116
Population growth rate	2.8%

⁴ Zambia Refugees Economies, <u>UNHCR, 2015</u>

⁵ <u>Central Statistics Office, Zambia in Figures 2018</u>

⁶ Central Statistics Office, <u>The Statistician 2018</u>

⁷ LOW-INCOME-COUNTRY-STATUS.pdf

⁸ Zambia (ZMB) - Demographics, Health & Infant Mortality - UNICEF DATA

Percent Urban	43.3%
Population density	24/Km ²
Sex ratio	98(Male per female)
Crude Birth rate	40.4 per 1000
Crude death rate	11.9 per 1000
Total fertility rate	5.3
Infant Mortality rate	69.8 per 1000 live births
Life Expectancy at Birth (Male: Female)	53.0:57.8 years
Physician population ratio	1 Physician per 12,000 population

The epidemiological profile of Zambia is characterized by a high prevalence and impact of preventable and treatable communicable diseases, particularly malaria, HIV/AIDs, sexually transmitted infections (STIs), tuberculosis (TB), and maternal and child health problems⁹. Additionally, there is a growing burden of non-communicable diseases (NCD), including mental health problems, cancer diseases, trauma, sickle cell anaemia, diabetes mellitus, hypertension, cardiovascular diseases (CVDs), chronic respiratory disorders, blindness and eye refractive defects, and oral health problems.

Cholera in Zambia

Cholera outbreaks in Zambia typically occur from week 40 to week 23 of the following year. However, districts may report sporadic cases throughout the year. Generally, most cases are recorded in the peri-urban areas of Lusaka and Copper-belt provinces and fishing camps. The country experienced its last major outbreak from October 2023 to 29th June 2024 with a total of 27,203 reported cases, with 304 facility deaths (CFR1.4%) and 436 community deaths. Although Lusaka was the epicentre of the outbreak accounting for 76% of the total cholera cases, the outbreak spread to all the other 10 provinces with Copperbelt having the second highest burden at 9%.

The first recorded Cholera outbreak occurred in Zambia in 1977/78, and by the end of 2023, Zambia had recorded approximately 34 different cholera outbreaks, varying in magnitude from **14** to **23396** cases and in case fatality rates (CFR) from 0.5% to 9.3% (Figure 2)¹⁰.

⁹ Ministry of Health, National Health Strategic Plan 2017-2021

¹⁰ Zambia National Situation report number 141 31st December 2024 <u>https://w2.znphi.co.zm/resources/</u>



Figure 2: Cholera cases and Case Fatality Rates in Zambia from 1S77 to 2024.

Cholera PAMIs/Hotspots

Cholera PAMIs/Hotspots are small areas where the cholera burden is highly concentrated, and outbreaks usually start in these areas and spread to other areas. In its quest to control and eventually eliminate cholera, Zambia conducted two cholera hotspot mapping/identification in 2018 and 2020. The 2018 exercise resulted in the identification of 12 districts as hotspots and 17 districts classified as high-risk for cholera transmission. In 2020, the country used a robust method called the GTFCC tool for the identification of hotspots, to identify the cholera hotspots. This exercise resulted in the identification 46 wards from 20 districts as cholera hotspots/PAMIs (Figure 3).



Figure 3: Cholera Hotspot map by ward based on GTFCC method, Zambia, 2021

The 2023/2024 cholera outbreak was widespread extending to areas that are nontraditional cholera endemic or hotspot areas. The outbreak was characterized with extensive geographic spread, high mortality and morbidity. Figure 4 shows the spread of the 2023/24 cholera outbreak. It affected all the 10 provinces in the country with over 70 out of the 116 districts reporting outbreaks. This was an early indicator of the changing dynamics of transmission, and the need for tailored climate-resilient prevention strategies.



Figure 4: Districts which reported Cholera Cases in the 2023-2024 Outbreak

Cholera surveillance system

Cholera is an immediately reportable disease in Zambia. Zambia has developed cholera surveillance, case management and laboratory guidelines to guide preparedness, response and post-outbreak actions and activities. Further, it uses the IDSR guidelines to identify, test and respond to cholera. Training and orientations at all levels have been conducted to ensure capacity among healthcare workers and communities to respond accordingly to signals, alerts and outbreaks of cholera. The lowest healthcare units that receive the cases are the health facilities. Further, the eIDSR system has been operationalized to ensure timely reporting of cases both case-based and in the event-based surveillance system. The provision of tablets and laptops has been procured and distributed to enhance timely reporting of data from the lowest levels.

Case detection

Case detection becomes important before and during the outbreak. Case definition becomes important for use to detect a case of cholera. The following are the case definitions of cholera cases.

Suspected case

Suspected Cholera Case			
In a district/sub-district were there is no confirmed cholera outbreak	In a district/Sub-district were there is a confirmed cholera outbreak		
 Any person 2 years of age or older presenting with acute watery diarrhoea and severe dehydration or dying from acute watery diarrhoea with no other specific cause attributed to this death. 	 Any person presenting with or dying from acute watery diarrhoea 		

Severe Dehydration

A person presenting with one of more of the following danger signs:

- Lethargy, loss of consciousness
- *absent or weak pulse,*
- respiratory distress

OR

At least two of the following signs:

- sunken eyes,
- unable to drink or drinking poorly,
- *skin pinch going back very slowly* (>2 *seconds*)

Confirmed case:

Any suspected cholera case in which Vibrio cholerae O1 or O139 is identified by presumptive identification (culture/sero agglutination) or PCR.

Cholera Deaths [1]

Community cholera death: is defined as a person suspected or confirmed with cholera who died in the community or on the way to a healthcare facility but before admission to the health facility or CTC.

Facility cholera death: is defined as a person suspected or confirmed with cholera who died in a health care facility after admission regardless of the time of admission

[1] Note: The term brought in dead (BID) will no longer be used in cholera surveillance in Zambia.

Case registration

Once the case has been detected, it is registered at the facility in the facility register and the case line list or the eIDSR. These are case-based forms for a cholera cases.

Case confirmation

Cholera cases are confirmed through laboratory tests with culture or PCR. In a setting where Cholera outbreak has already been confirmed, epidemiological linkage with a confirmed Cholera case is used to confirm cases.

Reporting

Facilities send facility reports to the district health office through the surveillance focal point person using the standard reporting forms provided. District surveillance officers prepare a district report and send it to the Provincial Health Office where reports from the provinces are also compiled and shared to the national level. Various platforms such as email and WhatsApp are used for data transmission to the next level.

Data analysis and feedback

Data is analysed according to person, time and place at all levels to inform interventions. Information products including situation reports and epidemiologic reports are produced on a regular basis. These information products are one way of giving feedback to districts where data is generated.

Response

Districts, provinces and the national level activate the incident management system (IMS) upon the confirmation of an outbreak according to the level of response. The IMS is responsible for guiding the response activities. The response activities are done through pillars to ensure all aspects of the response are addressed.

Testing strategy

The testing strategy has evolved according to the evolution of the outbreak. Culture tests have been the main laboratory test for confirming cholera and outbreaks. Suspected cases are tested using antigen-based rapid diagnostic tests (RDT) for screening. The tests

that become positive for RDT are sent for culture tests for confirmation. Cases are deemed confirmed if they are culture-positive or if they are epidemiologically linked with Cholera confirmed cases. Culture-positive tests are then escalated for polymerase chain reaction (PCR) and whole genomic sequencing. Outside of outbreaks, however, testing has been poor, and efforts are being made to increase community surveillance of cases with acute watery diarrhoea who meet the case definition from the oral rehydration corners that remain as sentinel sites in selected communities.

Rationale

The initial step toward formulating Zambia's National Cholera Control Plan (NCP) involves identifying Priority Areas for Multi-sectoral Interventions (PAMIs). Following the 2019 hotspot mapping, Zambia developed its initial NCP, guided by data-driven, evidence-based tools provided by the World Health Organization (WHO) and the Global Task Force on Cholera Control (GTFCC). This approach enhances the targeting of cholera control measures, optimally allocates limited resources, and strengthens the implementation of the NCP. Building on this foundation, the Ministry of Health and the Zambia National Public Health Institute (ZNPHI), in collaboration with WHO, GTFCC-CSP, and other partners, decided to identify PAMIs using the new GTFCC method to maximise the impact and effectiveness of multisectoral interventions for cholera control, aligning also with the devolution of government functions. It's now five (5) years since the last hotspot mapping and the recent cholera outbreaks in the country have shown that the cholera epidemiology in Zambia has changed significantly, compelling MOH/ZNPHI to conduct the complete PAMI identification exercise

The multi-faceted challenges of cholera transmission underscore the urgent need for PAMIs to address public health, water and sanitation (WASH), and socio-economic vulnerabilities. Cholera outbreaks are frequently fuelled by limited access to clean water, inadequate sanitation, and strained health infrastructure, particularly affecting high-risk communities. With WHO and GTFCC-CSP support, Zambia is taking a strategic and coordinated approach by pooling resources and expertise across sectors, advancing sustainable solutions that integrate health, water, education, and community development. Alongside PAMIs, securing and deployment of Oral Cholera Vaccines (OCVs) plays a critical role in cholera prevention, providing immediate immunity and reducing morbidity and mortality in affected communities. Combining OCVs with PAMIs strengthens community resilience, aligns with Sustainable Development Goals (SDG number 6- clean water, and sanitation) and builds momentum toward eliminating cholera in Zambia's vulnerable communities.

