GLOBAL TASK FORCE ON
CHOLERA CONTROL

Identification of Priority Areas

for Multisectoral Interventions (PAMIs)

for cholera control

User Guide

2023

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ABBREVIATIONS AND ACRONYMS

GIS	Geographic Information System
GTFCC	Global Taskforce on Cholera Control
IOM	International Organization for Migration
JMP	Joint Monitoring Programme
NCP	National Cholera Plan for control or elimination
NGO	Non-Governmental Organization
OCV	Oral Cholera Vaccine
PAMIs	Priority Areas for Multisectoral Interventions
PCR	Polymerase chain reaction
RDT	Rapid Diagnostic Test
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization

INTRODUCTION

This user guide complements the GTFCC Guidance document on the identification of priority areas for multisectoral interventions (PAMIs) for cholera control. It should be jointly used with this guidance document.

This user guide aims to provide national authorities with step-by-step guidance for the identification of PAMIs for cholera control using a GTFCC Excel-based tool which automates calculations. The intended users of this document are epidemiologists and data analysts involved in cholera surveillance and identification of PAMIs for cholera control.

This user guide is divided into three parts:

- The first part focuses on the **calculation of the cholera priority index**, including data collection and preparation as well as calculation of indicators, scores, and priority index.

- The second part describes the use of the **GTFCC Excel-based tool** which aims to automatize the calculation of the indicators, scores, and priority index.

- The third part illustrates the recommended use of the outcomes of the GTFCC Excel-based tool including **templates of tables and report**.

This user guide comes along with a template ("input dataset template") which shows how to structure the data to be imported into the GTFCC Excel-based tool. In addition, the users are provided with three training datasets to familiarize themself in the manipulation of the GTFCC Excel-based tool.

The GTFCC Excel-based tool used the spreadsheet software Microsoft Excel and works under Windows operating system only (i.e., macOS is not supported).

This user guide should be considered with the following resources:

- [GTFCC guidance document on the identification of priority areas for multisectoral interventions (PAMIs) for cholera control](#)

- [GTFCC Excel-based tool](#)

- [Template for preparing the data prior to import into the GTFCC Excel-based tool](#) (empty input dataset template)

- [Training dataset 1](#) – corresponding to a fictive situation where representativeness of cholera testing is acceptable

- [Training dataset 2](#) – corresponding to a fictive situation where representativeness of cholera testing is suboptimal

- [Training dataset 3](#) – corresponding to a fictive situation where representativeness of cholera testing is insufficient

PART I: STEP-BY-STEP CALCULATION OF THE CHOLERA PRIORITY INDEX

A. Data collection and preparation

It is recommended that national experts, involved in cholera surveillance, participate in the data collection and preparation given their expertise and knowledge of the country specific context.

Data collection shall cover the following information by NCP operational geographic unit for each year of the selected 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)
- 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.

Table 1 contains a set of **data preparation steps and quality checks** to be performed during the preparation of the data prior inputting into the GTFCC Excel-based tool.

Table 1: Data preparation check list

List of NCP operational geographic units
Variables: ■ names of geographic units ■ geographic identifier The list of geographic units can be obtained from the surveillance system as well as from the attribute table of the geographic information system file (e.g., shapefile) of NCP operational geographic units. ☐ Compare the list of names in the attribute table of the geographic information system file and in the surveillance dataset and correct names of geographic unit(s) and identifier as needed (e.g., disambiguate names of geographic units, remove duplicates, correct misspelling, etc.). A common unique **geographic identifier** which uniquely identifies each geographic unit should be available in the attribute table of the geographic information system file and in the surveillance dataset. This identifier is used as key to join the data table (containing indicators and index values) with the attribute table in a geographic information system software to create a map of priority index values by geographic units. It is not recommended to join data tables on name of the geographic units (i.e., potential encoding issues due to special characters in geographic unit names used as key for the join which would prevent accurate database joint). A unique GIS Place Code (e.g., P-code) might already be available for this purpose and can be used if it uniquely identifies each NCP operational geographic unit. If not, a new unique geographic identifier should be created (e.g., using the concatenation of: "the three first letters of first administrative level", "_", "the three first letters of the second administrative level", "_", and "a three-digits number based on alphabetical rank of the name of the second administrative level").

☐ Check for changes in the geometries of the NCP operational geographic units over the analysis period, notably looking for any differences in numbers or geometry shapes (e.g., major boundary modification, fusion of two geographic units, split of a large geographic unit into smaller units, etc.). If such changes occurred, it is essential to:

- document these differences as they could modify the population and surveillance data used in the calculation of epidemiologic indicators (i.e., change in population as denominator would impact the incidence or mortality values),
- adapt the geographic information system file and surveillance database contents to ensure consistency of the geographic units over the analysis period.

In the end, the number and the geometries of NCP operational geographic units should be comparable over the analysis period.

Population data by NCP operational geographic unit

Variable:

- yearly estimated population by NCP operational geographic unit

Population estimates are often based on extrapolation from the most recent population census.

☐ It is essential to verify the calculation of annual population estimates. To do so, apply on the latest census data the estimated annual population growth over the analysis period and perform a comparison against population data used in disease surveillance.

☐ Check unexpected major variations in population estimates between the different population data sources (for each NCP operational geographic unit and year) and correct population estimates as needed. Note that variation of estimated population in a specific unit could be explained by an acute event (e.g., population displacement due conflict or natural disasters, new update of census, etc.). Any major variations should be documented.

Surveillance data

Variables:

- number of cholera cases (suspected or tested positive) per year
- number of cholera deaths (suspected or tested positive) per year
- 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, gather basic information on the cholera surveillance system (i.e., cholera surveillance framework, case definition, surveillance data flow from local level to central level, performance indicators of cholera disease surveillance). This information is valuable to interpret the epidemiologic indicators.

☐ To allow a comprehensive data coverage, years with zero reported cholera cases/deaths should be included in the dataset (so-called "zero reporting" feature). The number of cases and deaths should be available for all years over the analysis period (without missing years) and for all NCP operational geographic units. If data points are missing, a check should be performed with the surveillance focal point to differentiate actively reported zero case versus non-reporting. If data are missing over the analysis period for some NCP operational geographic units, these values should be recorded in the dataset as "empty cell" and not zero (see more information in the user guide section on how to report missing value in the data entry template for the tool).

☐ Verify that the number of deaths is not above the number of cases by year and NCP operational geographic unit. If such an issue is identified, review the data with national surveillance expert(s).

☐ Verify 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 is reported for a given year in an NCP operational geographic unit.

Cholera test positivity data

Variables:

- number of weeks with at least one suspected cholera case tested for cholera over the analysis period
- number of suspected cholera cases tested for cholera over the analysis period
- number of suspected cholera cases tested positive for cholera over the analysis period
- number of years with case(s) tested positive.

☐ Gather general information on the cholera testing strategy valuable to interpret the test positivity indicators:

- identify focal point contact(s) at the national reference laboratory for cholera;
- describe the workflow of data exchange between laboratories in charge of cholera testing and the cholera surveillance system;
- collect the protocol for microbiological confirmation in the reference laboratory(ies), secondary level laboratories and under the field condition settings;
- describe the use of rapid diagnostic test (RDT) in the field (type of RDT, protocol of use and information on the test performance under field conditions, process of recording RDT result in line list, etc.).

☐ All testing methods are considered equally in the calculation of the test positivity indicators. Data to calculate the test positivity indicators can be obtained from case-based line-lists with both RDT information (RDT performed: yes/no; RDT result: positive/negative) and other laboratory methods results (check variables of interest in case-based line list to retrieve the relevant data: laboratory confirmation: yes/no; method of laboratory confirmation: culture/Polymerase chain reaction/…; laboratory confirmation result: positive/negative).

☐ For example, if RDTs are performed, the number of samples tested and the number of cases tested positive by RDT should be included in the test positivity indicator.

☐ Ensure that numerator and denominator of the positivity rate are correctly compiled:

- the numerator corresponds to the number of reported suspected cholera cases **tested positive regardless of the testing method** used over the analysis period (RDT and/or other laboratory methods).
- the denominator corresponds to the **number of reported suspected cholera cases tested** for cholera over the analysis period.
- If multiple testing methods are used (or multiple samples are tested) for a given suspected case, the corresponding suspected case should be considered only once in the calculation of this indicator (numerator and denominator). This should be supported using a unique patient identifier linking epidemiologic data and test results as part of routine cholera surveillance.

Vulnerability factors

Annex I of the [Guidance Document for Identification of priority areas for multisectoral interventions for cholera control](#) presents an indicative list of vulnerability factors to be considered at the stakeholder validation step (optional vulnerability assessment in Step 3).

For each vulnerability factor, possible data sources and indicative quality checks are proposed below and should be adapted to country and data sources specificities.

If information about a vulnerability factor is already available for all NCP operational geographic units, it is advisable to include it in the input dataset to be imported into the GTFCC Excel-based tool. Otherwise, relevant information on vulnerability factors can be collected only for the NCP operational geographic units undergoing the second step of PAMIs identification.

Location adjacent to cross-border cholera-affected areas or identified PAMIs

☐ This indicator aims to consider the probability of introduction of cholera cases in an NCP operational geographic unit from adjacent units in other countries.

☐ To accurately identify cross-border units located in the vicinity of cholera affected areas, it is recommended to use a geographic information system software to map the cross-border NCP operational geographic units bordering cholera-affected areas and/or PAMIs in bordering country(ies).

Examples of data sources:

- Databases from relevant health-related ministries in neighboring countries: historical cholera data at first/second administrative level for at least the last 5 years
- Outbreak investigation reports in cross-border areas
- National Cholera Plan and PAMIs classification in neighboring countries

Location along major travel routes with transportation hubs

☐ This indicator aims to consider the probability of introduction of cholera cases in an NCP operational geographic unit from geographical units connected along major transportation network.

☐ To accurately identify NCP operational geographic units located along major travel routes, it is recommended to use a geographic information system software to map transportation networks and travel routes. Transportation networks to be considered should cover primary roads, railways, and major waterways (e.g., navigable river/lakes/sea).

