GLOBAL TASK FORCE ON
CHOLERA CONTROL

REPORT OF THE

# Hybrid meeting of the Global Task Force on Cholera Control (GTFCC) Working Group on Surveillance (Epidemiology and Laboratory)

20-21 April 2022 | Online & Les Pensières Conference Centre, Annecy, France

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# Acronyms and abbreviations

| | |
|---|---|
| AWD | acute watery diarrhoea |
| CBS | community-based surveillance |
| CE | community engagement |
| CFR | case fatality rate |
| CI | confidence interval |
| CSO | civil society organisation |
| CSP | GTFCC Country Support Platform |
| CTC | cholera treatment centre |
| DRC | Democratic Republic of Congo |
| EOC | emergency operations centre |
| EPI | WHO Expanded Programme on Immunization |
| EWARS | Early Warning Alert and Response |
| GTFCC | Global Task Force on Cholera Control |
| IDP | internally displaced people |
| IDSR | infectious disease surveillance and response |
| IFRC | International Federation of Red Cross and Red Crescent societies |
| IMS | Incident Management System |
| IPC | infection prevention and control |
| JMP | Joint Monitoring Programme |
| M&E | monitoring and evaluation |
| MAI | mean annual incidence |
| MSF | Médecins Sans Frontières |
| NCP | national cholera control plan |
| OCV | oral cholera vaccine |
| PCR | polymerase chain reaction |
| PQ | WHO prequalifying |
| R&D | research and development |
| RCCE | risk communication and community engagement |
| RCRC | Red Cross Red Crescent |
| RDT | rapid diagnostic test |
| RRT | rapid response team |
| SOPs | standard operating procedures |
| TOR | terms of reference |
| TPP | target product profile |
| US CDC | US Centers for Disease Control and Prevention |
| VIS | Gavi Vaccine Investment Strategy |
| WAHO | West African Health Organization (WAHO) |
| WASH | water, sanitation and hygiene |

# Executive summary

This meeting of the Global Task Force on Cholera Control (GTFCC) Working Group on Surveillance (Epidemiology and Laboratory) took place on 20-21 April 2022. Because of the continued difficulties imposed by the COVID-19 pandemic, the meeting was held in a hybrid format, with some attendees meeting in person in Les Pensières, Annecy, France, and others attending virtually for part of the programme.

In 2021, the GTFCC Epidemiology and Laboratory Working Groups joined forces to create four sub-groups to address cross-cutting topics and strengthen cholera surveillance. The main objective of this meeting was to present preliminary outcomes of the work of these sub-groups, and discuss the following topics:

- progress in developing the new GTFCC surveillance and testing strategy;
- development of new procedures for recognising a country's cholera-free status;
- a revised framework for identifying priority areas for interventions ("cholera hotspots"); and
- perspectives for coordinated regional surveillance.

Working group members also presented different surveillance challenges and achievements from country case studies and working examples around the world.

Time was also set by for free discussion and ad hoc side meetings between technical experts, GTFCC partners, countries and regions, with the collective goal of shaping immediate paths forward and identifying the most pressing shared priorities. The meeting ended with the presentation of draft workplans for epidemiological and laboratory cholera surveillance for the coming year.

The meeting closed with a round of thanks to participants, donors and partners for their continued support of work to achieve the goals of the GTFCC core document, *Ending cholera: a global roadmap to 2030.*

# Opening session

***Philippe Barboza**, Head of GTFCC Secretariat; **Flavio Finger**, Epicentre & Head of Epidemiology working group; **Marie-Laure Quilici**, Institut Pasteur & Head of Laboratory working group*

The hybrid part of the meeting opened with short welcoming addresses from Philippe Barboza and Laboratory Working Group Chair Marie-Laure Quilici. This was followed with a short address from Flavio Finger, new Chair of the Epidemiology Working Group, who thanked his predecessor (Dr Marc Gastellu, Epicentre) for his hard work and a good handover.

# Surveillance strategies

## Cholera surveillance strategy

***Andrew Azman**, John Hopkins University*

The GTFCC's core document, *Ending cholera: a global roadmap to 2030* ("the Roadmap") is organised around three strategic axes: (1) early detection and response to contain outbreaks; (2) prevention of disease occurrence by targeting multi-sectoral interventions in cholera hotspots; and (3) an effective mechanism of coordination for technical support, resource mobilization, and local and global partnership. Without adequate surveillance, Axes 1 and 2 cannot be successful.

The rationale for revising surveillance strategy is that current approaches and tools do not provide sufficiently granular and accurate data. In 2017 the GTFCC recommended reporting aggregated numbers of cholera cases and deaths by age group (<5 and ≥5 years), but testing is irregular and infrequent and cholera surveillance relies heavily on monitoring AWD. The diversity of cholera epidemiological situations needs to be addressed with the proper surveillance and control objectives. For example, during outbreaks more granular, quicker surveillance is needed to interrupt transmission rather than mitigate the impact of disease.

The GTFCC cholera surveillance strategy is therefore being revised to develop practical recommendations that will help countries achieve prevention and control targets in line with the Roadmap goals. The most important element is the development of standards that are more specific than the 2017 guidance, and which reflect the resources and knowledge generated since then. This requires the development of clear minimum surveillance recommendations.

This revision process aims to address four overall goals: (1) increase the resolution of cholera surveillance; (2) increase its accuracy; (3) ensure the performance of cholera surveillance systems; and (4) maximize operational use of cholera surveillance data at local, regional and global levels.

- Recommendations for action to increase surveillance resolution include implementing case-based cholera surveillance and recording information on discrete cases (e.g., age, location, etc.) to document risk factors and allow confirmation of suspected cases.
- Recommendations to increase surveillance accuracy include expanding use of RDTs in line with levels of cholera transmission and local resources; increasing capacity for confirmatory testing; and integrating epidemiology and laboratory data.
- Recommendations to improve the performance of surveillance and ensure that surveillance in GTFCC target countries is at least equivalent to GTFCC minimum recommendations include routine monitoring of surveillance according to performance

indicators and GTFCC minimum targets, and conducting periodic evaluations of surveillance systems.

- Maximizing the operational use of cholera surveillance at local level requires "adaptative surveillance modalities" that support operational objective and surveillance modalities adequate to the epidemiological situation prevailing in each spatial unit – i.e. local surveillance would be made more effective by adapting surveillance methods to the context and goals of the target area.

The recommendation for the new guidance is to adapt cholera surveillance objectives and methods to the prevailing epidemiological situation and operational objectives for cholera control. To ensure adequate scale at local level, the recommendations are (1) to coordinate surveillance, aggregation, analysis and interpretation of data at the level of the spatial units in which control decisions are taken; and (2) to develop NCPs at the same level, linking surveillance outputs with the information needs of other technical pillars.