Objectives

Broad objective

The exercise was carried out to identify priority areas for multi-sectoral interventions for cholera control as a tool for evidence-based decision-making in the control and eventual elimination of cholera in Zambia

Specific objects.

- 1. To collect and collate data on Cholera outbreaks from January 2017 to June 2024
- 2. To calculate Cholera priority values for all geographical units across the country
- 3. To select priority areas based on priority index values for multi-sectoral interventions for resource mobilization

CHAPTER 2: METHODS

This chapter highlights detailed steps that were taken to identify Cholera priority areas for multi-sectoral interventions. Here we detail steps including preparation of datasets, assessment of vulnerability factors, calculation and scoring epidemiologic indicators, assessment of representativeness of test data, calculation of priority index, and stakeholder validation. The section is presented in two steps: Data sets and priority index scoring.

Step 1. Datasets

General

Definition and administrative level of NCP operational geographic units

The country selected the lowest geographic unit (level 4) as the NCP operational geographic unit for the identification of PAMIs for cholera control which is the wards. This allows for precision in the implementation of the multisectoral interventions but also aligns with the government's objectives of decentralization. Wards are assigned under the Ministry of Local Government and Rural Development into the different districts. Each district has a minimum of 10 wards, whilst more populous districts like Lusaka have over 33 wards. Each ward is allocated resources by the Ward Development Committee (WDC) chaired by the Ward counsellors and drawn from the Constituency Development Fund. It is envisaged that through this PAMI identification process, each ward will be strongly implored to allocate resources intended specifically for cholera control interventions. The wards also fall under a constituency for representation in parliament.

Definition of the analysis period

The Global Task Force for Cholera Control 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. For

Zambia, the priority index calculation was based on retrospective data collected over the last eight from January 2017 to December 2024, corresponding to 416 weeks.

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 national experts involved in cholera response from the Ministry of Health, Zambia National Public Health Institute, WHO, RED Cross, and line ministries collected and prepared data for the calculation of the priority index. The following data was collected for each NCP operational geographic unit for each year of the analysis period: estimated population, number of reported cholera cases (suspected and tested positive regardless of the testing methods (RDT/other laboratory methods), number of reported cholera deaths (suspected and tested positive regardless of the testing method Performed), number of reported suspected cholera cases tested for cholera, number of cholera cases tested positive (regardless of the testing method Performed), number of reported cholera case (suspected positive), number of weeks with at least one reported cholera case (suspected or tested positive), number of weeks with at least one reported suspected cholera case tested for cholera, information on vulnerability factors.

Category	Data by NCP operational	Periodicity	
	geographic units		
Administrative	List of NCP operational	Most recent	
	geographic units		
	Geographic units in	Most recent*	
	geospatial vector data		
	format for geographic		
	information system (e.g.,		
	shape file)		
Demography	Population	Annual	
Surveillance Number of reported		Weekly	
	cholera cases (suspected		
	and tested positive)		
	Number of reported	Weekly	
	cholera deaths (suspected		
	and tested positive)		
Test for cholera	Number of reported	Weekly	
	suspected cholera cases		
	tested for cholera		

Table 1: Definitions of Data by NCP operational geographic units

(regardless of the testing method)	
Number of reported	Weekly
suspected cholera cases	
tested positive for cholera	

List of NCP operational geographic units

The list of geographic units (wards)was obtained from the Zambia statistical agency frame of the 2022 census of population and housing. The teams went to the 10 provinces to map the PAMIs using the national frame which comprised 1,858 wards. A common unique geographic identifier (ward code) 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 units. The shape files covering the entire country (1,858 wards) was already available for this purpose and was used to uniquely identify each NCP operational geographic unit. Spatial analysis were made for changes in all the 1,858 wards of the NCP operational geographic units over the analysis period, notably looking for any differences in numbers or geometry shapes of polygons (wards). It was noted that there were no changes from the 2022 census of population and housing, ward names and the number of the geometries of NCP operational geographic units were maintained as such.

Population data by NCP operational geographic unit

Data on the yearly estimated population by NCP operational geographic unit (wards) were obtained from the Zambia Statistical Agency (ZAMSTATS) frame, which provides national 10-year population projections. The National population estimates are based on extrapolation from the 2022 census of population and housing.

Surveillance data

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

- 1. number of cholera cases (suspected or tested positive) per year
- 2. number of cholera deaths (suspected or tested positive) per year
- 3. number of weeks with at least one reported cholera case (suspected or tested positive) by NCP operational geographic unit per year

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

We collected surveillance data from the national cholera line list. We contacted Districts to gather historical data on cholera outbreaks for the period between 2017 and 2024. We 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. We verified that the number of deaths were not above the number of cases by year and NCP operational geographic unit. We also ensured that the number of weeks of reporting is superior to zero when at least one suspected or tested positive (regardless of the testing methods) cholera case were reported for a given year in an NCP operational geographic unit.

Cholera test positivity data

We collected data on the following variables to facilitate the calculation of Cholera test positivity:

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

Cholera testing strategy changed overtime in the analysis period, reflecting improvements in testing capacity over time. Culture testing was only done on samples with positive RDT cases. In addition to Cholera case confirmation by culture, confirmation of cases was also done when the suspected case had a history of linkage with a confirmed case. To the contrary, this was not the case in the preceding years

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/center or initial point of care where the case was being managed. For RDTs, the samples were tested onsite and the results were recorded in the patient's register and case notes. Surveillance was responsible for recording the test results in the case line list. For culture test, once the sample was taken at the CTU it was transferred to the nearest lab with culture testing capacity where testing was done. The results were communicated back to the district lab focal person for onward transmission of test results to the particular CTU through the district IDSR coordinator. At this point the results were recorded in the case line list. Therefore, we obtained data 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, we were 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 NCP operational geographic units and all years over the analysis period. We 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 limit bias we ensured that data was available for all NCP operational geographical units overall the analysis period by checking with the surveillance focal points at the national and district levels to retrieve the missed data. Checks were also made with surveillance focal points to differentiate the active reporting of zero values from missing reports.

Vulnerability factors

List of vulnerability factors

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

Component	Indicator Name
Cross border	Located adjacent to cross-border cholera-affected areas or identified PAMIs
Flood	Physical exposure to flood
Internally displaced people (IDP)	Presence of people who have been displaced due to several factors e.g. floods, land encroachment and disputes including other natural disasters
Vaccine administration	The 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 Major population gatherings

Table 2:	List o	of vul	nerab	ility	factors
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Wash	Areas with more than 30% of the population with access to
	unimproved water facility type
	Areas with more than 50% of the population with access to
	unimproved sanitation facility type
	Areas with more than 50% of the population with no handwashing
	facility on premises

All NCP operational geographic units underwent a vulnerability assessment

Data sources for vulnerability factors

We collected primary data from all 116 districts of Zambia using a specifically developed vulnerability questionnaire on KoboCollect, administered to District Environmental Health Officers. This questionnaire covered parameters such as water, sanitation, availability of health facilities, and water quality monitoring indicators. We collected data at the ward level. In addition to primary data, we assessed district reports and Community-Led Total Sanitation (CLTS) reports to comprehensively profile the water and sanitation facilities. We also utilized reports from ZAMSTATS, which provided data on population density, a key factor in assessing the spread of cholera, particularly in urban slums within Zambia.

Method for assessing vulnerability factors

We implemented a scoring system for assessing each vulnerability factor giving a score of 1 when the vulnerability factor is present and 0 if the venerability factor is absent. The scoring was influenced by benchmarks set by the Global Task Force on Cholera Control (GTFCC), with more than 50% of the population using unimproved sanitation facilities and more than 30% of the population relying on unimproved water sources each scored at the highest vulnerability level (score = 1). This method ensured that each factor is appropriately considered in the overall assessment of vulnerability.

Step 2. Priority index scoring

Principle

GTFCC guidance recommends that each NCP operational geographic unit is scored with a numeric priority index. Therefore, 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 NCP operational geographic unit in the country.

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 years with cases tested positive may be included as test positivity indicators. If the representativeness of testing is determined to be insufficient, test positivity indicators is excluded altogether.

We calculated the weekly testing coverage for each NCP geographical unit using the automated Excel based tool developed by GTFCC. We followed instructions step by step as per GTFCC instructions (see Part II: User guide for the GTFCC Excel-based tool).

Assess cholera testing representativeness

We assessed cholera testing representativeness using the automated GTFCC Excel tool as described above. The assessment of the representativeness of testing was automated and was based on the weekly testing coverage indicator. The table below describes criteria for assessing representativeness of cholera testing and determine the Cholera test indicator to be included in the priority index. In brief, if testing coverage (For what percentage of weeks with reported suspected case(s) was at least one suspected cholera case tested?) is greater equal to or greater than 50% in at least 80% of geographical units then testing representativeness is deemed acceptable representativeness. On the other hand, if the weekly testing coverage is less than 50% but > 0% in at least 80% of NCP geographical units then the testing representativeness is deemed suboptimal representativeness. However, if weekly testing coverage is > 0% in less than 80% of NCP 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 below and a positivity rate score ranging from 0 to 3 points is attributed to each NCP 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. 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 NCP 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. 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, testing coverage was > 0% in 85% of the units. Hence the representativeness of testing was suboptimal and the number of years with confirmed cases was included in the priority index.