☐ The definition of major travel routes should be adapted according to the national context (e.g., transportation infrastructure, population density, pattern of population movement). More detailed criteria could be used to define this indicator, for example "at least one city > 200,000 pop. located on three or more main transportation pathways (primary road or navigable river)".

☐ Ensure that the definition is applied consistently across all NCP operational geographic units.

Examples of data sources:

- Geographic information files of transportation networks from relevant ministries
- Information from actors involved in logistic clusters (World Food Programme, United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Non-governmental organizations (NGOs) or Governmental Organizations)

Major population gatherings

☐   This indicator aims to assess the probability of cholera introduction into unaffected locations. It is recommended to assess this factor in conjunction with the expected WASH service levels during gathering and origin of gathering attendees (potentially travelling from cholera-affected areas from within the country or neighboring countries).

☐   Population gatherings to be considered should be of a significant size (e.g., religious or pilgrimage gatherings, large-scale seasonal marketplaces/animal markets, important seasonal nomadic/pastoralist population gatherings or occupational-related population movement and gatherings). Local population gathering of limited size (such as local weekly market) should not be considered under this variable.

☐   The definition and size of such population gatherings should be defined according to country specificities and applied consistently across all NCP operational geographic units.

Examples of data sources:

- Databases from relevant ministries and actors involved in the WASH sectors targeting these population gatherings (UNICEF, NGOs)

Areas with high population density or overcrowded settings (e.g., urban slums, refugees/IDP camps)

☐   Document location(s) with high population density in rural and urban areas or specific overcrowded settings (e.g., urban slums, refugees/IDP camps). When available, compare the local specific population estimates against the population size in the NCP operational geographic units of interest. A geographic unit with a significant percentage population leaving in high population density or overcrowded settings should be considered during the multistakeholder review (indicative threshold > 10%).

☐   It is recommended to assess this factor in conjunction with the following factors: access to water, access to sanitation, access to hygiene. In the absence of good WASH service levels, high population density/overcrowded settings may play a role in the expansion of cholera transmission.

Examples of data sources:

- Database from relevant ministries (e.g., town planning, land use planning, agriculture),
- High spatial resolution on human population distributions (e.g., Gridded Population of the World, Version 4 (GPWv4), WorldPop)
- International Organization for Migration (IOM): national office reports/surveys, databases on displacement monitoring and population mobility such as Displacement Tracking Matrix
- United Nations High Commissioner for Refugees (UNHCR): national office reports/surveys, operational database covering the number of refugees, asylum-seekers, internally displaced and stateless people

Areas with high-risk populations (e.g., seasonal workers/fishermen/miners in informal settlements)

☐   It is recommended to assess this factor in conjunction with the following factors: access to water, access to sanitation, access to hygiene. In the absence of good WASH service levels, such populations are known to be at risk of cholera transmission.

☐   When available, compare the local population estimates to the high-risk population size in the NCP operational geographic units of interest. A geographic unit with a significant percentage high-risk population should be considered during the stakeholder validation (indicative threshold > 10%).

Examples of data sources:

- Database from relevant ministries (e.g., town planning, land use planning, agriculture)
- Monitoring data on WASH service at household, school, and health center levels (e.g., UNICEF Multiple Indicator Cluster Surveys, WHO/UNICEF Joint Monitoring Program)

Hard-to-access populations

☐   A hard-to-access population is a population living in an area that is not regularly accessible to health and humanitarian actors for the purpose of sustained health services. Cholera outbreaks in such areas could challenge the capacity of surveillance and public health response.

☐   Such populations can be found under the following conditions: natural or human-made physical characteristics (terrain or limited transportation infrastructure) or social, political, or cultural factors (insecurity, conflict, borders and other regulatory barriers).

☐   The definition should be adapted according to the national context. Such information should be collected and presented during the stakeholder validation step.

Examples of data sources:

- Databases from relevant ministries
- Information from actors involved in logistics and shelter clusters

Population received oral cholera vaccine more than three years ago (two-doses campaign with a coverage for both round >70%)

☐   This indicator aims to identify NCP operational geographic units with a local population having been recently vaccinated over the past decade. Recent vaccination may indicate areas with previous cholera outbreaks or previously identified as a PAMI. The oral cholera vaccine (OCV) campaigns provided the population with short-term immunity to reduce the number of cases and deaths attributable to cholera in the years following its implementation.

☐   Collect information on OCV campaigns (type of campaign, date of vaccination campaigns, target population size and final coverage). The size of targeted population by OCV campaign should be compared to the local population estimates to perform a consistency check of the population coverage estimates supplied.

☐   While OCV campaign were implemented, it is reasonable to assume that local cholera vulnerability factors existed and might have been targeted by multisectoral interventions following vaccination campaigns. It is recommended to assess this factor in conjunction with the following factors: access to water, access to sanitation, and access to hygiene. WASH (Water, Sanitation and Hygiene) service level indicators can vary across countries. It is recommended to compare several indicators for each item when possible. Definition of each indicator and the data collection process (date of survey, type of survey, methods, population coverage …) should be documented.

Examples of data sources:

- National public health authorities for information on previous OCV campaigns
- National entities and actors involved in the WASH sectors (WASH activities implemented since the last OCV campaign)
- Monitoring data on WASH service at household, school, and health center levels (e.g., UNICEF Multiple Indicator Cluster Surveys, WHO/UNICEF Joint Monitoring Program),
- National WASH household surveys
- National database on WASH access levels and practices from relevant ministries and WASH sector operators

Areas at high-risk for extreme climate and weather conditions (e.g., heavy rains, floods, droughts)

☐ During extreme weather conditions, cholera transmission may increase and the ability of the public health response to control outbreaks may be significantly reduced.

☐ The definition should be adapted according to the national knowledge on major and recurrent natural disasters (e.g., heavy rains, floods, and droughts). Such information should be collected in collaboration with relevant national services involved in prevention and response to natural disasters (e.g., Civile Protection).

☐ Conduct a brief assessment of the size of the population at risk. Note that the national capabilities of response during/after a natural disaster to prevent interruption of WASH services should be evaluated.

☐ Only NCP operational geographic units with a significant part of the population at risk should be considered (indicative threshold > 10%).

Examples of data sources:

- Databases from relevant ministries, national Red Cross, and Civile Protection departments
- Information from actors involved in prevention of and response to natural disasters

Complex humanitarian emergencies

☐ According to the United Nations High Commissioner for Refugees (UNHCR), "*A complex emergency can be defined as a humanitarian crisis in a country, region or society where there is a total or considerable breakdown of authority resulting from internal or external conflict, and which requires an international response that goes beyond the mandate or capacity of any single agency and/or the ongoing UN country program.*" Such areas are prone to health emergencies, including infectious disease epidemics due to sub-optimal epidemiologic surveillance and limited response capabilities.

Examples of data sources:

- United Nations High Commissioner for Refugees (UNHCR)
- United Nations Office for the Coordination of Humanitarian Affairs (OCHA)

Areas with more than 30% of the population with access to unimproved water facility type

☐ A high proportion of the population using unimproved water facility type may increase the vulnerability to cholera transmission especially when existing in conjunction with other vulnerability factors.

☐ The access to unimproved water facility type is defined according to the JMP service ladder for drinking water.

☐ It corresponds to sum of the percentage of population using **unimproved water source** (JMP drinking water ladder category: "Unimproved") and the percentage of population using **surface water** (JMP drinking water ladder category: "Surface water").

Examples of data sources:

- Monitoring data on WASH service at household, school, and health center levels (e.g., UNICEF Multiple Indicator Cluster Surveys, WHO/UNICEF Joint Monitoring Program: JMP service ladder for drinking water)
- National WASH household surveys
- National database on WASH access levels and practices from relevant ministries and WASH sector operators

Areas with more than 50% of the population with access to unimproved sanitation facility type

☐   A high proportion of the population using unimproved sanitation facility type may increase the vulnerability to cholera transmission especially when existing in conjunction with other vulnerability factors.

☐   The access to unimproved sanitation facility type is defined according to the JMP service ladder for sanitation.

☐   It corresponds to sum of the percentage of population using unimproved sanitation facilities (JMP sanitation ladder category: "Unimproved") and the percentage of population practicing open defecation (JMP sanitation ladder category: "Open defecation").

Examples of data sources:

- Monitoring data on WASH service at household, school, and health center levels (e.g., UNICEF Multiple Indicator Cluster Surveys, WHO/UNICEF Joint Monitoring Program: JMP service ladder for sanitation)
- National WASH household surveys
- National database on WASH access levels and practices from relevant ministries and WASH sector operators

Areas with more than 50% of the population with no handwashing facility on premises

☐   A high proportion of the population without handwashing facilities (no soap and no water at home) may increase the vulnerability to cholera transmission especially when existing in conjunction with other vulnerability factors.

☐   No handwashing facility on premises type corresponds to the percentage of population with no handwashing facility on premises (JMP hygiene ladder category: "No facility").

Examples of data sources:

- Monitoring data on WASH service at household, school, and health center levels (e.g., UNICEF Multiple Indicator Cluster Surveys, WHO/UNICEF Joint Monitoring Program: JMP hygiene ladder)
- National WASH household surveys
- National database on WASH access levels and practices from relevant ministries and WASH sector operators

B. Indicator calculation and quality check

Table 2 presents the indicators for the calculation of the priority index. These calculations are automated in the GTFCC Excel-based tool (see Part II of this user guide).

