# Global Task Force on Cholera Control (GTFCC) Working Group on Water, Sanitation and Hygiene (WASH)

## Ongoing research efforts

Webinar 03, 13 May 2020

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## Acronyms and abbreviations

| ACF | Action Against Hunger |
|---|---|
| AMR | antimicrobial resistance |
| CHNRI | Child Health and Nutrition Research Initiative |
| CIDRZ2 | Centre for Infectious Disease Research in Zambia |
| CISUR | commonly implemented but severely under researched |
| CORTS | Community Outreach Response Teams |
| COVID-19 | coronavirus disease 2019 |
| CRA | Cholera Roadmap Research Agenda |
| CTC | cholera treatment centre |
| DFID | UK Department for International Development |
| DRC | Democratic Republic of Congo |
| GTFCC | Global Task Force on Cholera Control |
| HDPE | high density polyethylene plastic |
| HWT | household water treatment |
| HWWS | handwashing with soap |
| icddr,b | International Centre for Diarrhoeal Disease Research, Bangladesh |
| LSHTM | London School of Hygiene and Tropical Medicine |
| MSF | Médécins sans Frontières |
| NCCP | national cholera control plan |
| NGO | non-governmental organizations |
| NIH | US National Institutes of Health |
| OCV | oral cholera vaccine |
| RCT | randomized control trial |
| RRT | rapid response team |
| UN | United Nations |
| UNICEF | United Nations Children's Fund |
| USAID | United States Agency for International Development |
| VBNC | viable but not culturable |
| WASH | water, sanitation and hygiene |
| WHO | World Health Organization |

# Note to the reader

This report condenses discussions according to the subjects addressed, rather than attempting to provide a chronological summary. It addresses the themes emerging from wide-ranging discussions among all speakers, and do not necessarily imply consensus. Summaries of presentations and points made in discussion are presented as the opinions expressed; no judgement is implied as to their veracity or otherwise.

## Participants

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7. Johnston
8. Jenala Chipungu
9. Philippe Barboza
10. Robert D'hondt
11. Peter Maes
12. David Olson
13. Catherine Kiama
14. Pierre Fourcassie
15. Albert Reichert
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32. Alexandra Machado
33. Camille Heylen
34. Noor Baya Pwani
35. Nabila Khandaker
36. Thomas Cherian
37. Marianne Gojon-Gerbelot
38. Cindy Grasso
39. Valentina Picot
40. Ibrahim Kabole

This webinar presented ongoing cholera research efforts. It was moderated by **Daniele Lantagne,** Associate Professor of Civil and Environmental Engineering at Tufts University.

## The status of hygiene behaviours for cholera prevention in hotspots in Zambia: targeted action for prevention of cholera

*Jenala Chipungu, Centre for Infectious Disease Research in Zambia (CIDRZ)*

Zambia is a low- to middle-income country in Sub-Saharan Africa with a population of around 17 million that has experienced spikes in cholera since the 1970s, with the most recent outbreak in 2018. Access to water, sanitation and hygiene (WASH) services—including safe drinking water, improved sanitation and functional locations for handwashing with soap (HWWS)—remains sub-optimal across the country, and there is limited evidence on the behavioural determinants of cholera transmission, of which improved understanding is needed as facilities are improved. A range of high-risk behaviours has been determined, in response to which a number of interventions have been selected: HWWS; household water treatment (HWT); and re-heating of food.

In this context, a study has being done to explore the determinants for cholera prevention behaviours. The study method included observations and recruitment at water points; in depth, blinded interviews with household heads to try to understand barriers to desired behaviours; motive mapping to determine psychological determinants for particular behaviours; and semi structured focus group discussions. There are three study sites: an area of islands in Lukanga swamp, wetlands in which a transient population lives on temporal, sometimes floating structures; a rural area on the border with Democratic Republic of Congo (DRC); and Kanyama, the country's largest per-urban area.

Jenala presented three slides summarising the findings around the determinants for HWWS, HWT and food re-heating in these three sites, before presenting the study's recommendations for behavioural interventions around cholera. These were as follows: rather than health benefit messages, theory-driven behaviour change interventions should be used to leverage motives to

drive change. Social marketing campaigns are needed for the props required to perform the desired behaviours (such as chlorine, soap and food storage containers), and backed up with a message of shared responsibility for everyone, rather than a focus on women and girls. Timing of implementations should not be not focussed exclusively on cholera seasons.