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.

Indicator	Calculation and definition
Incidence	Calculation Cholera incidence rate in an NCP operational geographic unit is calculated by dividing: - the total number of cholera cases (including suspected cases and cases tested positive) reported in the unit over the analysis period by - 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 This indicator is the number of cholera cases reported per 100,000 person-years over the analysis period.
	Calculation Cholera mortality rate in an NCP operational geographic unit is calculated by dividing:

Table 3:	Calculation	of	epidemiological	indicators
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Mortality	 the total number of deaths attributed to cholera reported in the unit over the analysis period by The cumulative person-time (i.e., the sum of the annual population over the period), then multiplied by 100,000.
	Definition 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 Cholera persistence in an NCP operational geographic unit is calculated by dividing: - the number of weeks with at least one reported suspected cholera case over the analysis period by - the total number of weeks over the analysis period
	Definition This indicator is the percentage of weeks with at least one reported suspected cholera case in the unit over the period of interest.

Scoring of epidemiologic indicators

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

The 50th and 80th 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 NCP operational geographic units where at least one cholera case (suspected or tested positive) was reported over the analysis period.

Scoring of epidemiological indicator for each geographical unit

The scoring of epidemiologic indicators for each geographic unit was also done in the 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 describes the criteria that was used to describe epidemiological indicators.

Epidemiologic	Score			
Indicator	0 Point	1 Point	2 Points	3 Points
Incidence*	No case	> 0 and <	≥ median	≥ 80th
		median	and < 80th	percentile
			percentile	
Mortality*	No death	> 0 and <	≥ median	≥ 80th
		median	and < 80th	percentile
			percentile	
Persistence*	No case	> 0 and <	≥ median	≥ 80th
		median	and < 80th	percentile
			percentile	
Number of years	0 years	1 year	>1 year	Not
with case(s)				Applicable
tested positive				
included in				
priority index				

Table 4: Scoring of epidemiological indicators for each geographical unit

Calculation of priority index

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

Priority index = incidence score + mortality score + persistence score + number of years with cases tested positive score

Calculation of vulnerability assessments

An additional assessment of the vulnerability factors specific to wards to provide a rationale for their potential selection as additional PAMIs. Specifically, the assessment of availability of clean and safe drinking water and the coverage of sanitation across wards to identify areas at higher risk and an analysis of population density metrics to understand

how overcrowding influences vulnerability. A comparative analysis was conducted between wards selected primarily on vulnerability factors and those selected based on epidemiological data. The primary respondents were District Environmental Health Officers (DEHOs) and District Water and Sanitation Focal points from each district, chosen for their expertise and familiarity with local water, sanitation, and health infrastructure

Variables: Key variables assessed included:

•Water Supply Coverage: Defined as the percentage of the population with access to basic water supply as per WHO/UNICEF guidelines

• Sanitation Coverage: Defined by the percentage of the households using basic and adequate sanitation facilities

•Health Facility Availability: Number and type of health facilities per capita within each ward.

• Water Quality Monitoring: Presence of active water quality monitoring systems.

• Population Density: Number of persons per square kilometer, obtained from the latest census data, to assess how population concentration impacts vulnerability.

Data was primarily collected through a specifically developed vulnerability assessment questionnaire on KoboCollect, administered to DEHOs. The questionnaire was pre-tested to refine questions for clarity and relevance. In addition to primary data from the questionnaire, we reviewed district reports and Community-Led Total Sanitation (CLTS) reports. Supplementary demographic and density data were sourced from Zambia Statistical Agency, ensuring that the most recent and comprehensive data were used for analysis. To reduce the potential bias of relying solely on DEHOs, we triangulated data with information published on water and sanitation coverages in Zambia.

Step 3. Stakeholder validation

Table 5 lists the stakeholders who participated in the validation exercise. A stakeholder validation meeting was organized in Kabwe district in October 2024 to review the initial list of Priority Areas for Multi-sectoral Interventions (PAMIs), including additional proposed interventions and the methodology used. With technical support from the WHO Zambia Country Office and WHO-Regional Office for Africa , Facilitators presented the methods and findings from the PAMI identification exercise, followed by group sessions where stakeholders were divided into smaller groups to review and discuss the process and findings in detail. When stakeholders identified discrepancies such as areas perceived as cholera hotspots but scored below the priority threshold, they were able to propose reassessing vulnerability factors, potentially adding those areas to the PAMIs list. This

collaborative approach allowed for adjustments, resulting in the inclusion of some previously excluded geographical units in the final prioritized list.

No.	STAKEHOLDERS
1	Officer of the Vice President-DMMU
2	Ministry of Water Development and Sanitation
3	Ministry of Local Government and Rural Development
4	Ministry of Community Development
5	United Nations Children's Fund
6	United States Agency International Development
7	Redcross/International Federation Red Cross Society (ZCRS/IFRC/CSP)
8	World Health Organisation
9	Zamstat
10	Ministry of Health/Zambia National Public Health Institute
11	Ministry of Green Economy & Environment
12	WaterAid
13	USAID
14	AMREF

Table 5: List of Stakeholders represented during PAMI data analysis and validation

CHAPTER 3: RESULTS

The PAMIs identification exercise results are presented according to the following sequence of sub-sections: Priority index and Stakeholder validation information and knowledge

Priority index

Data overview

Table 6 shows an overview of data that was used for calculating the priority index for NCP identification of PAMIs. A total of 1827 NCP geographical units at the level of the wards, representing 100% of all geographical units in Zambia were included in the analysis. The period of analysis covered eight (8) from January 2017 to December 2024. A total of 548 out of 1827 wards (30%) had recorded at least one Cholera case during the analysis period. During that period, a cumulative 31,980 cases were recorded over the period of analysis. 8,850 suspected cases tested, with a positivity of 51.3% came out positive.

Table 6: An overview of data used for calculating the priority index for PAMIs identification in Zambia

Data description*	
Number of NCP operational geographic units	1827
Study period: start year	2017
Study period: Mid-year	2024
Study period: number of years	8 years
Number of NCP operational geographic units with at least one	548
case	
Total number of cases	31,980
Total number of deaths	736
Overall case fatality	2.3
Total number of suspect cases tested **	8,850
Total number of suspect cases tested positive **	4,538
Overall positivity rate **	51.3%

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

** Regardless of the testing method applied

Epidemiologic indicators score thresholds

The epidemiological indicators score thresholds are used for scoring epidemiological indicators that feeds into the calculation of priority index for each geographical unit. Table 2 lists the epidemiological indicator score thresholds. Incidence had the highest median (13.82) over the analysis period.

Table 7: Epidemiological indicators score threshold.

Epidemiological indicator score threshold					
Incidence (100,000 pers.y-1)*	Median	7.59			
	80th percentile	40.98			
Mortality (100,000 pers.y-1)*	Median	1.72			
	80th percentile	4.57			
Persistence (% of weeks with \geq one case)*	Median	0.5			
	80th percentile	1.9			

* Calculated out of geographic units with indicator value >0

Assessment of representativeness of testing

The assessment of representative testing is done to inform the selection of positivity indicator that will be used in the calculation of priority index. First step involves assessing whether the positivity rate should be selected as a test indicator (if weekly testing coverage \geq 50% in at least 80% of the NCP operational geographic units). The second step aim to find out if the number of years with case(s) tested positive score should be included into the priority index. The assessment of testing representativeness showed that only 407 (22.3%) of geographical units had the weekly testing coverage of equal or greater than 50%. >80% of geographical units had the weekly testing coverage of shown in Table 8 below

Table 8: Assessment of representativeness of cholera testing *				
Step 1	NO./ Rate/ %			
Number of NCP operational geographic units with weekly testing coverage $\geq 50\%$	407			
Percentage of NCP operational geographic units (with at least one case) with testing coverage \geq 50%	74.1%			
Is weekly testing coverage ≥ 50% in at least 80% of the NCP 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			

S	Step 2	NO./ Rate/ %
Ν	Number of NCP operational geographic units with	469
v	weekly testing coverage > 0%	
F	Percentage of NCP operational geographic units	85.4%
v	with testing coverage $> 0\%$	
I	is the weekly testing coverage > 0 in at least 80% of	Yes
t	he NCP operational geographic units of the	
C	country?	
L	evel of representativeness of testing	Sub-optimal
I	nclusion of the num. of years with case(s) tested	Num. of years with
p	positive score into the priority index	confirmed case(s) score
		included the priority index
"NA:	not applicable	
* Reg	gardless of the testing method applied"	

Priority index scores

All the parameters were used to determine the priority index, the maximum score was 11. Therefore, the priority index values ranged from zero to eleven (0 - 11). A total of 1278 had a priority index of zero. A total of 212 had a priority index ranging from 6 - 11. A total of 337 had a priority index ranging from 3 - 5. As the priority index increased, the number of geographical units decreased.