Table 2: Priority index indicators

Incidence	
Definition	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 NCP operational geographic unit over the analysis period by ▪ the cumulative person-time the population at risk (i.e., the sum of the annual population over the analysis period of n years), then the ratio is multiplied by 100,000. This indicator is the number of cholera cases per 100,000 person-years over the analysis period (unit: 100,000 pers. y^{-1}).
Example of Excel-based calculation	= ROUND((SUM(num. cases year 1, num. cases year 2, … num. cases year n)*100000) / SUM(population year 1, population year 2, … population year n),2)
Mortality	
Definition	Cholera mortality rate in an NCP operational geographic unit is calculated by dividing: ▪ the total number of deaths attributed to cholera reported in the NCP operational geographic unit over the analysis period by ▪ the cumulative person-time (i.e., the sum of the annual population over the analysis period of n years), then the ratio is multiplied by 100,000. This indicator is the number of deaths attributed to cholera (suspected or tested positive (regardless of the testing method) per 100,000 person-years over the analysis period (unit: 100,000 pers. y^{-1}).
Example of Excel-based calculation	= ROUND((SUM(num. deaths year 1, num. deaths year 2, … num. deaths year n)*100000) / SUM(population year 1 , population year 2 , … population year n),2)

Persistence	
Definition	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, then the ratio is multiplied by 100. This indicator is the percentage of weeks with at least one reported suspected cholera case in the NCP operational geographic unit over the analysis period (unit: percentage).
Quality check	☐ Check for leap year(s) with 53 weeks over the analysis period. If needed, adjust the total of week over the analysis period accordingly (see variable **n_w_period** corresponding to the denominator of the persistence indicator in the data entry template).
Example of Excel-based calculation	= ROUND((SUM(num. weeks reporting >= 1 case year 1, num. weeks reporting >= 1 case year 2, … num. weeks reporting >= 1 case year n)*100) / SUM(total week year 1, total week year 2, … total week year n),1)

Weekly testing coverage	
Definition	The weekly testing coverage for cholera in an NCP operational geographic unit is calculated by dividing: ▪ the number of weeks with at least one reported suspected cholera case tested for cholera (regardless of the testing method) over the analysis period by ▪ the number of weeks with at least one reported suspected cholera case over the analysis period, then the ratio is multiplied by 100. This indicator corresponds to the percentage of weeks with at least one suspected case tested for cholera (regardless of the testing method) among weeks with at least one case reported (unit: percentage). Note the denominator of this indicator is the numerator of the persistence indicator.
Quality check	☐ Check if information on weekly testing is available for all NCP operational geographic units consistently over the analysis period. If this information is not available, test positivity indicators cannot be included in the calculation of the priority index. ☐ Check variation of testing strategy (e.g., supply interruption of RDT) which could bias comparability of testing strategies across NCP operational geographic units.
Example of Excel-based calculation	= ROUND((SUM(num. weeks suspected case tested year 1, num. weeks suspected case tested year 2, … num. weeks suspected case tested year n)*100) / SUM(num. weeks reporting >= 1 case year 1, num. weeks reporting >= 1 case year 2, … num. weeks reporting >= 1 case year n) ,1)

Positivity rate	
Definition	The positivity rate in an NCP operational geographic unit is calculated by dividing: ▪ the number of reported suspected cholera cases tested positive for cholera over the analysis period (regardless of the testing method) by ▪ the number of reported suspected cholera cases tested for cholera over the analysis period (regardless of the testing method). This indicator is the cholera positivity rate in the NCP operational geographic unit over the analysis period (unit: percentage).
Quality check	☐ Check if capabilities for testing were constant over time across NCP operational geographic units. ☐ Verify that the test positivity indicators correspond to case-based data and not total of samples tested at laboratory premises (one suspected case could have been tested multiple times, or by different methods).
Example of Excel-based calculation	= ROUND((SUM(num. suspected case tested positive year 1, num. weeks suspected case tested positive year 2, … num. weeks suspected case tested positive year n)*100) / SUM(num. suspected case tested year 1, num. suspected case tested year 2, … num. suspected case tested year n),1)

Number of years with case(s) tested positive	
Definition	This indicator is the number of years with at least one case tested positive for cholera (regardless of the testing method) reported in the NCP operational geographic unit over the analysis period (unit: number of years).
Example of Excel-based calculation	= COUNTIF("sum of case tested positive Year 1" : "sum of case tested positive Year n", ">0")

C. Scoring of indicators and calculation of priority index

▪ Scoring of epidemiologic indicators

Epidemiologic indicators (i.e., incidence, mortality, persistence) are 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 is attributed to each geographic unit for each epidemiologic indicator (**Table 3**).

Table 3: Scoring of epidemiologic indicators

Epidemiologic indicator	Score			
	0 point	**1 point**	**2 points**	**3 points**
Incidence*	No case	> 0 and < median	≥ median and < 80th percentile	≥ 80th percentile
Mortality**	No death	> 0 and < median	≥ median and < 80th percentile	≥ 80th percentile
Persistence*	No case	> 0 and < median	≥ median and < 80th percentile	≥ 80th percentile

* Calculated out NCP operational geographic units where at least one cholera case was reported over the analysis period

** Calculated out NCP operational geographic units where at least one cholera death was reported over the analysis period

▪ Illustration of incidence score calculation

An example of scoring of incidence indicator using a fictive set of 60 NCP operational geographic units is illustrated below in Figure 1.

Importantly, the distribution thresholds (median and 80th percentile) must be calculated out of the NCP operational geographic units **where at least one cholera case** (suspected or tested positive) was reported over the analysis period.

The same principle applies for score calculation of mortality and persistence indicators.

The thresholds and the scores of epidemiologic indicators are automatically calculated in the GTFCC Excel-based tool (see **Part II: User guide for the GTFCC Excel-based tool**).

Figure 1: Example of score calculation for the incidence indicator

Incidence			
50th percentile (mediane) =		4.54	
80th percentile =		15.32	

Geographic units	Numeric values (100,000 pers.y-1)	Rank	Score (num. of points)
health_unit_7887	22.6	50	3
health_unit_4547	22.5	49	3
health_unit_9542	21.8	48	3
health_unit_7425	21.7	47	3
health_unit_7344	20.0	46	3
health_unit_9382	18.5	45	3
health_unit_9167	17.4	44	3
health_unit_9575	17.3	43	3
health_unit_6237	15.6	42	3
health_unit_3431	15.4	41	3
health_unit_1886	15.1	40	2
health_unit_6798	15.1	39	2
health_unit_6393	13.0	38	2
health_unit_7948	11.9	37	2
health_unit_6986	9.4	36	2
health_unit_8655	8.3	35	2
health_unit_9557	8.3	34	2
health_unit_6767	7.8	33	2
health_unit_5187	7.6	32	2
health_unit_8172	7.4	31	2
health_unit_8942	7.3	30	2
health_unit_4452	6.8	29	2
health_unit_9975	6.5	28	2
health_unit_8693	6.2	27	2
health_unit_1446	4.6	26	2
health_unit_8848	4.5	25	1
health_unit_6337	4.1	24	1
health_unit_4461	4.1	23	1
health_unit_4717	4.0	22	1
health_unit_4235	3.8	21	1
health_unit_7188	3.8	20	1
health_unit_1847	3.2	19	1
health_unit_2784	3.1	18	1
health_unit_2626	1.0	17	1
health_unit_7268	1.0	16	1
health_unit_3414	0.9	15	1
health_unit_2936	0.9	14	1
health_unit_1983	0.9	13	1
health_unit_8259	0.4	12	1
health_unit_9847	0.4	11	1
health_unit_1896	0.4	10	1
health_unit_2416	0.3	9	1
health_unit_3438	0.3	8	1
health_unit_7222	0.3	7	1
health_unit_3671	0.2	6	1
health_unit_5834	0.2	5	1
health_unit_2341	0.2	4	1
health_unit_4582	0.2	3	1
health_unit_3199	0.1	2	1
health_unit_8476	0.1	1	1
health_unit_1179	0.0	NA	0
health_unit_2296	0.0	NA	0
health_unit_2769	0.0	NA	0
health_unit_4239	0.0	NA	0
health_unit_4748	0.0	NA	0
health_unit_5744	0.0	NA	0
health_unit_6231	0.0	NA	0
health_unit_6667	0.0	NA	0
health_unit_6898	0.0	NA	0
health_unit_8167	0.0	NA	0

Rank 41-50: NCP operational geographic units with incidence between 80th percentile and maximum

➜ 3 points

Rank 26- 40: NCP operational geographic units with incidence between median and 80th percentile

➜ 2 points

Rank 1-25: NCP operational geographic units with incidence below the median and with at least one case reported

➜ 1 points

No case reported

➜ 0 point

- This figure above illustrates the calculation for the incidence score among a fictive set of sixty NCP operational geographic units.
- In ten NCP operational geographic units no case was reported over the analysis period (at the bottom of the figure, marked with NA, not applicable).
- The remaining fifty NCP operational geographic units reported at least one case. The distribution thresholds are calculated upon these fifty NCP operational geographic units where at least one case was reported.
- Among these fifty health zones the median value corresponds to the middle number in ascending sorted value of incidence (position 25) and the 80th percentile is the smallest value that is at least as large as 80% of geographical units, that is, four-fifths of fifty elements.

▪ **Scoring of cholera test positivity indicators**

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 indicator. If the representativeness of testing is determined to be insufficient, test positivity indicators must be excluded altogether.

The assessment of the representativeness of testing relies on the weekly testing coverage indicator as described in Figure 2. This assessment of the weekly testing coverage and calculation of the suitable test positivity indicator are automated in the GTFCC Excel-based tool (see **Part II: User guide for the GTFCC Excel-based tool**).