## Evidence-Based Targeted WASH Interventions to Reduce Cholera in Hotspots in the Democratic Republic of the Congo and Bangladesh

*Christine Marie George, Associate Professor, Johns Hopkins Bloomberg School of Public Health*

Christine Marie is currently leading four cholera studies that align with the objectives of the Global Roadmap to End Cholera. Beyond their technical goals, all four include partnerships with ministries of health, building local laboratory capacity to inform cholera surveillance, engaging communities to enhance cholera control strategies, and strengthening healthcare systems.

When cholera patients present at healthcare facilities for treatment, their household members are at 100 times higher risk for cholera infections when compared to the general population. This is thought to be because they share the same contaminated environmental sources (such as drinking water), and because of poor hygiene practices in the home. The seven days after the cholera patient is admitted to the healthcare facility constitute the period when household members are at highest risk for subsequent cholera infections, but interventions for this period of high risk are limited.

The first study that Christine Marie presented partnered with the International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b) to develop the Cholera Hospital Based Intervention for 7 Days, or CHoBI7. This is a healthcare facility-initiated WASH intervention whereby a health promoter goes to the patient's bedside in the healthcare facility to deliver a WASH communications module on water treatment, HWWS and safe water storage. This is later reinforced through home visits. In a randomized controlled trial (RCT) of the CHoBI7 programme in Bangladesh this intervention was shown to reduce cholera significantly among household members of cholera patients, and to lead to sustained improvements in household stored drinking water quality and HWWS practices 12 months post intervention.

Building on this, the second study partnered with the Bangladesh Ministry of Health and Family Welfare to develop scalable approaches to deliver the CHoBI7 programme across Bangladesh, using funding from the United States Agency for International Development (USAID); this led to the development of the CHoBI7 mobile health (mHealth) programme. Delivery of WASH through mobile health is a promising approach in Bangladesh, where over 150 million mobile phones are registered with the government and 90% of households have at least one active SIM card. The CHoBI7 mHealth programme builds on the previous version of the CHoBI7 programme by removing the need for home visits. This programme is initiated in the healthcare facility, where a health promoter delivers a WASH communication module to the patient and their accompanying family members, and provides them with a hygiene kit. Patient households are then sent weekly reminders of the promoted WASH behaviours by voice and text message over a 12-month period. The cost of delivering weekly mobile messages to patient households in Bangladesh for a year is USD 2. A recent RCT of the CHoBI7 mHealth programme demonstrated this intervention was effective in significantly reducing diarrhoea and improving child growth in patient households over the 12-month programme period. Results showed that mHealth is a promising, very low cost approach for delivering cholera control programmes.

For the third study, Christine Marie was recently awarded a five-year grant by the US National Institutes of Health (NIH) to evaluate rapid response teams (RRTs) in Bangladesh. This study builds

on the previous studies by expanding the scope of the CHoBI7 programme to include those living in close proximity to cholera patients' households, a population also at very high risk for cholera infections. Again, there is very limited existing work on the effectiveness of interventions targeting those living near patients, and evidence is needed on the effectiveness of RRTs in reducing cholera in this high-risk population. This study will be the first randomized controlled trial of RRTs. After formative research for intervention development, a randomized controlled trial of 3 100 individuals will be carried out, using genomics to investigate the transmission dynamics of *Vibrio cholerae* from water sources and clinical strains.

The fourth study is funded by the Wellcome Trust and DFID and is being carried out in Bukavu in DRC, a cholera endemic area. This study is tailoring knowledge from the CHoBI7 work in Bangladesh to interventions to reduce household cholera transmission in other settings and is ongoing at time of writing. It started with formative research for intervention development and establishment of a laboratory for cholera surveillance, which will be followed by an RCT of a targeted WASH intervention to reduce cholera and the use of genomics to investigate transmission dynamics of *Vibrio cholerae* from water sources and clinical strains. This will be the first RCT of a WASH programme to reduce cholera in an African setting.

## Water, Sanitation, and Hygiene in Cholera Response
***Daniele Lantagne**, Tufts University*

Three years ago, Daniele's team at Tufts carried out a large systematic review of evidence for outcomes and impacts for WASH interventions in outbreaks. Examining over 15 000 documents, this work revealed the evidence base for WASH in outbreak contexts to be thin—high for in water treatment, low for hygiene/sanitation, and low for emergency-only interventions—and mostly clustered around WASH in cholera. These interventions were given a classification: "CISUR," which stands for "commonly implemented but severely under researched."