Over 4 million people are in geographical units with priority index ranging from 6 - 11. Over 4 million people are in the priority index ranging from 3 - 5. About 9 million people are in the priority index of zero. Combined the initial and the additional PAMIs represent **5,116,360** Zambians at risk of cholera, representing 28% of the national population

Geographical units with the highest priority index value (11) had the highest number of cholera cases over the analysis period with 9,975 (31.2%) cases, while the geographical units with the lowest priority index score had only reported two deaths during over the analysis period.

The distribution of deaths also an increasing trend of number of deaths with increasing priority index value. (Table 4). The geographical units with the highest priority index value (11), had over 39% of total number of deaths recorded over the reporting period.

Priority index of 6 had the highest positivity of 90.9% followed by priority index 7 with 77.1. Priority index 3 had the positivity of 74.2%.

Table 9: Key parameters stratified by priority index value

				Summary ta	able of key par	ameters strati	fied by pri	ority index	values					
										Asses	sment of re	presentat testing	iveness of ch	olera
										Level of represent testing	f tativeness o	of	Subopt	imal
										Testing included index	g indicator s into the pri	score iority	Num. of ye confirmed	ars with case(s)
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
(blank)		0	0.0%		0.0%	0.0%		0.0%	0.0%		0.0%	0.0%		
11	13	13	0.7%	487,884	2.6%	2.6%	9,975	31.2%	31.2%	287	39.0%	39.0%	48.3	3.7
10	25	38	1.4%	715,890	3.9%	6.5%	7,897	24.7%	55.9%	173	23.5%	62.5%	55.6	2.9
9	34	72	1.9%	1,108,614	6.0%	12.5%	7,718	24.1%	80.0%	135	18.3%	80.8%	51.8	2.9
8	27	99	1.5%	744,701	4.0%	16.6%	2,230	7.0%	87.0%	47	6.4%	87.2%	53.9	2.4
7	52	151	2.8%	698,957	3.8%	20.4%	1,725	5.4%	92.4%	43	5.8%	93.1%	77.1	1.6
6	61	212	3.3%	832,969	4.5%	24.9%	973	3.0%	95.4%	25	3.4%	96.5%	90.9	1.6
5	106	318	5.8%	1,372,772	7.4%	32.3%	872	2.7%	98.2%	15	2.0%	98.5%	61.1	1.3
4	100	418	5.5%	1,375,732	7.5%	39.8%	412	1.3%	99.4%	9	1.2%	99.7%	61.8	1.0
3	131	549	7.2%	1,464,010	7.9%	47.7%	178	0.6%	100.0%	0	0.0%	99.7%	74.2	1.0
0	1278	1827	70.0%	9,642,730	52.3%	100.0%	0	0.0%	100.0%	2	0.3%	100.0%	0.3	NA
Grand Total	1827		100.0%	18,444,260	100.0%		31,980	100.0%		736	100.0%		20.5	1.5



Figure 5: Map of NCP operational geographic units by priority index value for initial PAMIs

Stakeholder validation

Priority index threshold

Stakeholders selected the value of priority index threshold through consensus based on public health impact and the feasibility of implementing the interventions. After a considerable period of in-depth discussions and reflections, the team reached a consensus and selected six (6) as the **priority index threshold**. All wards that had a priority index score ≥ 6 were selected to form the initial list of PAMIS.

Initial list of PAMIs

A total of 212 PAMIs had a priority index score \geq 6 and were thus selected and formed the initial list of PAMIs representing 11.6% of all geographical units covering a total of 4,589,016 (24.9%) people living in these wards. Further, these wards represented 30,518 (95.4%) of cholera cases and 710 (96.5%) deaths over the analysis period. (Table 10)

Indicator	N (%)
NCP operational geographic units selected as initial PAMIs	212 (11.6)
Population and percentage of population living in these units	4,589,016 (24.9)
numbers and percentages of cholera cases and cholera deaths reported in these units over the analysis period	30, 518 (95.4)
numbers and percentages of cholera deaths reported in these units over the analysis period	710 (96.5)

 Table 10: Number of geographical units selected as initial PAMIs and associated

 population, number of cases and deaths

List of additional PAMIs

Additional PAMIs were identified based on vulnerability factors. The assessment of the presence and absence of vulnerability factors was only done for those wards (NCP operational geographic units) that did not make the initial list but had a priority index score very close to the priority index threshold of 6 to aid in the selection of additional PAMIs. The multisectoral stakeholders considered all the 12 vulnerability factors in the GTFCC indicative list in assessing and selecting the additional PAMIs. A ward with a vulnerability index of 5 or 4 with at least 6 of the 12 vulnerability factors was chosen as an additional PAMI. Using this criteria, 24 wards were selected as additional PAMIs. Additionally, the team also included four (4) wards that had never reported any cholera outbreak in the analysis period because of their:

- Unique location and livelihood that make the communities highly susceptible to cholera outbreaks that can be very difficult to control
- The government prioritizes them as areas requiring urgent attention especially advanced technology to improve water and sanitation.

Therefore, a total of 28 wards (24 based on a vulnerability index score of 5 or 4 with at least six vulnerability factors + 4 based on unique contextual vulnerabilities). Table 11 gives a summary of vulnerabilities and their scores per ward, while Table 12 gives detailed documentation of the vulnerability factors.





Table 12: List of Additional PAMIs Based on Vulnerability Factors

Province	District	Additional PAM	lls	Vulnerability factors
		Ward	Priority Index Score	
Copperbelt	Kitwe	Chimwemwe	5	 Very high population density of 6,776 per Km², peri-urban overcrowded area with several unplanned settlements(slums) Reported a large outbreak in 2023/2024 cholera epidemic Located along a major travel route with a transportation hub linking Zambia with the DRC with very high traffic daily Major population gatherings- the ward has one of the biggest markets in the country called Nakadoli where traders from different parts of the country and outside (DRC) converge and stay in makeshift buildings for considerable periods of times Occasionally, hosts truckers on transit to the DRC, some of which sleep in their trucks with no proper water and sanitation facilities (high-risk population) Intermittent water supply made worse by old dilapidated water and sewer pipes increasing the risk of contamination of drinking water. There is severe rationing of water aggravated by the

30

				drought the country is facing. About 72% of the population do not have access to improved sanitation
		Kwacha	5	 Very high population density' at 10,970 per Km², peri-urban overcrowded area with several unplanned settlements (slums) Reported cholera outbreak in the 2023/2024 cholera epidemic Surrounded by other high cholera-prone areas such as Ipusukilo ward which had a priority index of 10 Located along a major travel route to the DRC with transportation hubs Limited access to water supply. The ward experiences severe water rationing with supply for only 2 hours every after 2 days. This forces communities to use surface water especially shallow wells which are also poorly sited quite close to pit latrines WaSH infrastructure is old, and dilapidated and massive leakages leading to contamination of all other sources of water, especially surface water.
	Chililabombwe	Yotam Muleya	5	 Overcrowded with several unplanned settlements Very high population density at 2971 per Km² Located at the border in close proximity to a cholera-prone area (PAMI) in the DRC with a long porous border and high traffic to and from the DRC The ward provides temporary accommodation to local and international traders and truckers (high-risk groups) who stay in makeshift structures without proper WaSH facilities for considerable periods Limited access to water supply (43.7%) and sanitation (52%). Shallow wells form the main source of domestic water and poorly sited pit latrines as the main sanitation facilities with high levels of open defecation (not quantified)
Muchinga	Nakonde	Ikumbi	5	 Overcrowded, highly densely populated ward (1,909 per Km²) consisting of several unplanned settlements Located at the border with Tanzania—one of the busiest PoEs in Zambia through which most of the imports and exports from the Middle East pass. There is high traffic between Zambia and Tanzania. Most imported vehicles from Japan pass through this PoE causing overcrowding Provides temporary accommodation to both the local and international traders and truckers (high-risk groups) and some reside in makeshift structures with no proper water and sanitation facilities Located near high cholera-prone area in Tanzania to the north and another district in Malawi that is currently experiencing a cholera outbreak. Reported a cholera outbreak in the 2023/2024 cholera epidemic It is a major travel route with several bus stations and movement of people to and from the rest of the country including international travel Approximately 64% of the population do not have access to improved water supply and 50% to improved sanitation.
	Chinsali	Nkakula	5	 Located along major travel routes with transportation hub Highly densely populated ward (population density ## per Km²) consisting of several overcrowded compounds Reported cholera cases in the 2023/2024 cholera epidemic