Figure 2: Assessment of weekly testing coverage
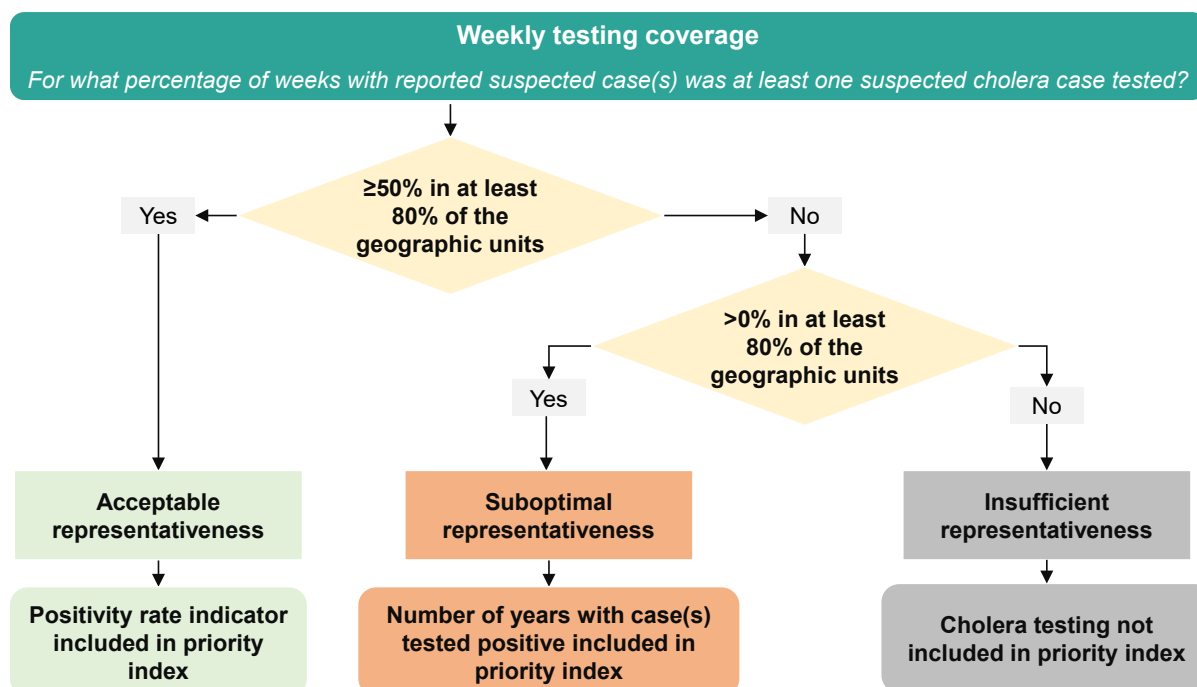
If the representativeness of cholera testing is **acceptable**, the positivity rate is used as the cholera test positivity indicator (**Figure 2**). The positivity rate is scored in four classes as described in **Table 4** and a positivity rate score ranging from 0 to 3 points is attributed to each NCP 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 (**Figure 2**). The number of years with case(s) tested positive is scored in three classes as described in **Table 4** and a score ranging from 0 to 2 points is attributed to each 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 (**Figure 2**). Only three indicators will then be used to calculate the priority index (i.e., incidence, mortality, and persistence) and reinforcement of routine testing for cholera shall be planned in the NCP with high priority.

Table 4: Scoring of cholera test positivity indicators

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

▪ **Calculation of priority index**

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

Priority index = incidence score + mortality score + persistence score +

cholera test positivity score (if applicable)

PART II: USER GUIDE FOR THE GTFCC EXCEL-BASED TOOL

A. Preparation of the surveillance data table

▪ **General recommendations**

Prior to importing data into the GTFCC Excel-based tool, the surveillance data should be prepared according to naming conventions rules and data quality verification described below.

The main prerequisite is to prepare the list of NCP operational geographic units together with their corresponding unique **geographic identifier**. This list should contain all NCP operational geographic units in the country (i.e., regardless of whether cholera cases were reported over the analysis period or not).

▪ **Naming convention rules**

> To allow for automatic indicator calculation in the GTFCC Excel-based tool, a **naming convention** needs to be **strictly applied on column headers of the input dataset** as follow:
>
> . column names should not include white space
> . column names should be unique
> . a unique geographic identifier should be included under the **unique_id** variable
> . strictly follow the **variables naming convention** and variable type defined in the **Table 5**.

The training datasets provide practical illustrations of the use of the naming convention rules (training dataset 1, training dataset 2 and training dataset 3).

In addition, it is strongly recommended to use the input dataset template. This template covers an analysis period of five years (2017-2021) and can be adapted to a different analysis period by adding/removing columns of the corresponding years for each variable.

Table 5: Naming convention rules for the headers of the input dataset

Variables	Type	Variables naming convention		
		Prefix	**Time stamp**	**Example (2017 year)**
Unique geographic identifier	Text	**unique_id**	NA	unique_id
First administrative level unit names	Text	**admin_1**	NA	admin_1
Second administrative level unit names	Text	**admin_2**	NA	admin_2
Estimated population for each year	Numeric	**pop_**	y_"YYYY"	pop_y_2017
Number of reported cholera cases (suspected or tested positive)	Numeric	**c_**	y_"YYYY"	c_y_2017
Number of reported cholera deaths	Numeric	**d_**	y_"YYYY"	d_y_2017
Number of reported suspected cholera cases tested for cholera (regardless of the testing method)	Numeric	**tot_test_**	y_"YYYY"	tot_tested_y_2017
Number of reported suspected cholera cases tested positive for cholera (regardless of the testing method)	Numeric	**tot_tested_pos_**	y_"YYYY"	tot_tested_pos_y_2017
Total number of weeks over the analysis period	Numeric	**n_w_period**	NA	n_w_period
Number of weeks with at least one reported cholera case (suspected or tested positive)	Numeric	**n_w_**	y_"YYYY"	n_w_y_2017
Number of weeks with at least one reported suspected cholera case tested for cholera (regardless of the testing method)	Numeric	**n_w_test_**	y_"YYYY"	n_w_test_y_2017
Location adjacent to cross-border cholera-affected areas or identified PAMIs	Text (Yes/No)	**VF_01_prox_chol**	NA	Idem Prefix value
Location along major travel routes with transportation hubs	Text (Yes/No)	**VF_02_maj_pathw**	NA	Idem Prefix value
Major population gatherings	Text (Yes/No)	**VF_03_pop_gathering**	NA	Idem Prefix value
Areas with high population density or overcrowded settings	Text (Yes/No)	**VF_04_overcrowd_sett**	NA	Idem Prefix value
Areas with high-risk populations	Text (Yes/No)	**VF_05_spec_risk_pop**	NA	Idem Prefix value
Hard-to-access populations	Text (Yes/No)	**VF_06_remote_unit**	NA	Idem Prefix value
Population received oral cholera vaccine more than three years ago	Text (Yes/No)	**VF_07_vacc_sup_3yrs**	NA	Idem Prefix value
Areas at high-risk for extreme climate and weather conditions	Text (Yes/No)	**VF_08_acute_emerg**	NA	Idem Prefix value
Complex humanitarian emergencies	Text (Yes/No)	**VF_09_complex_emerg**	NA	Idem Prefix value
Areas with more than 30% of the population with access to unimproved water facility type	Text (Yes/No)	**VF_10_WASH_ind_water**	NA	Idem Prefix value
Areas with more than 50% of the population with access to unimproved sanitation facility type	Text (Yes/No)	**VF_11_WASH_ind_sanitation**	NA	Idem Prefix value
Areas with more than 50% of the population with no handwashing facility on premises	Text (Yes/No)	**VF_12_WASH_ind_hygiene**	NA	Idem Prefix value

Note. NA: not applicable.

▪ **Input dataset quality checklist**

Figure 3 provides a checklist of verifications to be performed on the input dataset.

Figure 3: Checklist of the input dataset into the GTFCC Excel-based tool

☐ **Check for any duplicates** in the **unique_id** variable and NCP operational geographic unit names. If duplicates exist, correct accordingly.

☐ **Check the format of each variable** (see Table 5). Round estimated population values to remove the digits after the decimal point if data are derived from population growth rate applied on population census.

☐ **Perform a quality check of the population data to identify any outliers**. A sharp increase/decrease in population numbers from one year to another within the same NCP operational geographic unit should draw attention and lead to search for underlying explanations (new population arriving or leaving the geographic units, error in growth rate calculation …).

☐ **Compare cholera cases and deaths numbers by NCP operational geographic unit and years**. The number of deaths should be equal or below the number of cases. To perform this verification, subtract the number of deaths from the number of cases and highlight values to be corrected (below zero) using the conditional formatting feature in Excel.

☐ **Compare the numbers of reported suspected cases and the numbers of cases tested positive for cholera** (regardless of the testing method): the number of cases tested positive should be equal or below the number of suspected cases. If this is not the case, check if some cases reported through the surveillance system are missing or if multiple samples from the same patient were included in the tested positive case counts.

☐ **Compare the numbers of reported tested cases and the numbers of cases tested positive** (regardless of the testing method): the number of cases tested positive should be equal or below the number of tested cases. In case of discrepancy, refer to the laboratory surveillance focal point to help to correct errors.

☐ **Check for consistency between the number of cases and the number of weeks with at least one reported case** by NCP operational geographic unit and year. Each record with at least one week with reported cases should have at least one reported case during the corresponding year and vice-versa.

☐ **Check the maximum values of weeks with at least one case reported**. Use the conditional formatting feature to highlight values strictly above 52.

☐ **Identify leap year over the analysis period** and adjust the exact number of weeks over the analysis period (column: **n_w_period** used as the denominator of persistence indicator).

☐ **Check for consistency between the number of weeks with at least one reported case and the number of weeks with at least one tested case** by NCP operational geographic unit and year. Each record with at least one week of cases tested should have at least one week with at least one case reported during the corresponding year.

☐ **Check missing values**. In case of missing values, they must be reported as **empty cell** in the GTFCC Excel-based tool. General principles for the management of missing data are presented in the next section on the management of missing 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**.

To limit bias, it is preferable that data is available for all NCP operational geographic units over the analysis period.

If data are missing for some NCP operational geographic units and/or for some time periods, first, a check should be performed with the surveillance focal point(s) to differentiate the active reporting of zero values from missing reports and to retrieve missing reports to the greatest extent possible.

If missing data remain, the following principles should be considered:

- if for a given year, data are missing for a **significant number of NCP operational geographic units and more than one indicator**, it is recommended to exclude the corresponding year from the calculation of the cholera priority index;

- if for a given year, data are missing for a **significant number of NCP operational geographic units and one indicator**, it is recommended to exclude the corresponding year from the calculation of the indicator score. Other indicators should be calculated for the full analysis period;

- if for a given year or multiple years, data are missing for a **limited number of NCP operational geographic units**, it is recommended to exclude the corresponding units from the calculation of the cholera priority index (Step 2). Such unit(s) shall be further assessed at the stakeholder validation combining available indicators and the presence of vulnerability factors (Step 3);

- if data are missing for a **significant number of years**, it is recommended to assess the availability of any alternative data source(s) and to reconsider the selected analysis period as needed (Step 1); if the issue remains, the best course of actions should be determined on an *ad hoc* basis;

- measures to improve the comprehensiveness of routine reporting and recording of cholera surveillance data (epidemiological data and testing data) should be planned in the NCP.