Maximising operational use of cholera surveillance at other levels means using surveillance data to guide preparedness, readiness and response in other areas and countries. Recommendations to achieve this include encouraging and fostering information sharing in and across organizations, sectors, and countries, and developing a supranational e-surveillance platform. A strategy for the latter is in development and is addressed later in this report.

New recommendations for operationalising adaptative cholera surveillance are organised around a general framework that recognises three epidemiological situations for cholera (other than absence): baseline community transmission; outbreaks; and "sporadic to interrupted transmission." Transition between these situations is triggered by alerts, which in turn are triggered by surveillance systems with context-specific operational goals.

Baseline community transmission is defined as a situation in which "cholera transmission is community-related but does not deviate from that 'usually' observed in the past (based on threshold calculation)," and the goal of surveillance here is to inform tailored, well-targeted interventions to contain and eliminate transmission.

An outbreak situation is defined as a significant increase in cholera incidence and the spatial spread of cases above baseline, and the goal of surveillance here is to provide appropriate data to guide interventions that mitigate transmission and monitor their impact.

"Sporadic to interrupted transmission" is defined as a situation in which cholera transmission, if any, occurs as sporadic cases or small distinct cluster without sustained community transmission. The goal of surveillance here is to trigger reactive verification of causative agents and investigation around each new case to trigger timely control measures aiming at interrupting transmission.

An alert is defined as an increase in transmission that might represent an outbreak. In baseline community transmission settings, this means cholera exceeding a predetermined threshold. Outbreak thresholds shall be defined annually per spatial unit based on time series analysis, while seasonal thresholds (for settings with seasonal cholera) can be addressed by triggering an alert at the beginning of the season to perform proactive surveillance and be ready to trigger control measures. In settings of sporadic to interrupted transmission, an alert would be triggered by the occurrence of one or more confirmed cases. The operational goal of any alert is to trigger verification and onsite investigation and a risk assessment confirming or discarding the alert; and to anticipate interventions and changes in surveillance methods to respond to any potential outbreak.

Similar surveillance strategies are used effectively to guide responses and interventions to other high impact epidemic diseases, such as meningitis.

An updated GTFCC surveillance strategy that provided adequate support to the Roadmap goals would be:

- adaptative, thereby provided better, more accurate guidance for interventions towards elimination;
- based on spatial units that are the same spatial units used in the relevant NCP;
- case-based;
- implemented in a context of routine testing;
- designed to ensure the timely flow of information, including towards supranational surveillance; and
- performance monitored.

Revising the GTFCC cholera surveillance strategy is critical. The new strategy should be the cornerstone of efforts to end cholera, and countries should be involved in its development.

The next steps in this process are to continue development of minimum surveillance recommendations for each epidemiological situation; to test the strategy, including the use of RDTs and confirmatory testing (with RDT testing a particularly high priority); to ensure the strategy contains provisions for immediate notification, verification and investigation, as well as routine reporting, data collection, analysis and dissemination; and to devise a list of performance indicators for epidemiological and laboratory surveillance. Supporting tools will then need to be developed.

# Country experience: Cameroon

***Linda Esso**, Cameroon Ministry of Health*

Cameroon is "Africa in miniature:" home to over 250 languages and several religions, it is hugely diverse. The national health system is structured on three levels: central, intermediate and peripheral. The central level coordinates, regulates, and develops health concepts, strategies and policies and provides general hospital and university teaching hospital services. The intermediate level, divided into ten regions, provides technical support to lower-level health districts, runs regional hospitals, and administers regional funds. The lowest, peripheral level is divided into 191 health districts that implement national programmes and run district hospitals, medical centres and district health centres communities. This system works across three sectors: the public sector; the private sector (containing profit-making providers and the private not-for-profit sector, which in turn comprises religious denominations, associations and various non-governmental organisations/NGOs); and the traditional health sector, an important component of the national system.

Cameroon implements surveillance using the IDSR (integrated disease surveillance and response) system, and has produced national adaptations of the surveillance strategies published by the WHO Regional Office for Africa in 1998, 2005 and 2019 (with Cameroon's adaptation of the third and most recent version published in September 2021). Cameroon's surveillance strategy is based on standard case definitions as per the third edition of the IDSR.

Cameroon uses the DHIS2 system, implements four streams of surveillance – passive, active, indicator-based and event-based – and is currently strengthening and extending event-based surveillance in communities for enhanced early warning and response. If a single case is suspected, case-based information is reported immediately and the case is managed and treated according to national guidelines. Strict handwashing and isolation procedures are enhanced and case-based investigation is

done to identify potential unreported similar cases. RDTs are used when a suspected case is identified at any level.

Laboratory confirmation is done through liquid stool specimens or rectal swabs. Culture results usually take 2-4 days from arrival of the specimen at the laboratory. Three main laboratories are used for confirmation, but many others have the necessary capacities and just lack designation for this function. Samples are transferred using Cary-Blair transport medium supplied by WHO. Challenges to the system include difficulties transporting samples (due to the lack of dedicated funds and incomplete integration into the system used by the WHO Expanded Programme on Immunization (EPI)); the need to strengthen confirmation capacity in regional laboratories; and the lack of sequencing capacity.

Routine data are collected through DHIS2. For event-based surveillance Cameroon has two databases, using Excel or Early Warning Alert and Response (EWARS) respectively, the latter in regions affected by conflict. Data management challenges include management during outbreaks, when filling the DHIS tracker becomes challenging and other databases are used for line listing; and disparities in data. With the help of CDC and WHO, a tracker has been developed based on the line list used in prior epidemics that allows users to set their own parameters. This is not a standardised tool, but it can be adapted to context.

On the resources front, Cameroon's stockpile faces many challenges. A playbook has been written outlining the requirements for cholera outbreaks, but it requires updating. The WHO has a cholera kit quantification tool, though this requires users managing cholera supplies to be trained in its use. Stock reporting is done level by level using Excel files. At all levels of the health sector there is insufficient storage space for cholera control products. While prepositioning safety stocks in cholera risk areas during high-risk periods is recommended, this is not done.

The evolution of cases over past years allows the identification of at-risk regions and the implementation of priority actions. A mapping exercise between 2014 and 2021 showed movement of cases from northern areas to the coast. As of March 2022, Cameroon has 28 districts that are a high priority for cholera intervention, 63 moderate priority, and 99 low-priority. Challenges include the fact that regions in the South West that initially without cholera are now in active outbreak, and a widespread lack of potable water.

Dr Esso concluded her presentation with a brief overview of the regional cholera situation at the time of the meeting, presenting data from April 15, 2022.

# Perspectives to support extended use of rapid diagnostic tests

***Antara Sinha**, Gavi*

In December 2021 the Gavi Board approved funding to increase availability of fit-for-purpose diagnostic tools for six diseases, one of which is cholera. This initiative is designed to encourage development of tools that improve the efficiency, effectiveness and equity of vaccine support, and to address market failures in diagnostics.