				• Access to basic water supply is only 30%, basic sanitation is 42% while hand washing is very low at #%. People mainly use shallow wells and streams for domestic water and pit latrines for sanitation
	Mpika	Musankanya	4	 Presence of high-risk populations (illegal gold mine in informal settlements with inadequate WaSH Major transit point for both rail and road from Tanzania and Northern to Lusaka and Copperbelt Major population gatherings as it is the main ward were big conferences take place in the province Inadequate safe clean water supply and
Luapula	Lunga	Lunga	0	 This is a unique island located on lake Bangweulu which is surrounded by water. Although it has never reported a cholera outbreak, it has several vulnerabilities and a problem waiting to explode It is hard to access as the only means of transport is water and air. The community depend on surface water using shallow wells and streams with 67% of the population accessing water from an unimproved water facility type. 95% of the population access unimproved sanitation facilities, Communities have challenges to construct proper pit-latrines because the water table is very high and the few pit-latrines available easily get flooded and mix with surface water used for domestic consumption. Most of people practice open defecation mainly on surface water It is also affected by extreme climate and weather changes with massive flooding almost every year It consists high-risk populations (fishermen and fish traders) with numerous fishing camps surrounding the island Weak health systems including surveillance and laboratory for a prompt and effective response in case of an outbreak
		Itala	0	 This is a unique island located on lake Bangweulu which is surrounded by water. Although it has never reported a cholera outbreak, it has several vulnerabilities and a problem waiting to explode It is hard to access as the only means of transport is water and air. The community depend on surface water using shallow wells and streams with 67% of the population accessing water from an unimproved water facility type. 95% of the population access unimproved sanitation facilities, Communities have challenges to construct proper pit-latrines because the water table is very high and the few pit-latrines available easily get flooded and mix with surface water used for domestic consumption. Most of people practice open defecation mainly on surface water It is also affected by extreme climate and weather changes with massive flooding almost every year It consists high-risk populations (fishermen and fish traders) with numerous fishing camps surrounding the island Weak health systems including surveillance and laboratory for a prompt and effective response in case of an outbreak
	Mwense	Mambilima	4	 Mambilima Ward borders Katanga Province in the Democratic Republic of Congo (DRC), which is one of the hot spots for cholera outbreaks in that country. It has a very busy border called Kashiba border post with more than 1000 people crossing between Zambia and DRC

Northern	Mpulungu	Chibulula	5	 Presence of high-risk population (fishermen and traders) who reside in temporary makeshift structures Despite being an authorized border post, it has many unofficial entry points. The area has historically been prone to cholera outbreaks, driven by high population density, inadequate water and sanitation facilities, and significant cross-border movement. Part of the ward is a peri-urban areas with highly density population The area recorded 12 cases of cholera in 2023 The ward has high influx of traders from Zambia and Tanzania, Congo DR and Burundi 30% of the population use surface water i. e. streams and scoop wells only There is no safe water supply Only 57% of the population are using basic sanitation More than 50% of the population with no handwashing facility on premises The Population received OCV in 2021 with two-doses with a coverage >70%
		Iywendwe	4	 Hard to access—accessible mainly by marine transport. The ward experiences flooding It recorded 9 cases of cholera in 2023. The ward has 59% of the population using shallow wells, streams and other unprotected water sources There is no safe water supply. 62% of the population are using basic sanitation facilities. It is an area with more than 50% of the population without handwashing facilities. Population received OCV in 2021 with two-doses with a coverage of >70%)
	Mbala	Kazimolwa	5	 The ward is densely populated at 601 people per km2 Mobile population frequently hosts traditional markets with no water and sanitary facilities The ward has been reporting outbreaks in the past 5 years24 cases of cholera i.e. 22 cases in 2019 & 2 cases in 2023 It is located along major travel routes for Zambia and the port in Mpulungu which links Zambia to the Great Lakes (Burundi, DRC, Tanzania) Has 40% of the population using unimproved water i.e streams, boreholes and shallow wells. 60% of the population use unimproved sanitation facility type 50% of the population has no handwashing facility on premises It is usually affected by flooding in the rainy season
North Western	Kalumbila	Kisasa	5	 Kisasa is a mining area which houses Zambian and international miners and investors More than 60% use unimproved water facility type and 64% unimproved sanitation facility type Located along a major travel routes with transportation hub—it is a transit route to Angola and the Lobito corridor project It is overcrowded with 90% consisting of informal structures an unplanned settlement Recorded 6 confirmed cholera cases in the 2024 outbreak (cholera outbreak)

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 Transit point with more than 8 buses daily coming from Lusaka Location along major travel route for trackers from Namibia to the mining areas The ward season major population gatherings every year 					intermittent safe water supply and inadequate sanitary facilities
Location along major travel route for trackers from Namibia to the mining areas The ward season major population gatherings every year					Transit point with more than 8 buses daily coming from Lusaka
 mining areas The ward season major population gatherings every year 					Location along major travel route for trackers from Namibia to the
					 mining areas The ward season major population gatherings every year.

				•	It is at high risk of extreme climate and weather conditions. It experiences flood quite often which result in displacements and contamination of water sources
Southern	Monze	Monze urban	5	•	In 2023/2024 cholera epidemic, the ward recorded 6 confirmed cases of Cholera It is a transit point for southern African countries The ward also has temporal shelters for travelers, truckers where there's inadequate sanitary facilities and safe water sources More than 35% of the population access unimproved water facility type and more than 20% access unimproved sanitation facility type The ward is also a central trading point attracting high volume of people, moving from other wards within the district leading to higher chances of importing diseases into the ward.
	Mazabuka	Mazabuka Central	4	•	The ward is an unplanned settlement with a 'very high population density area at 6,019 Km2, overcrowded an unplanned settlement The ward recorded 10 confirmed cases of Cholera in 2023/2024 rainy season It is a transit point characterized by high volume of truck drivers More than 50% access unimproved water facility type and 50% access unimproved sanitation facility type The ward also acts as an entry and outlet to several fishing camps in Kafue flats High influx of fish trader
	Itezhitezhi	Nyambo	5	•	The ward is located on the Kafue plains, a major fishing area Main livelihood is fishing and fish trading. Fishermen live in unplanned settlements in fishing camps with very poor WaSH facilities. Almost the whole community depends on surface water for domestic consumption. More than 95% access unimproved sanitation facility type with rampant open defecation increasing the risk of surface water contamination It experiences massive flooding during the rainy season Several high-risk groups of fishermen and traders who live in makeshift structures It has a history of cholera outbreaks and in 2024 it recorded 6 cholera cases.
Eastern	Chipata	Kapata	5	•	Highly densely populated ward with a population density of 3437 people per Km ² Located along major travel routes with transportation hubs linking Zambia, Malawi and Mozambique It has the largest unplanned trading area in Eastern province and houses traders from across the country and also from Malawi and Mozambique The ward has a lot of unplanned settlements (slums), some of which are located in water logged areas More than 93% of the population access unimproved sanitation facility type and 46% access unimproved water facility type The ward experiences major population gathering on a yearly basis during one of the biggest traditional ceremonies that brings people from across Zambia and also Malawi, Mozambique, Zimbabwe and as far as South Africa Reported a cholera outbreak in the 2023/2024 cholera epidemic
	Petauke	Manyane	5	•	Located in close proximity to a cholera PAMI in Mozambique Illegal mining activities with several illegal miners who live in overcrowded unplanned settlements 35% access unimproved water supply facility type and 59% access unimproved sanitation facility type

				•	High illegal cross-border between Zambia and Mozambique in this
					area Reported cholera cases in the 2023/24 cholera outbreak.
Central	Kapiri Mposhi	Mpunde	0	•	Part of the large Lukanga Swamps with fishing as the major
		•••••	_		livelihood for the people
				٠	Presence of high-risk population-fishermen and fish traders.
					Fishermen live on floating islands for months and access surface
					water for drinking while sanitation is direct in the water as they
					On mainland, 80% of the population access unimproved water
					facility type (streams, shallow wells etc) while 60% access
					unimproved sanitation facility type (pit latrines that poorly sited)
				•	Hard to access ward with water transport as the main means of
					access and previous outbreaks in 1999, 2000, 2004, 2010 and 2016
					were extremely difficult to control.
				•	campaigns have been done in this ward before the analysis
					period including a prospective cohort-immunogenicity studies.
					The OCV campaigns could have accounted for the low
					incidence but the WaSH situation is still poor and requires urgent
					attention.
				•	It is also at high risk for extreme climate and weather conditions-
					Constructing WaSH facilities requires advanced technology and
					thus need to be prioritized for interventions
	Mumbwa	Nangoma	4	•	Major an unplanned settlement with a huge fishing village.
	District			•	High risk populations of fishermen and fish traders
				•	Fishermen live on floating islands
				•	Poor access to basic water supply at 30% (surface water and shallow wolls
				•	The ward has unimproved sanitation coverage of 35%
				•	Influx of fish traders increasing the risk of cholera importation into
					the area
				•	Hard to access area— It is only by water and air transport. Cut off
					during the rainy season
				•	areas/PAMIs
				•	Weak surveillance system in the ward including long distance to
					nearest facility for cholera testing and confirmation
	Ngabwe	Chilwa	0	•	The large part of the ward is an island with fishing and fish trading
					as the main economic activity
				•	streams.
				•	Coverage for basic water supply stands at 28% and 81%
					unimproved sanitation with rampant open defecation
				•	It consist of several fishing camps with extremely poor sanitation
					and no access safe drinking water. Fishermen and their families
					They dispose of human waste directly into the water that they also
					use for domestic consumption.
				•	Influx of fish traders during the peak fishing period further increases
				1	the risk of importing cholera into the ward.
				•	Presence of illegal gold mine with influx of illegal miners from
					across the country. This stresses the ward further in terms of WASH and high-risk and highly mobile population
				•	Part of a new district that was initially part of Kapiri Mposhi which is
					a Known cholera PAMI. Strong likelihood cholera cases for this
			1	1	area for the period under review would have been reported