▪ **Data input template**

To ease the data preparation into the input dataset template file, validation rules are illustrated in **Figure 4** and corresponds to:
- mandatory numeric values for numeric data
- mandatory dropdown list for additional factor entry (**empty cell**, **Yes** or **No**).

Figure 4: Input dataset template – illustration of validation features
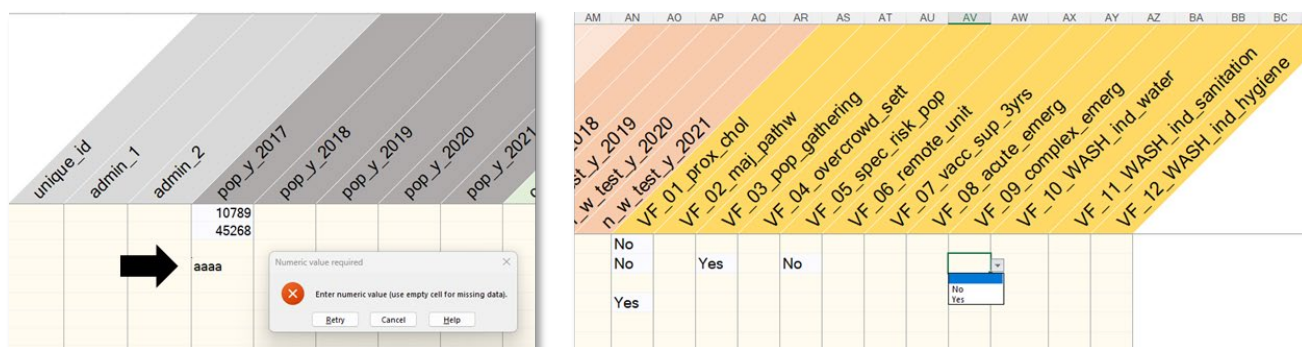
B. Priority index calculator in the GTFCC Excel-based tool

▪ **Training datasets**

Hereafter, the use of the GTFCC Excel-based tool for the calculation of the priority index is illustrated using training datasets which consist of 100 geographic units and of a five-year analysis period. These datasets are available for the users to familiarize themselves with the manipulation of the GTFCC Excel-based tool.

Three training datasets are proposed:
- Training dataset 1 corresponding to a fictive situation where representativeness of cholera testing is acceptable;
- Training dataset 2 corresponding to a fictive situation where representativeness of cholera testing is suboptimal;
- Training dataset 3 corresponding to a fictive situation where representativeness of cholera testing is insufficient.

These fictive datasets contain the following information by NCP operational geographic unit for each year:
- estimated population
- number of cholera cases (suspected or tested positive)
- number of cholera deaths
- number of suspected cases tested for cholera
- number of cases tested positive (regardless of the testing method)
- 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 (regardless of the testing method)
- vulnerability factors

- **Overview of the GTFCC Excel-based tool**

The **Figure 5** below presents an outline of the sheets of the GTFCC Excel-based tool.

Figure 5: Overview of the GTFCC Excel-based tool

▪ **Step-by-step user guide**

This section guides the user through these steps using the training dataset. To compute the priority index, the major steps are the following:

- ▪ **Import** the input dataset prepared in accordance with the nomenclature described in Table 5 into the GTFCC Excel-based tool

- ▪ **Compute** automatically the derived indicators, the testing representativeness, and the priority index for all NCP operational geographic units

- ▪ **Consult** the results and summary tables

- ▪ **Export** the indicators and priority index values

#	Actions
1	**Open the GTFCC Excel-based tool**
	. Open the file GTFCC Excel-based tool. Depending on the computer settings, a warning message may appear: The user should click on the **Enable editing** button and select the sheet: "**-> Data input table**"
2	**Open the input dataset**
	. In this example using the training dataset, open the file Training dataset 1 and select the sheet "**Data**"
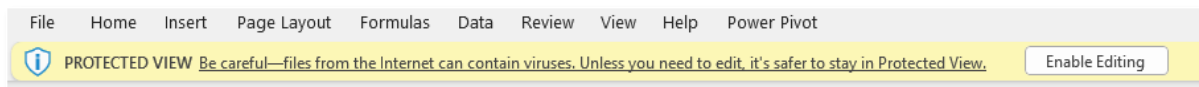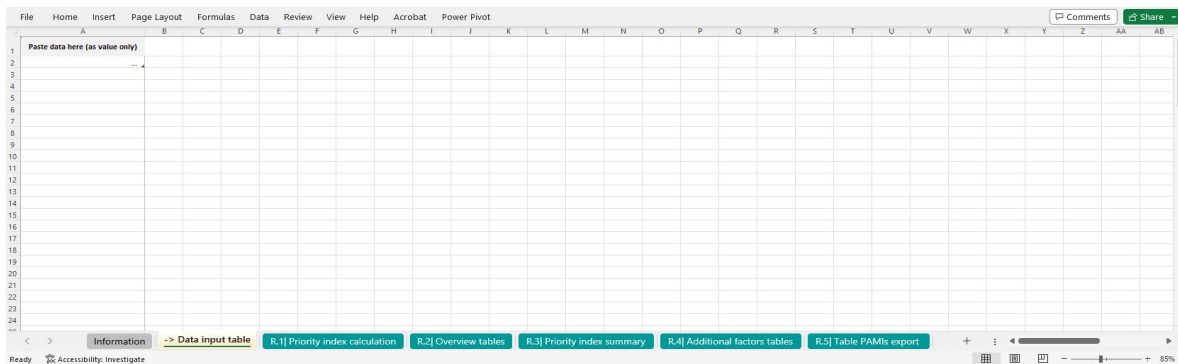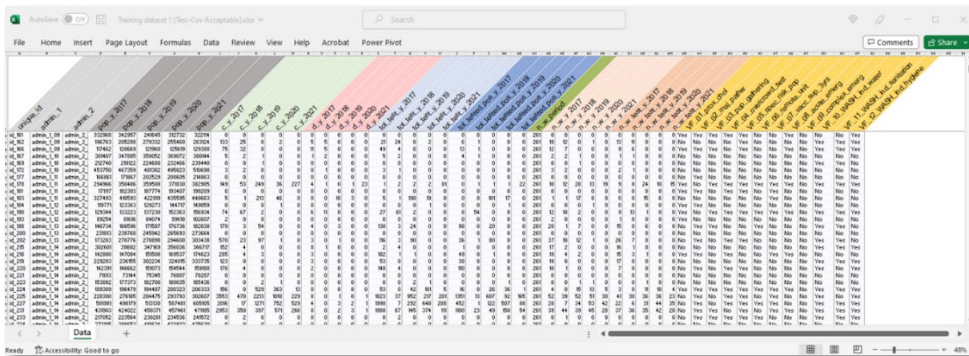
3 | **Import the input dataset into the GTFCC Excel-based tool**

. Select the entire input dataset range **including column headers** clicking on the cell on the upper left corner (cell A1) and selecting all data range pressing **CTRL + A**
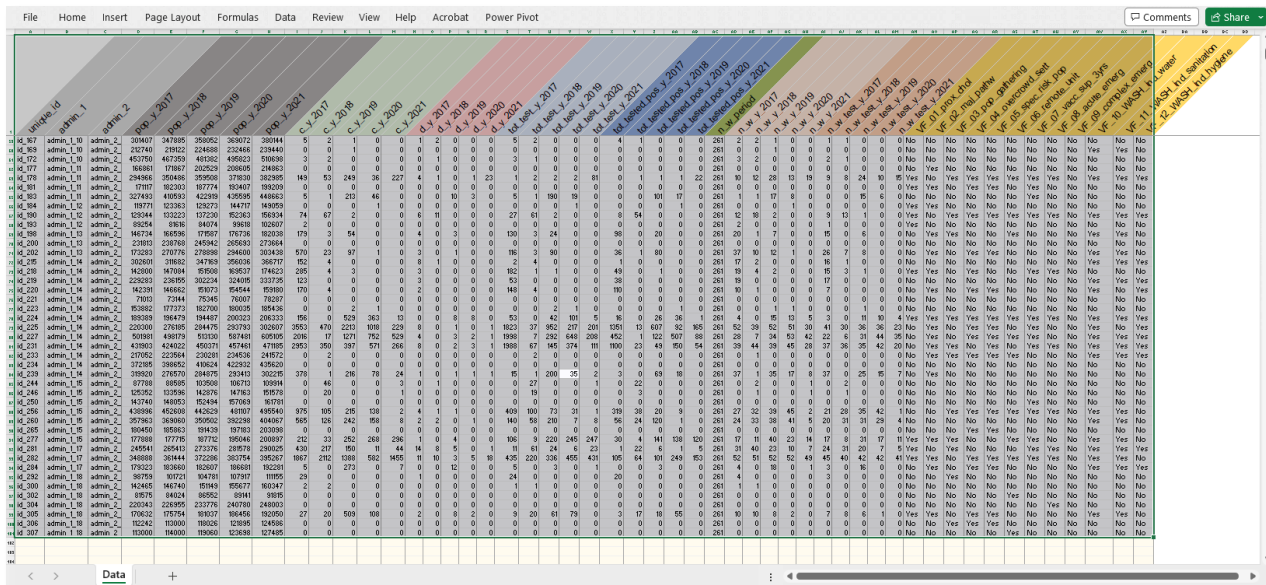
. Copy the selected data range pressing **CTRL + C**
. Then, go to the second sheet of the GTFCC Excel-based tool "**-> Data input table**", select the cell A1 flagged with "**Paste data here (as value only)**" message
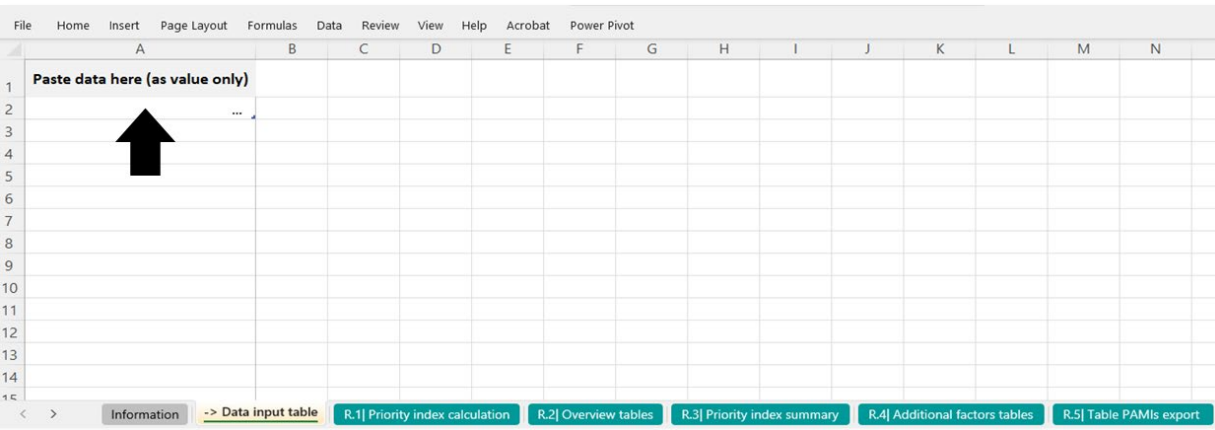
Paste the selected data as **values** in the GTFCC Excel-based tool (Home > Paste > Paste Values only or as Text)