Gavi support for the development of better diagnostic tools will include several activities, many of which entail collaboration with individuals and groups within and beyond the Gavi Alliance: developing target product profiles (TPPs) for tests to support immunisation programmes; funding demand with a pooled procurement mechanism to boost commercial availability of validated test kits; funding the evaluation of diagnostic tests; developing and disseminating testing guidance to support vaccination; distributing

diagnostic tests for surveillance of relevant diseases to countries eligible for Gavi new vaccine support; and facilitating longer-term transitions to national funding of diagnostic procurement.

Preventive vaccination drives in Gavi-eligible countries need better diagnostics. In the cholera context, a series of preventive OCV campaigns in hotspots will be funded by the 2018 Gavi Vaccine Investment Strategy (VIS), targeting hotspots using suspected AWD surveillance. Improved diagnostic capacity would allow use of data on diagnostically-confirmed cholera cases to target campaigns more accurately. Improved diagnostic capacity enables more efficient preventive vaccination, and preventive campaigns with high coverage will probably end cholera transmission in many areas (though this cannot be confirmed without diagnostic capacity). If data on laboratory-confirmed cholera cases were routinely available, the estimated number of areas where preventive cholera vaccination campaigns are needed could be cut by roughly half, an estimated level of efficiency that would increase in each round of repeat campaigns.

Currently, culture methods are the backbone for cholera laboratory confirmation, but scale-up is hampered by major gaps in availability, and logistical and technical challenges. Rapid diagnostic tests are potentially the most practical and cost-effective options for addressing surveillance questions relevant to Gavi vaccination programmes, but there are currently no validated, commercially available RDTs – even though several promising RDTs are commercially available and WHO prequalifying (PQ) standards exist. PCR tests are an alternative to culture and RDTs, and validated multiplex PCR tests are available, but they are expensive and complicated.

Deployment and support by Gavi of cholera RDTs would aim primarily to support continuous cholera surveillance in hotspots identified using surveillance data on suspected cases – a strategy chosen to keep the volume of testing manageable and allow the determination of cholera prevalence against specified thresholds. There would be limited use of support for other, complementary purposes such as detecting outbreaks, but primary focus would remain the targeting of preventive campaigns.

Gavi's overall goals for cholera diagnostics by 2025 are to have shaped the market by ensuring the availability of at least two validated, commercially available tests of a novel type (e.g. RDTs); and to ensure that applications for Gavi support include the use or systematic collection of data on the use of novel diagnostics.

## Discussion

A brief discussion period covered several points.

- To be validated, RDTs must meet clear WHO criteria for sensitivity and specificity. Compliance enables prequalification of the tests. Gavi is keen to comply with these methods, and both Gavi and UNICEF require WHO PQ of an RDT for procurement. It is important to expedite the PQ process and ensure that manufacturers with advanced products can prequalify them quickly. In the meantime, non-validated commercial tests are available (at least one of which has been submitted to PQ) and countries do use them.
- It was suggested that using high volumes of RDTs in hotspots to test large number of suspected cases should bring down the current high prices per test, which are a barrier to procurement in many settings. In some circumstances this strategy would be appropriate, but there is a funding gap. There is a wider need to stimulate the market and engage new manufacturers, then procure volumes of RDTs and ensure they are effectively used in as diverse a set of situations as possible. The Gavi board is keen to see benefits from a narrow strategy before expanding to more exhaustive approaches.
- In settings where culture tests cannot be done quickly, the use of enriched RDTs could trigger a response. Countries should set high targets: if suspected cases are not tested, transmission will continue. Cholera elimination will require massive testing, and RDTs – when placed near patients

– do make this possible. It is a challenge, but if elimination is a serious goal, tests must be made available for those who need them.

- In communities where accessing healthcare is difficult, testing will always be difficult; but if the incidence of suspected cases decreases, it becomes possible to test them all. In these settings culture confirmation is important.
- Countries should consider training non-health professionals to administer tests. Outbreaks impose high financial human costs when detected late, so earlier detection is crucial. Training civil servants, community representatives etc. in community RDT testing could help alleviate this problem.
- Increased testing must come with the ability to diagnose and respond immediately, or the public will turn against it. When tests are sent into communities for investigations and reports without further action, perceptions of testing are likely to become negative. Rapid response kits are a potential solution, though they come with implementation challenges. Working towards more rapid diagnoses requires the ability to respond immediately.

# Cholera free status

## Principles for documenting, recognising and maintaining cholera-free status

***Raoul Kamadjeu**, UNICEF*

National cholera elimination is currently defined as the situation in any country that reports no confirmed cases with evidence of local transmission for at least three consecutive years, and which has well-functioning epidemiological and laboratory surveillance systems able to detect and confirm cases. As many as 20 countries could eliminate cholera by 2030. To support the achievement of this goal, the GTFCC is developing the "Cholera-Free Status Framework," a structured, transparent framework with two purposes: to allow GTFCC target countries and regions to document, in a standardized manner, the achievement and maintenance of elimination of cholera; and to help the GTFCC assess, formally recognize and monitor progress towards the elimination of cholera.

Under this framework, "cholera-free status," which can be achieved by both countries and regions, means that cholera disease has been eliminated as a threat to public health in the particular country or region – with "cholera disease" defined as "disease caused by toxigenic Vibrio cholerae O1 or O139, carrying the ctxAB genes encoding the cholera toxin (CT), linked to the seventh pandemic lineage or any lineage that might emerge with similar properties."

The core requirements of cholera-free status are the absence of community transmission (with transmission in the community defined as occurrence of indigenous cholera cases which cannot all be linked epidemiologically) in the presence of appropriate, well-performing epidemiologic and laboratory surveillance consistent with minimum GTFCC Surveillance standards.

Efforts to achieve cholera-free status should include development of formalized procedures to respond rapidly to the detection of cases; assessment of risk and vulnerability factors for re-establishment of local transmission; and development, implementation and monitoring of mid- to longer-term mitigation plans.

In an ideal scenario, the path to country cholera-free status begins with a three-year "pre-recognition" period of compliance with core requirements and engagement in the documentation process. This is followed by the recognition of cholera-free status based on documented compliance with core requirements for the relevant time period, subject to GTFCC assessment; and ongoing maintenance of that status through documented continuous compliance with the core requirements, subject to annual GTFCC assessment. Maintenance of cholera-free status remains possible even with a small amount of community transmission, as long as it lasts no longer than two months and does not spread beyond a certain area. However, the pathway to country cholera-free status may also involve the suspension or revocation of a recognized status is continuous compliance with the requirements for the maintenance a status cannot be established.

A Regional cholera-free status may be achieved by a WHO region when all GTFCC target countries in that region have achieved and maintained recognized country cholera-free status for at least three years.

The process for achieving a country cholera free status requires countries to submit standardised applications (with templates for reports and questionnaires for recognition, annual maintenance and/or re-establishment phases) that are assessed by an GTFCC independent review panel (IRP).