				 under Kapiri Mposhi (mother district)-noted weaknesses in surveillance system The island is hard to access. It only be accessed through water and air transport.
Lusaka	Kafue	Shabusale	5	 It is the largest unplanned settlement in Kafue District It has an inadequate basic water supply coverage is 50% which are shallow wells. The sanitation coverage is 48%. There is evidence of rampant open defecation. Access to safe drinking water is below most of the people use shallow wells for drinking water. It is located along major travel routes with transportation hubs The ward recorded a total of 33 cases with a test positivity rate of 96% in the 2023/ 2024 cholera epidemic. The population had been vaccinated with two doses of OCV in 2021 Located along the major transportation hubs that connect routes to the southern African countries including South Africa, Zimbabwe, Botswana and Namibia as well as Tanzania and DR Congo
	Chongwe	Kanakantapa	5	 Kanakantapa is a farming community in Chongwe District that brings people from within Chongwe district as well as Lusaka The ward reported a cholera outbreak with 10 cases of cholera in the 2023/2024 cholera outbreak with a test positivity rate of 40% reported. Poor access to WaSH with 57% accessing unimproved sanitation facility type and 52% unimproved water facility type (shallow wells). Evidence also show that the area is water stressed and the situation has become dire with the current drought that the country has experienced in 2023/2024 season.

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 240 PAMI wards were included in the final list of PAMIs for Cholera control in Zambia covering **5,116,360 million people,** representing 28% of the national population as shown in the table and figure below:

Figure 5: Zambia Map with Final PAMIs 2024





39

Figure c: 2024 Map of Zambia with final PAMIs wards highlighted in priority provinces highlighted



Figure 7: Districts with Priority Areas for Multi-Sectoral Interventions

The initial PAMIs (Priority index \geq 6) represent 24.9% of the total population covering approximately 4.5 million people. The additional 28 PAMIs, representing wards with particular vulnerability factors, puts an additional 527,3444 people at risk of cholera. Thus, the PAMI identification exercise has outlined how **5,116,360 million Zambians** live at risk of cholera—about 28% of the national population – from the previous 2020 assessment that had 2.1 million at risk – showing the gravity of sluggish efforts towards cholera control.

The 240 wards identified in the final list of PAMIs (both initial 212 PAMIs with priority index greater than and equal to 6, and the additional 28 PAMIs with extenuating vulnerability factors) represent **54 districts of the 116 districts** in the country, identified to have wards with increased risk for cholera transmission and recognised as Priority Areas for Multisectoral Interventions (PAMIs). Districts and wards with Moderate and Low risk must also be monitored closely for continued cholera prevention activities to ensure that the next iteration of the PAMI identification process will not result in additions to this final list.

		Initial PAMIs	Additional PAMIs
Province	District	Ward (Priority Index)	Ward (Priority Index)
Central	Kabwe	Makululu (10) Zambezi (10) Nakoli (10) Chililalila (9) Chirwa (9) Katondo (9) Moomba (9) David Rasmushu (8) Ben Kafupi (7) Kawama (7) Njanji (7) Bwacha (6) Ngungu (6) Highridge (6) Justine Kabwe (6) Kaputula (6) Luansase (6)	
	Mumbwa	Kamilambo (10) Mumba (9) Nalubanda (7) Chisalu (7) Matala (6) Myooye (6)	Nangoma (4)
	Kapiri Mposhi	Kampumba (9)	Mpundwe (3)
	Shibuyunji	Nampeya (8) Kalundu (7) Nampundwe (7) Mukalaikwa (7) Nakaiba (6)	
	Mkushi	Chibefwe (7)	
	Serenje	Chisangwa (7)	
	Chibombo	Chunga (7) Katuba (7) Chaloshi (7) Chibombo (7) Mungule (6) Kalola (6)	
	Chisamba	Liteta (6) Miswa (6)	
	Ngabwe		Chilwa (0)
Copperbelt	Chililabombwe	Ngebe (11) Chitimukulu (10) Kasumbalesa (7) Nakatindi (6)	Yotam Muleya (5)
	Ndola	Skyways (11) Mapalo (9) Kabushi (9) Kanini (8) Twapia (8) Lubuto (8)	

Table 13: Combined List of Initial and Additional PAMIs

	Kitwe	Masala (8) Itawa (7) Nkwazi (7) Chichele (6) Kantolomba (6) Twashuka (6) Kafubu(6) Ipusukilo (10) Buchi (8) Wusakile (8) Bulangililo (7)	Chimwemwe (5) Kwacha (5)
		Chamboli (6)	
Eastern	Chasefu	Membe (10)	
	Vubwi	Chisiya (8) Mlawe (7) Vubwi (7) Mbande (6) Mbozi (6)	
	Chipata	Dilika (8) Kanjala (7) Msanga (7)	Kapata (5)
	Chadiza	Chadiza (7)	
	Chipangali	Chipangali (7) Kasenga (7)	
	Kasenengwa	Ng'ongwe (6)	
	Katete	Mphangwe (6)	
	Nyimba	Chamilala (6) Chiweza (6)	
	Petauke		Manyami (5)
Luapula	Chienge	Lunchinda (9) Mununga (8)	
	Mwansabombwe	Kazembe (7) Mwansabombwe (6)	
	Nchelenge	Kabuta (7) Kashikishi (6) Nchelenge (6)	
	Mwense		Mambilima (4)
	Lunga		Lunga (0) Itala (0)
Lusaka	Lusaka	Chaisa (11) Chinika (11) Kanyama (11) Raphael Chota (11) Kapwepwe (11) Lima (11) Mwembeshi (11) Chawama (10) Nkoloma (10) Chilenje (10) Garden Park (10) Munkolo (10) Justin Kabwe (10)	

	Ngwerere (10)	
	Kalikiliki (10)	
	Kamwala (9)	
	Libala (9)	
	Harry Mwanga Nkumbula	
	(9)	
	Makeni Villa (9)	
	Kabulonga (9)	
	Kabanana (9)	
	Matero (9)	
	Muchinga (9)	
	Chainda (9)	
	Chakunkula (9)	
	Kalingalinga (9)	
	Mtandara (0)	
	Murali (0)	
	John Howard (8)	
	Kabwata (8)	
	Kamulanga (8)	
	Independence (8)	
	Lubwa (8)	
	Mpulungu (8)	
	Roma (8)	
	Lilavi (7)	
	Silwizya (6)	
	Mulungushi (6)	
Channen		
Chongwe	Ngwerere (11)	Kanakantapa (5)
	Ntandabale (10)	
	Chongwe (9)	
	Madido (8)	
	Mulenje (8)	
	Palabana (7)	
	Kapwayambale (7)	
	Kasisi (7)	
	Niolwe (7)	
	Chainda (6)	
	Nakatindi (6)	
Chilanga	Kalundu (10)	
Chilanga	Kaluliuu (10) Maxat Malului (10)	
	Kasupe (9)	
	Namalombwe (9)	
	Chilanga (8)	
	Mondengwa (6)	
	Mwembeshi (6)	
	Nakachenje (6)	
Kafue	Matanda (9)	Shabusale (5)
	Chifwema (7)	
	Kabweza (7)	
	Kabweza(7)	
	Chilesone (C)	
	Shikoswe (6)	
	Snimadaia (6)	
Rufunsa	Chintimbwi (9)	
	Rufunsa (9)	
	Bunda_Bunda (6)	
	Mankhanda (6)	
	Mulamba (6)	
Luangwa	Mandombe (10)	

		Dzalo (9) Lunya (8) Chiriwe (7) Katondwe (7) Kavuula (7) Phwazi (7) Chikoma (6) Mankhokwe (6) Mphuka (6) Mwalilia (6)	
Northern	Nsama	Kapisha (11)	
	Mpulungu	"Kapembwa (10) "Kapembwa (10) Mpulungu Central (10)" Isoko (8) Chilumba (7)	Chibulula (5) Iyendwe (5)
	Mbala	Kalambo Falls (6)	Kazimolwa (5)
North-Western	Chavuma	Chavuma Central (10) Chivombo Mbalango (7)	
	Solwezi	Tumvwang'anai (9)Kimasala (6) Kyalalankuba (6)	
	Kalumbila		Kisasa (5) Shilenda (3)
	Mushindamo		Musaka (0)
	Champ	Singani (11)	
	Choma	Mbabala (9) Sikalundu (7) Stateland (7) Mutandalike (6)	
	Zimba	Kanyanga (11) Chalimongela (10)	
	Gwembe	Jongola (9) Chibuwe (7)	
	Mazabuka	Munenga (9) Nakambala (8) Itebe (7)	Mazabuka Central (5)
Southern	Monze	Bbombo (9) Singonya (8) Bweengwa (7) Choongo West (7) Hamusonde (7) Manungu (6) Chona (6)	Monze Urban (5)
	Itezhi Tezhi	Kabulungwe (8) Luubwe (8) Shambala (6)	
	Chikankata	Nansenga (7)	
	Chirundu	Chirundu West (7) Njame (7) Kapululira (6) Lusitu (6)	

		Ng'ombe Ilede (6)	
	Siavonga	Nanyanga (7) Manchamvwa Lake Shore (6)	
	Livingstone	Lizuma (6)	
	Namwala	Namusonde (6)	
	Sinazongwe	Chiyabi (6) Sinazongwe (6)	
	Lukulu	Lyambai (6)	
Western	Mongu		Lewanika (5) Lealui Lower (4) Kampule (4)
	Nakonde		Ikumbi (5)
Muchinga	Chinsali		Nkalula (5)
	Mpika		Musakanya (4)

CHAPTER 4: DISCUSSION

This analysis demonstrates that cholera has consistently affected Zambia from 2017 through to 2024, with outbreaks spanning multiple districts and affirming endemicity in many parts of the country. The largest and most geographically widespread outbreak occurred in 2023-2024, almost double what had been seen in previous years. This outbreak showed an increased risk for local cholera transmission in non-traditional hotpot districts, hence the need to update the priority areas for multisectoral interventions. The updated PAMI lists were created using the latest GTFCC tools with districts ranked by priority index supported by vulnerability factors. Lower-risk wards were flagged for ongoing monitoring.