The excel data table in "**-> Data input table**" is automatically extended to the imported data range.

- **Over the next steps, do not change the row order nor sort the data table in the "-> Data input table"**

4 **Compute indicators, score, and priority index for each NCP operational geographic unit**

. Open "**R.1| Priority index calculation" sheet**. The first line contains already an automated calculation of epidemiologic indicators, scores, and priority index corresponding to the first row of the entry the "**Data input table**".
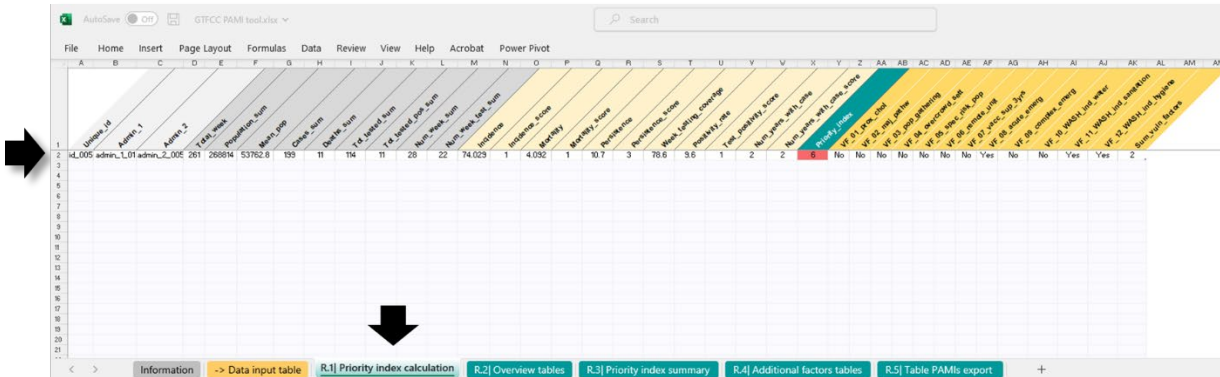
. To expand the calculation to all NCP operational geographic units across the entire input dataset range contained in the "**Data input table**", **first select the entire first row** (from cell A2 to AK2).
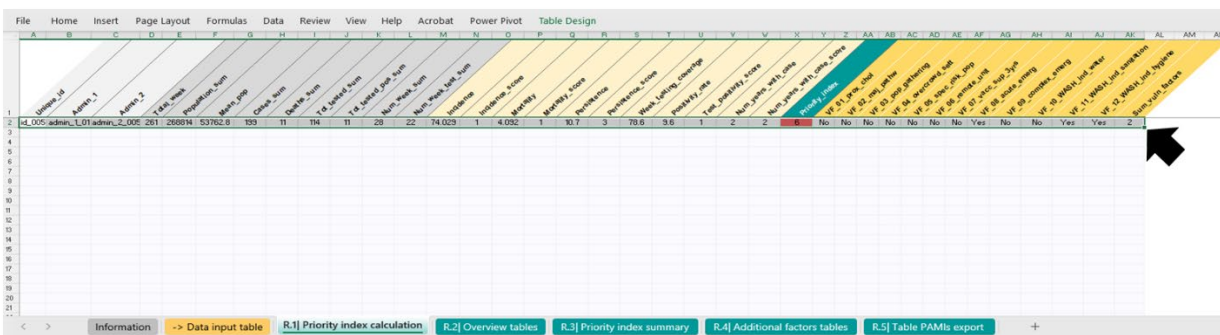
. **Select the bottom right corner of the cell "AK2"** (place the mouse on the green square mark and maintain left click). Then, drag the selection (maintaining left click) down to fill the formulas until all NCP operational geographic units of the input dataset are included in the data table (for the training dataset, up to row 101 to include all NCP operational units (n=100)).
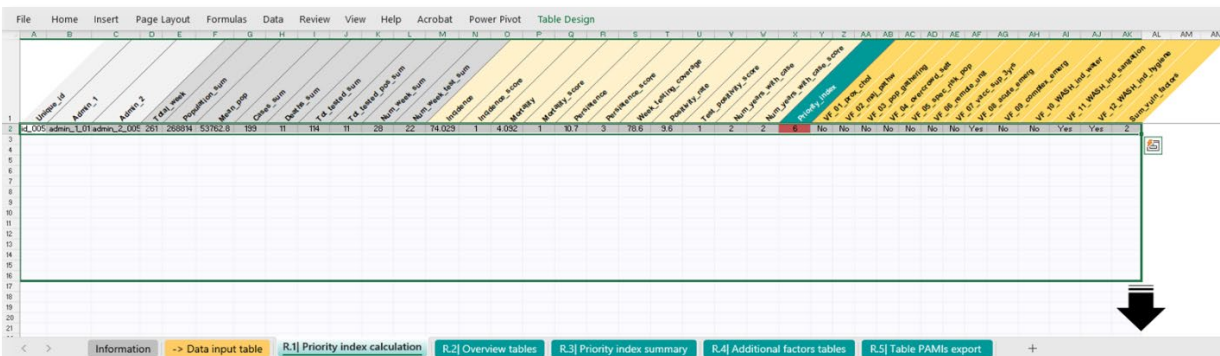
- **The tab "R.1| Priority index calculation" is protected, preventing using the sort and filter features and changing formulas (in the first row only). Over the next steps, do not change the row order nor filter the priority index calculation data table.**

When dragging formulas down to fill the data table of "**R.1| Priority index calculation**" until all NCP operational geographic units of the input dataset are included, it may happen that the user extends the selection over the data input range contained into **"-> Data input table"**.

With the training dataset used in example above, it corresponds to row numbers > 101 containing errors message in the corresponding cells ("#REF!" or "#VALUE!").

- **These additional unnecessary rows must be deleted prior any workbook refresh to avoid errors and unnecessary dummy entries in the pivot tables in the other tabs.**

To **resize the data table** and select back only the input dataset range remove these unnecessary row(s) follow these steps:

- Select the last bottom-right cell and select all contents of the table range pressing **CTRL + A**

Drag the selection (**select the green square mark and maintain left click**) to unselected unnecessary row without data.
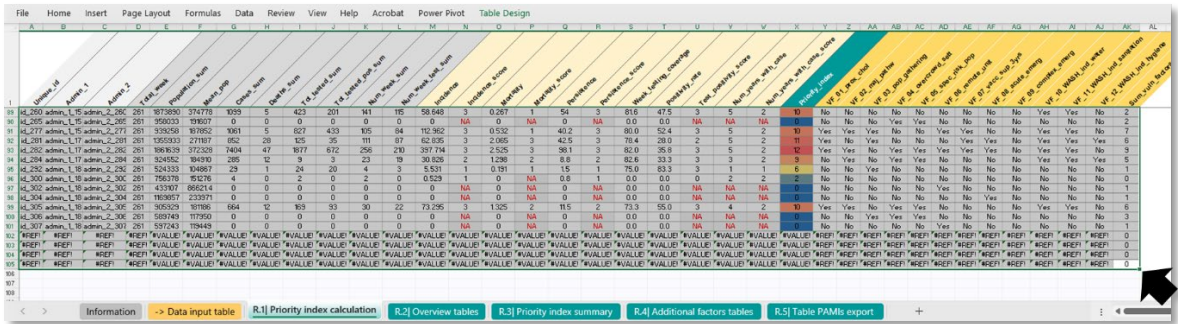
- The selection will resize to fit the cells you drag over (here up to row number 101).

5   Consult R.2| Overview tables

The fourth sheet contains generic information about the input dataset in the "**Data overview**" table (upper left table).

DATA OVERVIEW	
Data description *	
Number of NCP operational geographic units	100
Study period: start year	2017
Study period: end year	2021
Study period: number of years	5
Number of NCP operational geographic units with at least one case	78
Total number of cases	47,483
Total number of deaths	679
Overall case fatality	1.4%
Total number of suspect cases tested **	22,851
Total number of suspect cases tested positive **	9,194
Overall positivity rate **	40.2%

The totals are calculated for the entire set of geographical unist over the study period
***Regardless of the testing method applied*

The threshold values for each epidemiologic indicator are reported under the **Epidemiological indicators** section (upper right tables).