In conclusion, key points of this proposed framework include the following:

- Cholera-free status does not mean the absence of *any* cholera case, provided transmission in the community is prevented.
- Recognized cholera-free status is subject to maintenance.
- Countries must document compliance with applicable requirements.
- Assessment by the IRP is independent and based on transparent criteria.

Next steps and provisional timelines for finalising and implementing the framework are as follows:

- June 2022: Endorsement of the proposed framework by the GTFCC Steering Committee
- Summer 2022: Creation of an independent review panel
- Autumn 2022: Opening of applications for recognition.

# Country experience: Haiti

***Katilla Pierre**, Haiti Ministry of Health*

In October 2010, while struggling to overcome the impact of a major earthquake, Haiti began to experience a major cholera epidemic. The outbreak saw up to 4 000 cases per day and inspired a ten-year national plan to fight cholera in three phases, with four main components: social mobilization, epidemic surveillance, curative health care and increasing access to WASH. The government led the implementation of the plan, supported by a range of strong partners, and eventually the epidemic was subdued.

There were several lessons to retain from this period. National leadership was crucial – while Haiti had many partners at the start, there were few at the end, and had the fight not been government-led momentum would have been lost. Unusual decisions and decision-making structures proved critical – for example, doxycycline was used prophylactically in communities with poor WASH access (without any subsequent drug resistance observable in lab surveillance). Decisions were made in the field, guided by strong epidemic surveillance. Rapid intervention teams were established, have run non-stop since 2010, and are still working. Public awareness campaigns supported this work; laboratory testing was decentralised; and reagents were permanently available in national and regional laboratories.

Thanks to all this activity, the cholera situation in Haiti has evolved greatly. Overall, since October 2010 over 820 000 suspected cases have been reported in Haiti, including approximately 9 800 deaths; but following a peak in 2011 (a year that saw over 350 000 suspected cases) cholera has been on a downward trend, and no cases have been confirmed since February 4, 2019.

Haiti does not currently use RDTs. Haiti's elimination plan now includes a 2019-2022 surveillance strategy to strengthen epidemiological cholera surveillance of Vibrio cholerae in diarrhoea that does not respond to the national cholera case definition. This strategy is based on intensifying and amplifying specimen collection, improving the management of information for decision-making, and developing better intervention models. The methodology has five core activities: continued surveillance of suspected cases; passive surveillance in healthcare institutions; active surveillance of community cases (with hospitalisation of a case as the triggering element); weekly sampling of the first five cases of acute diarrhoea in people over five years old (via community "labo-moto" health workers on motorcycles); and weekly sampling of ten cases of acute diarrhoea in people over five years old in sentinel sites. Integration of this strategy in hospitals is difficult and requires a great deal of work and training, but the goal is to broaden the strategy to the whole country, including approximately 1 000 healthcare facilities. This imposes challenges in terms of staffing and financing and makes retention – already hard – crucial.

Labo-Moto staff carry out a range of support activities, assisting staff, training service providers, making visits, transporting and tracing samples, and facilitating feedback. They work from one sentinel in each department designated as a base.

Haiti is working to strengthen national surveillance capacities. A new, enhanced system for sampling suspected AWD cases is being implemented, using 56 institutions across the country's ten administrative departments. Over 8 900 samples from AWD patients have been tested to identify potential cholera cases. Four regional laboratories have been equipped for culture testing and the national laboratory can do PCR tests. An improved early warning and response system is also being established, with both indicator- and event-based surveillance.

To ensure this system is effective, field epidemiologists from central and departmental levels are being trained and provided with the necessary equipment and tools. Challenges and gaps affecting this plan include low involvement of institutional staff and general socio-political instability and national security concerns.

An assessment of this work has generated recommendations including the following:

- maintaining the strategy for searching Vibrio cholerae in acute non-choleriform diarrhoea beyond 2022, ensuring permanent availability of lab reagents and human and financial resources; culture testing; maintaining a guaranteed communication network; and establishing efficient processes for transporting specimens for culture testing;
- reinforcing interventions in the event of possible re-emergence of cholera in the environment (i.e. establishing contingency plans);
- formalising community involvement through community-based epidemiological surveillance programmes;
- strengthening environmental surveillance; and
- applying for national cholera-free status.

## Discussion

A brief discussion period covered several points.

- The Haitian context is particularly complex, and the country's achievements are to be congratulated and shall set an example. The most important points to replicate might include the decentralised laboratory approach and the adaptability of surveillance.

# Identification of priority areas for interventions

## Revised GTFCC framework for the identification of priority areas for interventions ("hotspots")

***Elizabeth Lee**, John Hopkins University*

Axis 2 of the Roadmap – "prevention of disease occurrence by targeting multisectoral interventions in cholera hotspots" – is dependent on reliable capacity to identify "hotspots".

The 2019 GTFCC Hotspot Methodology uses two indicators: mean annual incidence (MAI) and persistence (i.e. the percentage % of weeks with suspected cases). Countries set their own thresholds and place administrative units into one of three priority groups: low, medium or high.

The revision of this method has taken place in four stages: review of previous hotspot identification exercises; drafting the revised framework; piloting it; and consolidating it.

The review stage was designed to identify gaps and challenges to inform development of the revised framework and consisted of 22 reviews of past identification exercises using a standardized questionnaire. Its guiding principle was to ensure that the revised framework is simple, generalizable, flexible and something that facilitates targeted, long-term planning (and not emergency responses).

The revised GTFCC framework address two situations depending on cholera situation in-country. In countries where cholera transmission is high to moderate, the revised method is to identify priority areas according to cholera impact in recent years. In countries where cholera transmission is low to very low, the revised method is to identify priority areas according to the risk of re-establishment of transmission.

Impact in countries where cholera transmission is high to moderate is measured by scoring on four dimensions – incidence, persistence, mortality and laboratory confirmation – that are then combined in an index. Priority areas for interventions are identified according to the feasibility of targeting all high priority areas when implementing the NCP, and the impact of the NCP in reducing overall cholera burden.

Principles guiding assessment of the risk of re-establishment in countries where cholera transmission is low to very low are that the priority vulnerable areas should include any remaining geographic units that report cases as well as areas with risk factors for (re-)introduction AND spread of cholera. These are identified based on qualitative risk factors (adjacency to cholera-affected areas, intensive movement of populations, the presence of gathering places, the presence of conflict and/or displaced populations, and high population density) and a WASH assessment looking at access to improved water services, water quality, access to sanitation, presence of open defecation, and hygiene information.

The revised framework is being piloted in two countries. Piloting of the cholera impact component has been completed in DRC (see next section), and the pilot of the risk of re-establishment component was ongoing in Mali at the time of the meeting.

The piloting of the cholera impact component has been informative to refine the methodology to by comparing three proxies for impact: case burden, death burden and persistence.

The next steps, which comprise the year's workplan for the subgroup, are to finalize the consolidation of revised framework, then develop guidelines for countries, supporting tools and accompanying training materials.