The 2024 review identified 240 wards across 54 districts in all 10 provinces as priority areas for multisectoral interventions for cholera control. The **initial** PAMI list represents 11.6% of the wards in the country but 24.9% of the total population, covering approximately 4.5 million people – from the previous 2020 assessment that had 2.1 million at risk – showing the gravity of increasing cholera burden and reflecting the need for urgent efforts towards cholera control. The 28 additional PAMIs represent 527,3444 people. Therefore, *the total number of people living in the PAMIs is* 5,116,360 million *representing* 28% of the *national population living at risk for cholera*.

Lusaka Province, particularly Lusaka District, accounted for 86% of reported cases, with peri-urban settlements lacking adequate WASH infrastructure, clean water access, and sanitation. Flood-prone areas in Lusaka, worsened by inadequate drainage systems, increase vulnerability, especially during the rainy season. As a hub for cross-border trade,

Lusaka's high mobility also raises the risk of transmission and spread. From this iteration of the PAMI identification, wards in Lusaka Province that met the priority index threshold represented 2,684,503 people living in them. This represents 52% of the total population in the PAMI wards.

In comparison to the previous hotspot map, there is a noticeable increase along the line of rail from Southern province, through Lusaka and Central and into the Copperbelt. Most of these unplanned peri-urban slums that have been mushrooming over the years have very high densities with very limited wash infrastructure. A similar situation is seen in the Eastern province and the transit hubs of the northern circuit (towns along Great North Road in Northern, Muchinga, and Luapula Provinces). This revelation brings evidence to support the presidential directive to ban unplanned urban settlements^{11–12}. Further, Zambia's location puts it at greater risk of cross-border cholera transmission. Several wards identified as PAMIs are located along the border with the DRC (13 districts), Malawi (6 districts), Mozambique (4 districts), Zimbabwe (4 districts) and Tanzania (3 districts). This underscores the critical need to strengthen cross-border coordination and collaboration to curb the regional spread of cholera.

PAMIs near borders with the DRC, Tanzania, Malawi, Mozambique, and Zimbabwe highlight the role of cross-border movement in cholera spread, emphasizing the need for coordinated cross-border surveillance. For instance, collaborative efforts with these countries and WHO have strengthened real-time data sharing and joint preparedness, a critical strategy for controlling transmission.

Additional PAMIs areas include fishing camps around Lake Tanganyika (Northern Province), Lake Bangweulu (Luapula), Kafue flats (Central Province), and Lake Kariba (Southern Province). These camps often lack planned infrastructure, with surface water sources used for domestic needs, inadequate sanitation, and open defecation often practised, which further contaminate water sources. High traffic from fish trading is another factor in the heightened transmission risk in these communities.

Enhanced cholera management measures, including early detection, case confirmation, improved WASH interventions, and reactive Oral Cholera Vaccination (OCV) campaigns in high-risk areas like Kapiri Mposhi and Ngabwe, have contributed to better containment and hence the lower priority index during this assessment.

Cholera's recurring presence in Zambia since its first recorded outbreak in 1977 highlights the significance of mapping hotspots. This data-driven approach provides essential insights for targeted prevention and control efforts, as outlined in Zambia's updated National Multisectoral Cholera Control Plan 2025- 2030. These initiatives prioritize long-

¹¹ https://diggers.news/local/2024/01/12/we-wont-allow-new-unplanned-settlements-hh/

¹² <u>https://w2.znphi.co.zm/2024/04/13/speak-out-the-znphi-says-the-journey-to-eliminating-cholera-in-zambia-just-began/</u>

term improvements in WASH services, community-focused OCV campaigns culminating in local manufacture, and investments in epidemic preparedness and rapid response aligned to reduce the public health impact and economic disruptions of cholera.

The identification of the PAMI wards and districts in each province will be used for developing tailored solutions that will be led by Provincial Cholera Task forces. Each province will be supplied with also the districts and wards that are at risk to allow them to prioritize interventions that would prevent further spread of cholera. This iterative process will be the basis of the updated National Cholera Control Plan that is being developed using the decentralised approach that highlights strengthened surveillance systems in the at-risk wards, and heavier investments in new wards and districts such as Lunga and Kanakantapa that have been identified as additional PAMIs. An annual award will be introduced for the best-performing wards and districts meeting targets towards cholera control and elimination efforts. The recommended actions are listed overleaf.

CHAPTER 5: CONCLUSIONS, RECOMMENDATIONS AND WAY FORWARD

The findings underscore a significant increase in the number of high-risk wards, highlighting the need for a shift in cholera control strategies to prevent further deterioration. If current approaches are not adjusted, the situation will likely escalate, endangering more communities. Key recommendations are presented alongside a roadmap for sustainable and effective cholera prevention and control efforts at all levels. The largest strength in the methodology for this exercise was that PAMI data was collected manually using Kobo tools to extract the case numbers from the last 10 years in all the 1827 wards, using registers from the health facilities.

Limitations to the findings of the PAMI report

- 1. Suboptimal testing outside of outbreaks, resulting in limited data for action.
- 2. Similarly limited mortality surveillance may result in lower testing numbers before outbreak declaration and in community deaths
- 3. The vulnerability assessment did not collect data specifically related to hygiene practices, such as handwashing behaviour or the availability of soap
- 4. Limited assessment of environmental factors such as climate variability, flood risk, or drought impact, which are known to influence cholera outbreaks

5. The study's scoring system did not account for urban versus rural settings, the inherent differences between these areas could mean that some vulnerability factors are weighted differently in reality

Recommendations

In cholera PAMIs, comprehensive preparedness and response plans should be prepared and should include:

- Conduct Comprehensive Assessments of WASH Indicators in the selected Priority Areas for Multi-Sectoral Interventions (PAMIs). This will establish a benchmark to monitor and evaluate progress over time and adjust strategies as needed to ensure the effectiveness of interventions
- Cholera prevention efforts should be incorporated into the Integrated Developmental Plans managed at the ward level by the Ministry of Local Government and Rural Development
- Advocacy for increased investment in WASH infrastructure both at National and subnational levels through increased domestic spending from avenues such as the constituency development fund
- Advocacy from parliamentarians to increase their involvement in cholera elimination efforts
- Improvement of laboratory capacity for prompt detection of vibrio cholera by both Rapid Diagnostic Tests (RDTs), cultures and polymerase chain reaction (PCR) especially outside of confirmed outbreaks.
- Stronger integration of lab testing platforms (DISA), DHIS and IDSR to ensure historical case numbers are maintained on the online servers
- Strengthening early detection and rapid response with effective use of Event-Based Surveillance (EBS), Community-Based Surveillance (CBS) and cross-border alerts
- Strengthening testing and case management at points of entry (PoEs) with improved isolation facilities
- Strengthening Multisectoral coordination mechanism through Cholera Task Forces in all hotspot districts with designated focal point person
- Perineal risk communication, social mobilization and community engagement strategies not only in the peaks of the outbreaks
- Building effective cholera management capacity through training, simulation exercises including for the utility companies
- Develop and implement a structured system for continuous monitoring and regular reporting of WASH indicators in non -PAMI wards
- Completion of the multiyear plan of action for the application of pre-emptive oral cholera vaccines from 2025

- Encourage local research in cholera to generate evidence for more effective interventions such as the local vaccine manufacturing plant which is being established
- Annual review of the progress towards PAMI implementation activities with awards for the best performing and most improved wards
- Biannual revision of the PAMI maps

Conclusions

In conclusion, the 2024 PAMI review underscores an urgent need for a reinforced cholera control strategy in Zambia, identifying 240 wards across 54 districts as priority areas for multisectoral interventions. The findings reveal that 5 million Zambians—representing 28% the national population—remain at risk, with hotspots like Lusaka Province, particularly its peri-urban settlements, accounting for 86% of reported cases. Inadequate WASH infrastructure, flood-prone conditions, and high cross-border mobility amplify cholera vulnerability. The expanded PAMIs more than double the population identified in 2020, signalling the critical importance of accelerating efforts in prevention, rapid response, and sustained investment to reduce this substantial public health threat. Implementing these measures will lay a strong foundation for effective cholera prevention, improved outbreak response, and long-term health resilience across high-risk areas in Zambia.