EPIDEMIOLOGICAL INDICATORS		
Epidemiological indicator score thresholds		
Incidence (100,000 pers.y-1)*	Median	13.74
	80th percentile	50.31
Mortality (100,000 pers.y-1)*	Median	0.65
	80th percentile	1.83
Persistence (% of weeks with ≥ one case)*	Median	5.2
	80th percentile	18.5

Calculated out of geographic units with indicator value > 0

Score values by epidemiological indicators				
Epidemiological indicator	**Score**			
	0 point	**1 point**	**2 points**	**3 points**
Incidence	No case	> 0 and < median	≥ median and < 80th percentile	≥ 80th percentile
Mortality	No death	> 0 and < median	≥ median and < 80th percentile	≥ 80th percentile
Mortality	No case	> 0 and < median	≥ median and < 80th percentile	≥ 80th percentile

The section **Testing indicators** presents the scoring rules for the cholera test positivity indicators on the right.

Score values by testing indicators					
Weekly testing coverage	**Testing indicator**	**Score**			
		0 point	**1 point**	**2 points**	**3 points**
Acceptable	Positivity rate	0	≤ 10%	> 10% and ≤ 30%	> 30%
Suboptimal	Num. of years with confirmed case(s)	0	1	> 1	NA*
Insufficient	NA*	NA*	NA*	NA*	NA*

NA: Not applicable
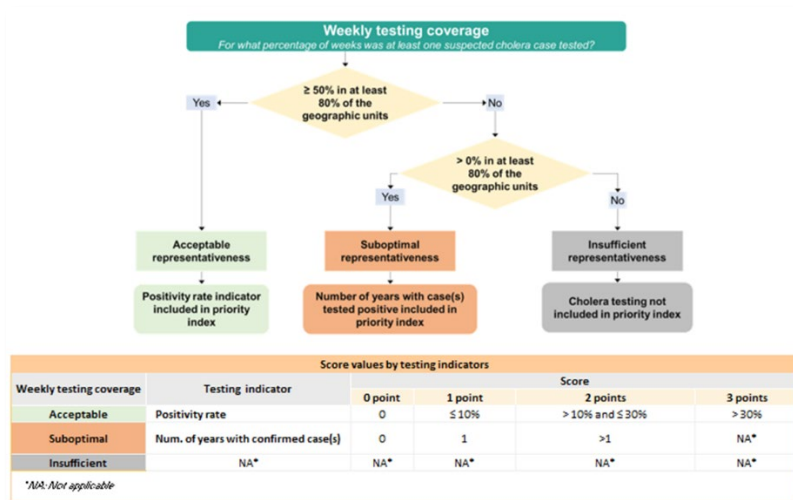
On the left, an automatic calculation of the two-step algorithm is available for the assessment of the weekly testing coverage as reported in the **Figure 2** .

The example below uses the Training dataset 1, which is set with a level of representativeness **acceptable**. The results of this representativeness assessment performed in "**R.2| Overview tables**" are automatically included in the test positivity scores and priority index calculation in the "**R.1| Priority index calculation**" sheet.

.   If the level of representativeness of cholera testing is lower than **acceptable**, the GTFCC Excel-based tool automatically provides the user with the results of as illustrated in the two screenshots below:

Level of representativeness assessed as suboptimal using the Training dataset 2:

Level of representativeness assessed as **insufficient** using the Training dataset 3:

6 R.3| Priority index summary

A summary table of key parameters stratified by priority index values is available in the "**R.3| Priority index summary**" sheet. Upon importing data, this table needs to be updated.

. To **update all the pivot tables** in the workbook with the inputted data:

- **Option 1**: type **CTRL + ALT + F5** [Excel keyboard shortcut under Windows Operating system] OR
- **Option 2**: Open tab Data, then select the drop-down menu "Refresh all" and click on "Refresh all"
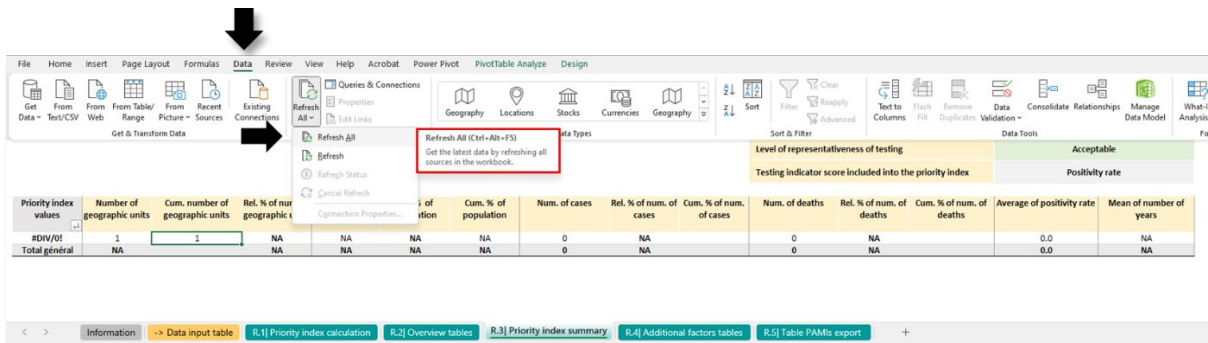
The refreshed pivot table contains key parameters (i.e., number of NCP operational geographic units, sum of the estimated population, sum of the number of cholera cases and cholera deaths, average, and test-related indicators) sorted by decreasing priority index value. The table on the top right reports the status of the assessment of the representativeness of cholera testing.

Relative and cumulative percentages are calculated for the number of NCP operational geographic units, the sum of estimated population, the sum of the number of cholera cases and cholera deaths.

7   R.4| Vulnerability factor tables

The sheet "**R.4| Additional factors tables**" contains the number of NCP operational geographic units where each vulnerability factors are present ("Yes") or absent ("No"), sorted by decreasing priority index values.

This table is intended to support the review of NCP operational geographic units scoring a given priority index value. To explore which NCP operational geographic units are contained in each cell, select the corresponding pivot table cell, then right-click and select **Show details** in the drop-down menu.

A new Excel sheet is automatically inserted with the information contained in "**R.1| Priority index calculation**" sheet for the corresponding NCP operational geographic unit.


- **The new "Sheet1" can be deleted without modifying the data in the sheet "R.1| Priority index calculation".**

| 8 | R.5| Table PAMIs export |

Prior adding inputted data in the tool, the "**R.5| Table PAMIs export**" is empty. However, the table is linked in the background with "**R.1| Priority index calculation**"

The tab "**R.5| Table PAMIs export**" is automatically updated with the content of "**R.1| Priority index calculation**" sheet when refreshing the workbook using Excel keyboard shortcut under Windows Operating system **CTRL + ALT + F5**.

If the data table is not updated, open the tab "query", and get the latest data clicking the refresh button from the "**R.1| Priority index calculation**"
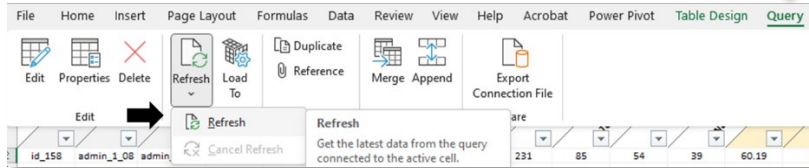
The data table is sorted by decreasing priority index values. The table can be filtered/sorted using drop-down arrow for the column to be filtered.
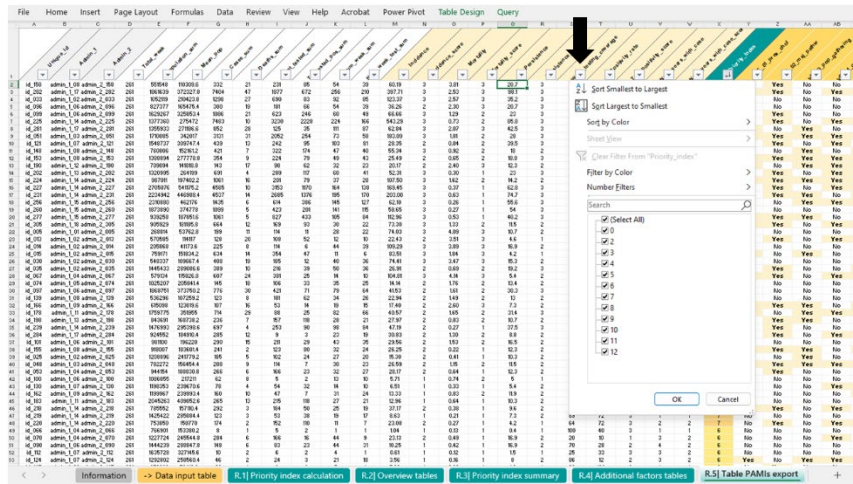
For example to display priority index values ≥ 10, uncheck **Select All** box and check the boxes 10, 11 and 12.
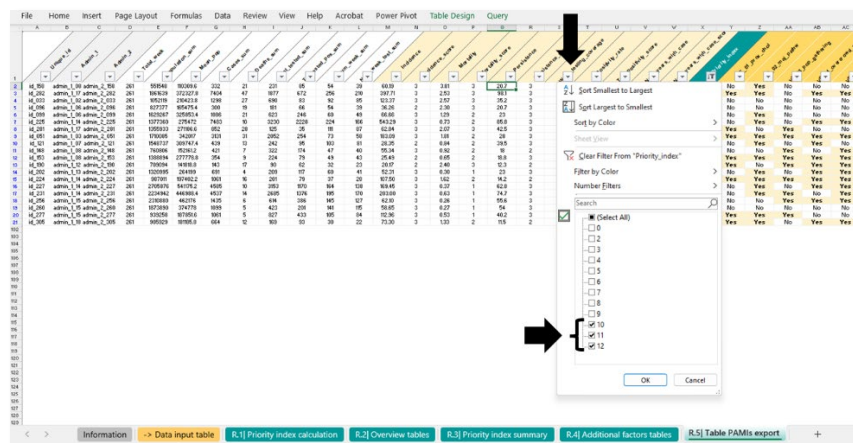
| 9 | **Save the GTFCC Excel-based tool file with specific name at location of your choice** |

It is recommended to save the Excel file with a new name at the end of the data analysis to avoid overwriting the empty template.