Comparing the 2019 methodology with the revised framework, there are some similarities: both are designed to be simple, flexible and adaptable for semi-automation in an Excel-based tool, and both define priority areas using annual epidemiological indicators aggregated by health units of interest. Differences in the new framework include the use of a composite index based on key scored indicators relevant for cholera impact; the harmonized calculation of epidemiological indicators; harmonized scoring rules for all indicators; inclusion of a cholera-death dimension to reflect mortality; inclusion of coverage information to support index level selection (cumulative percentage of population, cases, deaths and persistence); and – pending the results of further pilots in new countries – possible inclusion of laboratory-derived indicators.

# Country experience (pilot): Democratic Republic of the Congo

***Placide Okitayemba Welo**,DRC National Programme for Cholera Control (PNECHOL)*

Dr Placide presented the first results of the pilot of the revised framework (as described in the previous section). The analysis period ran from 2017 to 2021 and was measured at the level of DRC's health administrative units: Health zone (i.e. admin 2), using the following indicators:

- Incidence: suspected cholera cases per 100 000 person-years
- Mortality: suspected cholera cases per 100 000 person-years
- Persistence: percentage of weeks with at least one suspected case reported over the analysis period.

No laboratory indicator was included in the analysis due to low coverage.

Each indicator was scored on a scale from 0 to 3.The index, scored from 0 to 9, was calculated using the following formula:

Index (per health zone) = (incidence score + mortality score + persistence score)

Surveillance data generated by the pilot between 2017 and 2021 covered 147 607 cases and 3 201 deaths for a CFR of 2.1%. 306 of the 519 health zones in the pilot area were affected, a proportion of 59%.

The next steps in this process will be to discuss the outcomes at a workshop, and carry out a situational analysis support the development of DRC's national cholera control plan.

Dr Placide finished by offering some conclusions on the new framework based on the experience of the pilot. The new framework is a simple index based on annual epidemiological indicators, but the inclusion of indicators on confirmed cases requires good testing coverage, which is likely to be a challenge in many countries, at least in the short term. There is also a current need for guidance in how to use this framework while following the situational analysis steps of the NCP development framework. This should be an area of focus for the GTFCC.

This a first draft: problems will be addressed, and the system will be improved. Accessibility parameters and issues caused by moving populations will also be addressed: these are parameters that will have to be quantified more accurately.

## Discussion

A brief discussion period covered several points.

- Identifying priority areas for interventions using available data is a complex task that requires the application of a process rather than key indicators. For example, a “hotspot” that has a very good hospital and therefore few deaths is not practically speaking a hotspot. Priorities must therefore be defined for each context – and this requires reinforcement of the surveillance system rather than a diagnostic approach.
- Quick access to culture capacity is important.
- Weighing cases is hard. The framework proposes a linear approach, but the need to prioritise suggests a non-linear scale may be more helpful. While this was a lively discussion topic during the development process, the conclusion was that simplicity is paramount. Introducing weighting and extending complexity will cause problems: there is a pressing need for consensus, not just analysis.
- The GTFCC must consult with each country and region to ensure that the available data is what we believe it is.
- Even when areas are not selected as per the threshold, there may be other reasons for them to be in the high priority category.
- Many contexts will present challenges regarding completeness and/or availability of data. The final guidance will address how to treat the problem of missing surveillance data.
- The use of geo-mapping approaches to distribute resources will also be considered.

# Coordinated regional cholera surveillance

## Regional cholera surveillance and coordination – state of play and perspectives

***Alexandra Medley**, US CDC*

Coordination of regional cholera surveillance is important because outbreaks are often fuelled by cross-border migration, environmental reservoirs, socioeconomic factors, climate change and political instability – all issues unconfined by administrative borders. Cholera control or cholera-free status in one country is unlikely to be sustainable unless all countries within connected regions aim to prevent cross-border or regional spread. Strong collaboration and coordination between countries, sub-regions, and regions is therefore essential to progress towards cholera control.

This is a new thematic area for the Surveillance working group. A dedicated sub-working group was formed, with active participation of regional stakeholders, to carry out a landscape analysis and decide upon the next activities. This analysis is now the foundation of efforts to strengthen coordination of regional surveillance and develop a related framework and tools. It found high diversity between regions in the nature and number of regional stakeholders, the level of routine implementation of regional cholera surveillance and the operational mechanisms in place. The principles for strengthening coordinated regional surveillance must therefore be to embrace diversity and build on existing mechanisms while maximising engagement with regional stakeholders, and *not* to attempt to harmonize operational mechanisms and processes across regions.

The Framework for strengthening coordinated regional cholera surveillance was borne of this process. It is a stepwise approach designed to help stakeholders develop regional action plans and strengthen core missions in a coordinated way. Building on the landscape analysis, it provides structure but is not prescriptive, and is intended for use by stakeholders of regional organizations. It also encourages integration into multi-disease approaches.

The core missions of coordinated regional surveillance are threefold: to develop, animate, and sustain strong regional cholera networks; to monitor epidemiology and risk at regional level; and to support countries in strengthening national surveillance.

Development of regional networks entails building networks of focal points and points of contact linked by effective communication mechanisms, with multi-directional alert and reporting channels and regular meetings to foster continued engagement and direct communication.

Monitoring regional epidemiology and risk entails timely regional collection of national surveillance data; analysis of that data from a regional perspective and dissemination of the conclusions in regional bulletins; assessment of risk for cross-border or regional spread to guide the provision of assistance in coordinating preparedness and response activities; and the development of guidance for mid- to long-term regional strategies, including movement towards regional cholera-free status.

Helping countries strengthen national cholera surveillance entails assessing and monitoring national capacities and providing technical support accordingly; supporting capacity building for data systems to enable early detection and confirmation of cases; identifying priority areas for interventions (“hotspots”) with regional implications; and supporting information-sharing between cholera-connected countries.

This framework can be implemented in a three-phase approach.

Phase one, self-assessment, consists of identifying stakeholders and their roles, then identifying joint objectives and priorities and assessing progress towards achieving them. These processes would be supported by a stakeholder checklist for objectives and priorities.

Phase two, the development of a regional action plan, requires the region to define core objectives and priorities, develop a plan to fill gaps identified in the previous phase, and develop a monitoring and evaluation (M&E) plan. These processes are supported by templates for the action plan and for M&E.

Phase three, implementation, requires regional coordination of implementation and M&E. Development of tools to support these processes is the subgroup's next priority.

The goal is to create a situation where, by 2030, cholera supranational and national surveillance systems are working with prevention and control teams to achieve and maintain a cholera-free world. The way forward from here is through the expansion of surveillance to regional and global levels and development of tools to support implementation, and requires continuous, active, collaborative engagement of regional stakeholders. The tools in question will include guidance on data and indicators based on the objectives of supranational surveillance; a surveillance governance and data access policy; supranational epi bulletin and dashboard templates; and new tools to identify regional hotspots and cross-border threats.