Figure 8: Map of PAMIs in Lusaka Province

Table 14: Proportion of Districts in Lusaka Province with PAMI wards

	Lusaka Province	No. District: 6	No. PAMI Districts: 6	Population
S/N	District	Total wards	identified PAMI	District
			wards	Population
1	Chilanga	12	8	215,917
2	Chongwe	21	12	234,827
3	Kafue	18	8	208,442
4	Rufunsa	12	5	78,036
5	Luangwa	17	11	32,324
6	Lusaka	38	38	1,151,637
	Total	118	82	

Lusaka Province represents the 1,921,183 people living in districts at risk for cholera. Sixty-nine per cent of the wards in the province (82 of the 118) were recognised to have overt vulnerabilities for continued cholera transmission.



Annex 2 Priority Areas for Multisectoral Interventions by Province – Copperbelt

Figure S: Map of PAMIs in Copperbelt Province

Table 15: Proportion of Districts in Copperbelt Province with PAMI wards

	Copperbelt Province	No. District: 10	No. PAMI Districts: 3	Population
S/N	District	Total wards	identified PAMI wards	District Population
1	Masaiti	19	0	
2	Ndola	30	13	576,314
3	Kitwe	32	7	601,308
4	Mufulira	30	0	
5	Mpongwe	15	0	
6	Chingola	29	0	
7	Kalulushi	24	0	
8	Lufwanyama	20	0	
9	Chililambombwe	24	5	127,632
10	Luanshya	30	0	
	Total	253	25	

Copperbelt Province represents an additional 1,305,254 people living in 3 districts at risk for cholera. The main identified vulnerability factors for the wards identified on the Copperbelt are high population density and poor access to WASH services, as shown in the pictures below.



Figure 10a: Sewage leakages in Chimwemwe Ward - Kitwe



Figure 10b: Unkept toilets/pit latrines in Yotam Muleya Community in Chililabombwe, near Kasumbalesa border



Figure 10c. Sewage run off near a stand water pump in Kwacha ward, Kitwe

52



Annex 3: Priority Areas for Multisectoral Interventions by Province – Central

Figure 11: Map of PAMIS in Central Province

Table 16: Proportion of Districts in Central Province with PAMI wards

	Central Province	No. District: 11	No. PAMI Districts: 9	Population
S/N	District	Total wards	identified PAMI	District
			wards	Population
1	Kabwe	29	17	287,280
2	Chitambo	16	0	
3	Serenje	15	1	165,426
4	Mkushi	16	1	198,228
5	Luano	12	0	
6	Kapiri Mposhi	19	2	352,079
7	Chibombo	21	6	400,155
8	Chisamba	12	2	152,520
9	Shibuyunji	12	5	92,065
10	Mumbwa	21	5	310,849
11	Ngabwe	8	1	40,049
	Total	181	40	

53



Annex 4: Priority Areas for Multisectoral Interventions by Province – Eastern

Figure 12: Map of PAMIs in Eastern Province

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	Eastern Province	No. District: 15	No. PAMI Districts: 9	Population
S/N	District	Total wards	identified PAMI wards	District Population
1	Chadiza	20	1	105,429
2	Chama	24	0	
3	Chasefu	10	1	124,533
4	Chipangali	8	2	160,813
5	Chipata	11	4	305,810
6	Kasenengwa	8	1	146,999
7	Katete	22	1	210,942
8	Lumezi	11	0	
9	Lundazi	10	0	
10	Lusangazi	11	0	
11	Mambwe	15	0	
12	Nyimba	15	2	137,522
13	Sinda	19	0	
14	Petauke	13	1	238,591
15	Vubwi	9	5	43,117
	Total	206	18	



Annex 5: Priority Areas for Multisectoral Interventions by Province – Luapula

Figure 13: Map of PAMIs in Luapula Province

Table 18: Proportion of Districts in Luapula Province with PAMI wards

	Luapula Province	No. District: 12	No. PAMI Districts: 5	Population
S/N	District	Total wards	identified PAMI wards	District Population
1	Chienge	15	2	179,015
2	Samfya	10	0	
3	Kawambwa	18	0	
4	Mwansabombwe	12	2	55,904
5	Chifunabuli	13	0	
6	Chipili	12	0	
7	Chembe	8	0	
8	Nchelenge	15	3	217,258
9	Mwense	21	1	116,367
10	Mansa	20	0	
11	Milenge	13	0	
12	Lunga	10	2	37,396
	Total	167	10	



Figure 14: Vulnerabilities in Lunga District Luapula Province, from top to bottom showing the impassable terrain and high water table with flooded shallow wells and latrines

Lunga District, a remote island on Lake Bangweulu in Luapula Province, faces significant vulnerabilities despite never having reported a cholera outbreak. Accessible only by water or air, the district struggles with poor water and sanitation infrastructure. High water tables and frequent flooding exacerbate the risk of contamination, as open defecation is common, and pit latrines are often flooded. Home to high-risk populations such as fishermen and fish traders, the district also endures extreme weather conditions and lacks robust health systems for surveillance and outbreak response, making it a potential hotspot for a public health crisis



Annex 6: Priority Areas for Multisectoral Interventions by Province – Northern

Figure 15: Map of PAMIs in Northern Province

Table 19: Proportion of Districts in Northern Province with PAMI wards

	Northern Province	No. District: 12	No. PAMI Districts: 3	Population
S/N	District	Total wards	identified PAMI wards	District Population
1	Chilubi	24	0	
2	Kaputa	17	0	
3	Kasama	19	0	
4	Lunte	14	0	
5	Lupososhi	13	0	
6	Luwingu	13	0	
7	Senga Hill	10	0	
8	Nsama	17	2	73,824
9	Mungwi	15	0	
10	Mbala	9	2	153,458
11	Mporokoso	12	0	
12	Mpulungu	17	6	145,907
	Total	180	10	



Annex 7: Priority Areas for Multisectoral Interventions by Province – Southern

Figure cc: Map of PAMIs in Southern Province

	Southern Province	No. District: 15	No. PAMI Districts: 12	Population
S/N	District	Total wards	identified PAMI wards	District Population
1	Chikankata	14	1	79,070
2	Choma	28	5	255,077
3	Chirundu	12	5	45,811
4	Gwembe	16	2	75,184
5	Kazungula	16	0	
6	Kalomo	20	0	
7	Itezhi-Tehzi	15	3	123,637
8	Monze	25	8	237,114
9	Namwala	16	1	159,883
10	Pemba	12	0	87,004
11	Siavonga	12	2	62,673
12	Sinazongwe	16	2	150,942
13	Livingstone	20	1	158,847
14	Mazabuka	20	4	220,882
15	Zimba	12	2	103,585
	Total	254	36	

Annex 8: Priority Areas for Multisectoral Interventions by Province – Muchinga

Figure 77: Map of PAMIs in Muchinga Province

Table 21: Proportion of Districts in Muchinga Province with PAMI wards

	Muchinga Province	No. District: 8	No. PAMI Districts: 3	Population
S/N	District	Total wards	identified PAMI wards	District Population
1	Chinsali	17	1	125,228
2	Isoka	14	0	
3	Kanchibiya	10	0	
4	Lavushimanda	6	0	
5	Mafinga	13	0	
6	Mpika	12	1	132,099
7	Nakonde	15	1	154,265
8	Shiwang'andu	7	0	
	Total	94	3	

Annex 9: Priority Areas for Multisectoral Interventions by Province – Northwestern

Figure 18: Map of PAMIS in Northwestern Province

Table 22: Proportion of Districts in Northwestern Province with PAMI wards

	Northwestern Province	No. District: 11	No. PAMI Districts: 4	Population
S/N	District	Total wards	identified PAMI wards	District Population
1	Chavuma	15	2	52,211
2	Solwezi	12	3	316,873
3	Ikelenge	10	0	
4	Mushindamo	8	1	62,212
5	Kalumbila	12	2	168,932
6	Mufumbwe	18	0	
7	Mwinilunga	21	0	
8	Zambezi	16	0	
9	Kabompo	17	0	
10	Kasempa	24	0	
11	Manyinga	14	0	
12	Total	167	8	

Annex 10: Priority Areas for Multisectoral Interventions by Province – Western

Table 23: Proportion of Districts in Western Province with PAMI wards

	Western Province	No. District: 11	No. PAMI Districts: 4	Population
S/N	District	Total wards	identified PAMI wards	District Population
1	Sioma	12	0	
2	kaoma	18	0	
3	Sesheke	10	0	
4	Nkeyema	8	0	
5	Senanga	14	0	
6	Nalolo	12	0	
7	Sikongo	14	0	
8	Shangombo	12	0	
9	Mulobezi	9	0	
10	Mongu	27	3	190,521
11	Mitete	13	0	
12	Lukulu	17	1	91,748
13	Luampa	12	0	
14	Limulunga	13	0	
15	Mwandi	12	0	
16	Kalabo	24	0	
	Total	227	4	

Annex 11: List of Contributors to the PAMI validation process

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Annex 12: Photos from the validation process and meetings with line ministries

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