- It is recommended to always use an **empty input dataset template and an empty GTFCC Excel-based tool for each new analysis.**

PART III: USE OF GTFCC EXCEL-BASED TOOL OUTCOMES FOR STAKEHOLDER VALIDATION

The final list of PAMIs shall consist primarily of NCP operational geographic units (**Figure 6**):

- that have a priority index value above a (country-specific) priority index threshold, **and,**
- on an exceptional basis, those with lack of reliability of the priority index and presence of context-specific vulnerability factors.

NCP operational geographic units with a lack of reliability of the priority index was identified at step 1 may undergo an optional additional stakeholder review for inclusion in the final list of PAMIs (for more details, see section on Considerations for undertaking vulnerability assessment in the guidance). It is not recommended to assess all vulnerability factors for all NCP operational geographic units; only units with lack of reliability of the priority index that may be added to the final list of PAMIs shall be considered in the optional vulnerability assessment.

This assessment aims to reach a consensus regarding which of these units will be added to the list of PAMIs considering the combination of vulnerability factors present in these units. Various participative approaches might be considered to facilitate this decision among stakeholders. Approaches may include — but are not limited to — agreeing on the maximum number of additional NCP operational geographic units or the maximum total percentage of the population that shall be included in the final list of PAMIs (for instance, the number of additional PAMIs should be less than X% of the number of NCP operational geographic units included in the initial list of PAMIs).

The **inclusion of additional NCP operational geographic units** in the final list of PAMIs shall be duly **justified and documented** in the report on PAMI identification.

Figure 6: Decision tree at step 3 (stakeholder validation)
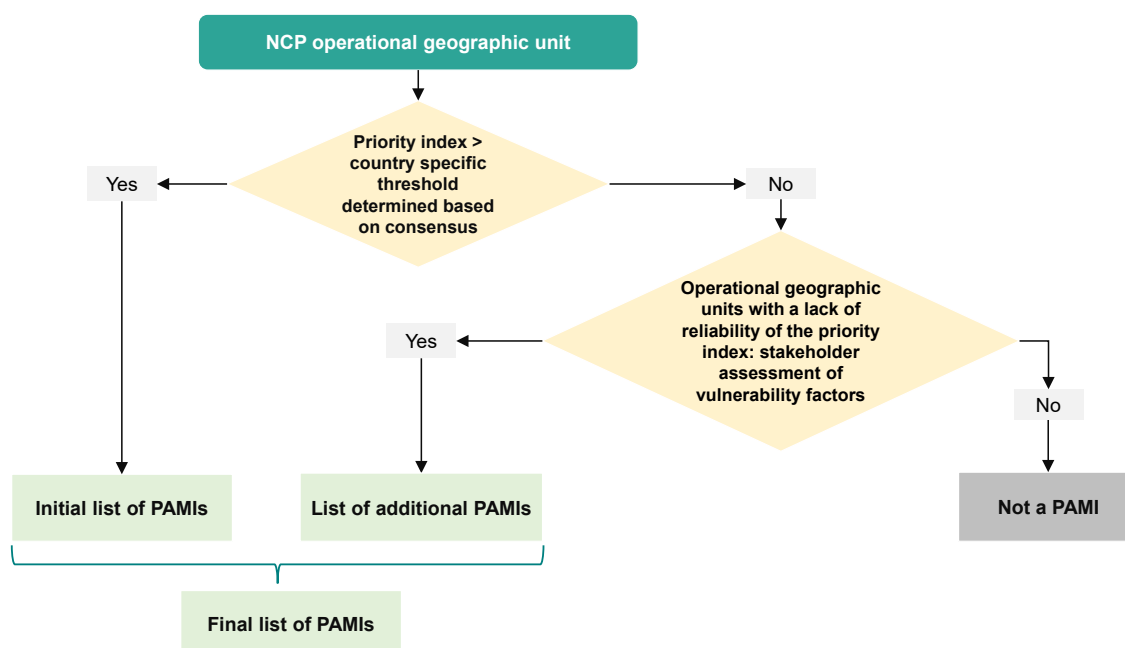
A. Initial list of PAMIs based on priority index

All NCP operational geographic units with a priority index greater than or equal to the selected priority index threshold will be included in an initial list of PAMIs.

The threshold value should be chosen by country stakeholders based on consensus after considering how to balance the principles of feasibility and potential impact:

- **Feasibility** of targeting all PAMIs as part of the NCP considering the resources available to support implementation, as in "How many PAMIs and how much of the population would the NCP target with at least one intervention at the chosen threshold?"
- **Potential impact** towards achieving national cholera control objectives by targeting all PAMIs, as in "What percentage of cholera cases and deaths were reported in PAMIs at the chosen threshold?"

Setting the priority index threshold too low (i.e., resulting in a high number of PAMIs) may result in a particularly ambitious NCP that is not feasible with available resources. Setting the priority index threshold too high (i.e., resulting in low number of PAMIs) may have limited impact by serving few cholera-affected areas in the country.

- ▪ **Example of threshold selection**

To guide the choice of the adequate threshold, the information contained in the sheet: "**R.2| Overview tables**" and the table in the sheet "**R.3| Priority index summary**" provide users with an overview of the key indicators sorted by priority index values.

A summary table (**Figure 7**) is displayed in sheet "**R.3| Priority index summary**", resulting from analysis of a training dataset.

In this fictive example, with a selected index threshold value superior or equal to 10 (i.e., above red line):

- 20 NCP operational geographic units are included as initial PAMIs.
- These geographic units represent:
  - o 25.3% of the national total population;
  - o 80.8% of the total cholera cases reported over the analysis period;
  - o 47.4% of the total cholera deaths reported over the analysis period.
- In addition, the level of representativeness of testing is acceptable with a positivity rate ranging between 36% and 47% in average in the three highest priority index vales (12,11 and 10) resulting in a high-level of confidence in cholera circulation in the considered NCP operational geographic units.

Figure 7: Summary table of key parameters stratified by priority index value (based on fictive training dataset)

Once the final priority index threshold value has been selected, an initial list of PAMIs can be filtered using the sheet "**R.5| Table PAMIs export**" using the filtering feature of the field **Priority index values** (button below the black arrow in the figure above).

B. List of additional PAMIs based on vulnerability factors

The assessment of NCP operational geographic units with a lack of reliability of the priority index aims to reach a consensus regarding which of these units will be added to the list of PAMIs considering the combination of vulnerability factors present in these units. Various participative approaches might be considered to facilitate this decision among stakeholders. Approaches may include — but are not limited to — agreeing on the maximum number of additional NCP operational geographic units or maximum total percentage of the population that shall be included in the final list of PAMIs (for instance, the number of additional PAMIs should be less than X% of the number of NCP operational geographic units included in the initial list of PAMIs).

The GTFCC Excel-based tool sheet "**R.5| Table PAMIs export**" can help to explore the profile of such NCP operational geographic units looking at the detailed list of units with a given priority index value. For this purpose, the user can apply a filter by priority index values (filter using the button below the black arrow in the figure above).

Context-specific considerations (i.e., presence/absence of vulnerability factors) should be used to build a robust rationale for the inclusion of some additional NCP operational geographic units in the final PAMIs list. All additional NCP operational geographic unit(s) selected as additional PAMIs during the stakeholder validation should be **duly justified according to specific and documented characteristics**. It is recommended to include a written summary in combination with the proposed template tables in the report on the identification of PAMIs to document the rationale supporting the inclusion of each additional geographic units in the final list of PAMIs.

C. Final list of PAMIs

The **final list of PAMIs shall comprise all NCP operational geographic units that will be targeted with an intervention package**. It consists of all NCP operational geographic units with a priority index value above the priority index threshold (initial list of PAMIs), and optionally, a limited number of units with a priority index below the threshold that were identified as highly vulnerable to cholera transmission (list of additional PAMIs). Of note, it is not advisable to remove PAMIs from the initial list when creating the final list for any reason.

D. Template report on PAMI identification for cholera control

It is recommended that a report on the identification of priority areas for multisectoral interventions for cholera control follows the template provided in **Figure 8**.

Figure 8: Template report on the identification of PAMIs

BACKGROUND

- Information on any previous identification of PAMIs (method, analysis period)
- Information on NCP status and targets (past, current, and future) in the country
- Concise description of the cholera situation in the country in recent years (up to last 10 years)
- Concise description of cholera surveillance system
- Concise description of cholera testing strategy

METHODS

Step 1. Datasets

General
- Definition and administrative level of NCP operational geographic units
- Definition of analysis period

Priority index
- Sources of data for calculation of priority index
- Assessment of quality of the data
- Management of missing data

Vulnerability factors [optional]
- List of vulnerability factors emphasizing their relevance in the country context
- Criteria to identify NCP operational geographic units to undergo a vulnerability assessment
- Data sources for vulnerability factors
- Method for assessing vulnerability factors

Step 2. Priority index scoring

- Scoring scales

Step 3. Stakeholder validation

- List of stakeholders involved and meeting format (e.g., in person workshop, online consultation, facilitation of consensus building)

RESULTS

Priority index

- Copy of figures of sheet '**R.2| Overview tables**' of the [GTFCC Excel-based tool](): data overview, epidemiologic indicators score thresholds, assessment of representativeness of testing
- Copy of table of sheet '**R.3| Priority index summary**' of the [GTFCC Excel-based tool:]() summary table of key parameters stratified by priority index value
- Map of NCP operational geographic units by priority index value

…/…

Stakeholder validation

Initial list of PAMIs

- Value of selected priority index threshold and justification for the threshold selected considering feasibility and impact
- Number and percentage of NCP operational geographic units selected as initial PAMIs, population and percentage of population living in these units, numbers and percentages of cholera cases and cholera deaths reported in these units over the analysis period

List of additional PAMIs *-if optional assessment of vulnerability factors undertaken-*

- Description of vulnerability factors present in each NCP operational geographic unit selected as additional PAMIs as well as priority index value of each NCP operational geographic unit selected as additional PAMIs and justification for considering that the priority index underestimates the cholera priority level in these units

Final list of PAMIs

- Map showing initial PAMIs and additional PAMIs
- Attach the PAMI table generated from the sheet '**R.5| Table PAMIs export**' of the GTFCC Excel-based tool

WAY FORWARD

- Description of next steps of the NCP process including provisional timelines