# Regional experience: Lome Cholera Hub

***Ann Fortin**, WHO*

Dr Fortin described the establishment of a multicountry cholera response body, also known as the "Cholera Hub," in Lome, Togo – chosen for its good transport links with the rest of West Africa – on 5 Oct 2021. The Hub was organised along an Incident Management System (IMS) response structure under the authority of the regional emergency manager. Dr Fortin listed the hub's activities and achievements between October 2021 and March 2022.

The Hub supported five countries (Benin, Cameroon, Niger, Nigeria and Togo) to develop national response plans and IMS structures to deal with outbreaks, with reactive vaccination campaigns conducted in Cameroon, Niger and Nigeria. Over 100 experts were deployed to, or repurposed in, 11 Member States to provide technical support for preparedness and response, and cholera kits and other resources were provided to eight countries at risk of or experiencing outbreaks. Seven countries were helped to complete hotspot mapping using GTFCC tools, and cholera readiness assessments were done in 22 countries using a standardised checklist.

The Hub supported four cross-border meetings for West African countries, and one further meeting between West African countries, the West African Health Organization (WAHO) and UNICEF. USD 10 million was mobilized for preparedness and response (of which USD 3.7 million was allocated to countries); USD 0.3 million was used to conduct six regional readiness workshops for 27 countries; and USD 0.35 million was used to procure cholera and WASH kits for the regional stockpile in Accra, Ghana.

Two trainings on protection from sexual exploitation and abuse were given to 103 experts across 10 Member States, two cholera preparedness and response trainings were given to 18 epidemiologists across 10 Member States, and training material was developed in French and English for in-country teams. Further information products were also published, including Rapid Risk Assessments and information products such as EIS and DONs for countries in outbreak.

Dr Fortin then outlined the Regional Framework for the Implementation of the Global Strategy for Cholera Prevention and Control 2018–2030 in Africa, which set out to reduce by 100% the number of countries

experiencing cholera outbreaks by 2030, reduce Cholera cases to less than 50% of the current level by 2022 and reduce the regional CFR for cholera to less than 1% by 2022. The Hub is evidence of progress: the first such model, it has been successful enough to inspire the establishment of more, including one for yellow fever.

Challenges have included recurrent outbreaks and other humanitarian and health problems pressuring already strained resources, with critical shortages of supplies such as investigation and laboratory kits. Member States have also shown insufficient ownership and political will to respond to outbreaks and, more broadly, to implement the regional framework for cholera elimination. Insufficient closeness to partners has also been an issue. Surveillance-specific challenges have included delayed declaration of outbreaks and difficulty establishing cross-border collaboration; the fact that the region contains multiple, fragmented surveillance systems; limitations to laboratory surveillance; and limited M&E of NCP implementation across the region. There has also been widespread failure to use the GTFCC app in responses: knowledge of the app has been poor. In response, the Hub has held (and will continue to hold) app training workshops and exercises. Twenty-eight countries will be trained in its use by August.

The next steps are to develop a strategy document for next year in the hope of building an even stronger regional platform, both within WHO and with partners. In this context, the GTFCC's work on regional surveillance is welcome: having stronger systems and access to regional data will really help.

# Identification of "regions of cholera transmission:" ontological units of cholera transmission in Africa

***Andrew Azman**, John Hopkins University*

Cholera does not respect national or administrative boundaries. Defining epidemiologically relevant geographic units of transmission is therefore tricky. It is, however, crucial, because it allows assessment of where else is at risk once cholera is circulating in a given area, and is key to regional strategies, including cholera free status.

Epidemiological and genomic data can inform the definition process, but the task is challenged by technical obstacles including under-testing and a consequent lack of clarity around suspected versus confirmed cases; severely limited genomic data; and limited spatio-temporal information on cases and sequences. Data on cholera outbreaks in Africa since 1970 contain several gaps, but what is available does show geographic concordances in lineage, allowing estimation by year of what proportion of cases are likely to be caused by different lineages.

Taking this data as a starting point, the approach is first to fill in gaps in genomic data, establishing or modelling what lineage was responsible for what cases and, in places where cholera was reported, what proportions of cases can be attributed to each lineage. This is currently in progress. Once this is completed, the resulting more "complete" set of genomic and incidence data can be used to estimate the strength of links between areas. Based on these links, clustering algorithms can be used to estimate cholera regions and group countries together.

In step one, models were developed to infer the pandemic V. cholerae lineage in unsequenced country-years using inverse Euclidean distance and correlation in annual cholera incidence between country pairs

as a measure of closeness. The performance of these models was then assessed using the area under the curve (AUC) and leave-one-out cross-validation (LOOCV) methods.

They were found to perform well in predicting co-occurrence of a lineage in country-year pairs, and alternative (multinomial) models have performed well in assigning lineage based on a weighted distance metric.

The next steps in this project are to add new sequencing data as it becomes available and incorporate a distance matrix, based on genetic distance, into the calculations. Predictions from these models and cholera incidence data will then be used to group countries into transmission units.

Proven epidemiological links with which to group countries remain rare, and the examination of concordance of space and time of reported cases remains the most pragmatic approach. There are, of course, huge limitations to both data and methodology. The extent of the estimates will be quantified as much as possible, but this will never be a perfect approach. Some error is unavoidable in current imputation of lineages, though efforts are made to account for this uncertainty by using different models. The ultimate wider goal is not to have to impute at all, and instead to work towards a more standardised framework for regular whole genome sequencing.

# Towards regional and global electronic surveillance

## Global cholera database

***Elizabeth Lee**, John Hopkins University*

Dr Lee gave a short presentation of the Global Cholera Database developed and hosted by John Hopkins University (JHU), which collects observations by "location periods" – i.e. geographic and temporal characteristics. The data therein come in many shapes and sizes from a range of sources, but all are linked to locations and time periods.

This project links incidence, serological and molecular data and risk factor information into a database where it is analysed to produce summary country profiles , burden projections and insights into the impact of control measures.

Dr Lee briefly demonstrated how to use the database and explained some of the data sorting metrics.

Several upgrades are planned for the next few months. These include expansion of external access to data, making it available to GTFCC members and partners interested in incidence data; expanding access to the API; and piloting new dashboard features with partner countries.

There are also some planned internal improvements to improve the back end.

## Official cholera figures reported annually to WHO

***Morgane Dominguez**, GTFCC Secretariat*

WHO's annual cholera reports are based on annual official national cholera figures: number of cases, number of imported cases, and number of deaths. These data must be used and interpreted with caution, for a number of reasons including lack of comparability and possible under-reporting. These data can also only serve limited surveillance objectives, for two main reasons: they are never wholly up to date, because they are published the second semester of the year; and they are insufficiently granular for many surveillance purposes.

However: they are there to be used. They give insight into global and historical coverage going back to the 1950s; they are in the public domain; and they are official. They can therefore be useful in such important activities as documenting general trends and monitoring Roadmap targets. This usefulness will be enhanced by the imminent launch of an interactive dashboard facility that allows additional insight into figures from 2000 to 2020, and which makes all data available for consultation and/or download. While this dashboard has not yet been released to the public (it is currently under review by WHO regional offices and 2021 data are being compiled for inclusion prior to release), Dr Dominguez was able to give a brief demonstration, and to assure the meeting that it is coming soon.

# Perspectives for e-surveillance: strategy for cholera supranational surveillance 2022-2030

***Denis Coulombier**, GTFCC Secretariat*

Dr Coulombier has been developing a strategy for supranational eSurveillance of cholera that follows a simple guiding vision: "by 2030, cholera supranational and national surveillance are working hand in hand to achieve and maintain a cholera-free world." But there are several obstacles to achieving this outcome, including wide variations between country and transmission settings, difficulties integrating epidemiology and laboratory data, the risk of resurgence of large epidemics, conflicting country priorities (particularly during the COVID-19 pandemic), and gaps and difficulties with funding.

The guiding principles for the project are that the strategy should be owned by countries, but should impose a minimal additional burden on them while strengthening national surveillance programmes; it should be language-independent and informative for teams and partners, generating outputs that are fit for purpose; and it should be responsive to threats and adaptive to country profiles.

This project has five objectives, each of which has several targets.

**Objective 1** is to monitor roadmap impact and other supranational strategies, and has four targets.

Target 1 is routine reporting of incident-based cholera data to supranational platforms while imposing minimal burden on countries. This might require establishing a steering committee for supranational surveillance; coordinated definition of supranational indicators and surveillance metadata; definition of metadata for each type of transmission setting using adaptive approaches; and coordinated preparation of functional and technical requirements for supranational surveillance.

Target 2 is to support validation, consolidation, analysis and interpretation of data, allowing for routine production of epidemiological outputs. This requires the establishment of procedures for each step, definition of templates for epidemiological bulletins, specifications for regional and global cholera epidemiological dashboards, and integration into surveillance output data from community sources.

Target 3 is to perform in-depth analyses in partnership with data-providing countries that inform prevention and control strategies. This requires a supranational data access policy for third parties and should be set up to provide pooled data for supranational studies and analyses.

Target 4 is to make supranational surveillance interoperable with that in other pillars, resulting in joint outputs. This will require a landscape analysis of supranational datasets of interest for joint outputs.

**Objective 2** is to monitor priority areas for interventions ("hotspots") and detect and analyse cross-border outbreaks and has two further targets.

Target 5 is to coordinate priority areas mitigation and control strategies across countries to maximize impact and prevent outbreaks from spreading across borders. This requires specifications with which to classify priority areas, and the establishment and maintenance of a data repository.

Target 6 is to detect, investigate and respond to cross-border outbreaks in a coordinated way. This requires development of a tool to establish epidemiological thresholds for detecting alerts at appropriate levels, automated screening of supranational data to detect epidemiological patterns requiring verification, and a set of variables to record and monitor cross-border outbreaks.

**Objective 3** is to integrate epidemiological and laboratory surveillance and has one target (target 7): to link laboratory data to case data, integrate it in national surveillance systems and report it at supranational level. This requires functional and technical requirements for linking epidemiological and laboratory case data, promotion of RDT use and PCR/culture confirmation, supranational monitoring of antimicrobial resistance, and defined requirements for supranational genomic cholera surveillance.

**Objective 4** is to monitor surveillance methods and performance, and has one target, target 8, which is to document surveillance modalities in each country and monitor performance indicators. This requires a set of descriptors for surveillance modalities and monitoring of changes over time, as well as defined performance indicators with thresholds and targets.

**Objective 5** is to maintain a data repository for research purposes, and again has a single target, target 9, to provide authoritative data for research. This requires establishment of a data access policy and a board to review access requests.

The technical aspects of how all this will work are yet to be defined, but the guiding principle will be to reduce the burden on countries. In the weeks following the meeting detailed definitions will be produced for all the information that should be reported into the system. Once these are agreed with countries, the best way to gather the appropriate data can be identified.

## Discussion

A brief discussion period covered several points.

- Similar initiatives for other diseases can be used as examples: there is a meningitis surveillance system for Western Africa and there are other systems for yellow fever and polio. There are many diseases for which this approach is feasible: methods may be different but they are united by the principle of real time data sharing.
- There are still some countries which are reluctant to report cholera for fear of stigma, though this has changed for the better in recent years. Ethiopia and Sudan, previously guarded, are good examples of countries that now report cholera cases openly. The more information is shared, the less stigma there will be.
- “When you have money you go vertical; when you don’t, you integrate:” does the GTFCC have enough resources to “go vertical” when DHIS and other systems that could be integrated are already collecting district level data? While this part of the process is not currently being addressed, and work is focussed on defining what to collect, a standalone vertical system can be expected to fail – even if the resources were available this is not an objective. A series of regional platforms is currently the frontrunning model, but the final choice of technologies will be made by countries. Many countries have already developed good systems, so rather than implementing a new one, the goal is to ensure that harmonized information is correctly collected and channelled.
- Users of the system should include governments. Cholera must be made to be of interest to governments to guide policy development. The tool should be also be seen from an advocacy perspective: non-health people who can support cholera prevention and control must be made aware of the level and extent of their responsibilities. Such stakeholders – including but not limited to WASH authorities and Ministries of Water – should be targeted.
- Mechanisms to collect non-health, cholera-relevant data will be needed. The WASH sector, for example, does not yet have data and indicators, but there are projects happening now that will define these and how they will be collected. There should be an examination of what further information might be relevant to cholera. Improving the use of clinical information, for example, might be valuable, given that it is still not fully understood who is at higher risk of dying of cholera. To this end the project must address the interoperability and integration of different information

sources, with the eventual goal of gaining insight into all relevant information from diverse sources, including data on climate, WASH, migration etc.

# Surveillance Working Group – priorities and workplan

*Epidemiology Working Group chair:* ***Flavio Finger****, Epicentre*
*Laboratory Working Group Chair:* ***Marie-Laure Quilici****, Institut Pasteur*

The **epidemiology** Working Group will work jointly with the laboratory Working Group to continue to develop the revised country level surveillance strategy, including (and not limited to) recommendations for extended RDT use.

Work on regional and global cholera surveillance will focus on completing the draft framework to strengthen regional surveillance, and helping countries develop or improve regional information-sharing approaches built on existing regional systems -without imposing additional burdens. Work will also continue to define a framework for global eSurveillance.

Methodological work on the identification priority areas for interventions will centre on finishing the revised GTFCC framework -including based on new pilots; developing implementation tools and guidance.

Lastly, provided the cholera-free status framework is endorsed by the GTFCC Steering Committee, an independent review panel will be launched.

The **laboratory** Working Group will continue to develop a revised laboratory testing strategy (that includes RDTs), in coordination with the Epidemiology Working Group. Other projects include developing the general guidance for PCR use and the minimum laboratory capacity standards. The draft technical note on environmental surveillance will be finalized and published, and guidance will be developed on AMR.

Technical guidance will continue to be developed. This work includes but is not limited to: translating the culture job aid into French and validating the accompanying factsheet; developing a new fact sheet and SOPs for AMR; and producing a job aid for stool specimen collection. SOPs will also be developed for PCR use.

Country laboratory assessments will be continued -in collaboration with the GTFCC Country Support Platform (CSP) where applicable.

There is a lot of work to do in the coming year and timelines are still to be finalised. The initial approach is to designate leads for relevant topics and meet monthly.

# Closing remarks

***Philippe Barboza**, Head of GTFCC Secretariat*

The fact that country representatives shared their experiences and difficulties so openly in this meeting should be appreciated. The last few years have seen good evolution in how information is shared, and the process is now more lively, more informal and more informative. The amount of work achieved in the past two years is impressive and stems from the massive engagement of many people. The GTFCC is grateful to all its partners.

While all of us have learnt to use digital tools in recent years – and the GTFCC will continue to use them well – the occasional booster of human interaction and communication is important and must continue. Having simultaneous translation in meetings of all types is a great boon in that it enables more people to communicate at ease: this will be continued, and the further and deeper participation of non-Anglophones is encouraged.

All of us know that surveillance is crucial. Robust cholera surveillance informs all cholera prevention and control pillars. Strengthening cholera surveillance is essential to generate a more precise view of where we are and what we need to do and to advocate, generate funds and attract interest in cholera. There is a long way to go, in both the epidemiology and laboratory areas, but things are advancing well.

Thanks are due also to the Fondation Mérieux for hosting the meeting; to Flavio Finger for taking on his new subgroup chairing role; to all the other subgroup chairs; to the GTFCC Secretariat who work to provide a basis for these discussions.

# Annex 1: Agenda

GLOBAL TASK FORCE ON CHOLERA CONTROL

**Meeting of the Global Task Force on Cholera Control (GTFCC)**
**Working Group on Surveillance (Epidemiology and Laboratory)**
**20 - 21 April 2022**

## Wednesday, 20 April

**Morning: Parallel sessions for onsite participants**

| | Experience sharing with countries | Internal Working Group meeting |
|---|---|---|
| **Time** | 09.00 – 12.30 | 09.00 – 12.30 |
| **Room** | Charles Merieux | Simone Merieux |
| **Audience** | Country representatives and other participants attending on-site | Members of the Epidemiology or Laboratory Working Groups attending on-site |
| **Objectives** | Foster experience sharing between countries through guided discussions with a focus on:<br>○ cholera surveillance<br>○ identification of priority areas for interventions ('cholera hotspots') | For Working Group members to reconnect and discuss the ongoing work as well as the way forward (priorities, workplan [Spring 2022 – Spring 2023], working modalities) |
| **Moderators** | ○ Cholera surveillance:<br>D. Coulombier (GTFCC Secretariat)<br>P. Quenel (GTFCC Secretariat)<br>○ Priority areas for interventions:<br>B. Sudre (GTFCC Secretariat) | F. Finger (Epidemiology Working Group chair)<br>M.L. Quilici (Laboratory Working Group chair) |

**Afternoon: Hybrid meeting**

| | Content |
|---|---|
| **14.00 - 14.10** | Welcome, ***Philippe Barboza*** *(Head of GTFCC Secretariat)*<br>Opening remarks: Epidemiology, ***Flavio Finger*** *(Epicentre)* & Laboratory, ***Marie-Laure Quilici*** *(Institut Pasteur)* |
| **Surveillance strategy, moderator Andrew Azman (John Hopkins University)** | |
| **14.10 - 14.30** | Cholera surveillance strategy, ***Andrew Azman*** *(John Hopkins University)* |
| **14.30 - 14.40** | Country experience - Cholera surveillance in Cameroon, ***Linda Esso*** *(MOH Cameroon)* |
| **14.40 - 14.50** | Perspectives to support the extended use of Rapid Diagnostic Tests, ***Antara Sinha*** (Gavi) |
| **14.50 - 15.30** | Discussion |
| **15.30 - 16.00** | **Coffee break** |
| **Cholera free status, moderator Raoul Kamadjeu (UNICEF)** | |
| **16.00 - 16.15** | Principles for the documentation, recognition and maintenance of a cholera free status, ***Raoul Kamadjeu*** *(UNICEF)* |
| **16.15 - 16.30** | Country experience - Cholera surveillance and control in Haiti, ***Katilla Pierre*** *(MOH Haiti)* |
| **16.30 - 17.00** | Discussion |

## Thursday, 21 April

**Morning: Networking between onsite participants & side meetings**

This free morning is to foster networking and to allow for the organization of ad hoc side meetings between onsite participants.

**Afternoon: Hybrid meeting**

| | Content |
|---|---|
| **Identification of priority areas for interventions, moderator Elizabeth Lee (John Hopkins University)** | |
| **14.00 - 14.15** | Revised GTFCC framework for the identification of priority areas for interventions ("cholera hotspots"), ***Elizabeth Lee*** *(John Hopkins University)* |
| **14.15 - 14.25** | Country experience - Democratic Republic of the Congo, ***Placide Okitayemba Welo*** *(PNECHOL)* |
| **14.25 - 14.45** | Discussion |
| **Coordinated regional cholera surveillance, moderator Alexandra Medley (US CDC)** | |
| **14.45 - 14.55** | Regional cholera surveillance and coordination – state of play and perspectives, ***Alexandra Medley*** *(CDC)* |
| **14.55 - 15.05** | Regional experience - Lome cholera hub, ***Ann Fortin*** *(WHO)* |
| **15.05 - 15.10** | Identification of "regions of cholera transmission", ***Andrew Azman*** *(John Hopkins University)* |
| **15.10 - 15.30** | Discussion |
| **15.30 - 16.00** | **Coffee break** |
| **Towards regional and global electronic surveillance, moderator Denis Coulombier (GTFCC Secretariat)** | |
| **16.00 - 16.05** | Global cholera database, ***Elizabeth Lee*** *(John Hopkins University)* |
| **16.05 - 16.10** | Official cholera figures reported annually to WHO, ***Morgane Dominguez*** *(GTFCC Secretariat)* |
| **16.10 - 16.20** | Perspectives for e-surveillance, ***Denis Coulombier*** *(GTFCC Secretariat)* |
| **16.20 - 16.45** | Discussion |
| **Wrap up** | |
| **16.45 - 16.55** | Surveillance Working Group – priorities and workplan : Epidemiology: ***Flavio Finger*** *(Epicentre)* & Laboratory: ***Marie-Laure Quilici*** *(Institut Pasteur)* |
| **16.55 - 17.00** | Closing remarks, ***Philippe Barboza*** *(Head of GTFCC Secretariat)* |