For the last 2-3 years, the team has worked to fill the gaps in the review, which were found to be in three main areas: laboratory work, fieldwork and policy. The gaps that precipitated further research in the laboratory context were to do with the efficacy of bucket chlorination; the efficacy of household spraying/wiping and household disinfection kits; cleaning of jerricans, cans and taps/biofilm; and fouling in membrane filters. In the field, they were around the effectiveness of water trucking, bucket chlorination, household spraying and household disinfection kits; and hygiene kits, cash transfers and shared latrines. For policy, they were the selection and alignment of interventions, and the impacts of coordination and quality in cholera responses.

For the research on spraying and wiping, existing knowledge gaps beg the question—which has never otherwise been looked at—of whether spraying/wiping with chlorine works to remove cholera from the same surfaces you would expect to see in a home or healthcare facility. Most research to date has been done on stainless steel, but household surfaces are different. This research looked at a range of surfaces (stainless steel, high density polyethylene plastic (HDPE), ceramics, nitriles, tarpaulin, wood, terracotta, foam, cloth and dirt) treated with two different chlorine concentrations, and arrange of exposure times, chlorine types and application methods.

The preliminary takeaway is that spraying until a surface is wet with 0.2% or 2.0% chlorine is efficacious to reduce *vibrio cholerae*, as is wiping with 2% chlorine on most surfaces (though notably not on dirt). Spraying is generally effective across surfaces, with a good reduction of cholera and no difference by chlorine type, no real difference between 0.2 and 2% concentrations, and very little difference between one and ten minutes contact time. Foam, cloth and dirt, however, are much harder to clean, and a lower concentration is not as good on these surfaces—and might need longer contact time.

Wiping, is very different, with big differences for different methods, concentrations and surfaces.

The research then went into household spraying programmes in DRC and Haiti and conducted interviews and observations to map a range of real-world results for detection of *v. cholerae* on different surfaces in households. The most effective programme sprayed surfaces systematically until they were wet.

In conclusion, spraying can reduce contamination on household surfaces if implemented properly. Intervention coverage is limited, however, as it does not address asymptomatic and/or community cases, and so one key challenge is to identify the correct households for the intervention. VBNC (viable but not culturable) *v. cholerae* was also not detected in this work, and their relevance remains unclear.

The recommendations that emerged were to use a systematic procedure ensuring complete coverage and spray until the target surface is thoroughly wet. For cholera control, treating kitchen areas is critical. The approaches that increase community coverage should be prioritized, and household spraying opportunities should be leveraged for hygiene promotion. Finally, sprayers should be equipped with phones and/or radios, and should travel with patients' relatives.

This project was presented as an example of an approach that can—in accordance with the Roadmap—bring together laboratory and field effectiveness work to aid policy, all based on the gaps identified in the large systematic review.

## Prevention and control of cholera with household and community WASH interventions: a scoping review of current international guidelines

*Lauren D'Mello-Guyett, London School of Hygiene and Tropical Medicine & Médecins Sans Frontières (MSF)*

To date, there has been no review of practical guidelines for cholera prevention and control programmes. In this study, a team at the London School of Hygiene and Tropical Medicine (LSHTM), Médecins Sans Frontiers (MSF) and UNICEF performed a systematic search of international WASH intervention guidelines in use in cholera programmes in endemic and epidemic settings. The recommendations in these guidelines were extracted, categorized according to predefined criteria for WASH interventions, analysed for consistency and concordance, and classified according to whether the interventions were targeted within households or at community-level transmission.

Eight international guidelines for cholera prevention and control are in current use: three come from non-governmental organizations (Oxfam 2012, Action Against Hunger/ACF 2013 and Médécins sans Frontières/MSF 2017); one from a non-profit organization, Sphere (2018); three from multilateral organisations (WHO 2004, UNICEF 2013 and a pre-press copy of GTFCC 2019); and one from a research institution (icddr'b 2018).

From all these, 95 distinct recommendations were identified across all categories of WASH interventions. Consistency and concordance among guidelines was poor. Six interventions recommended in the guidelines are explicitly not recommended for cholera control (all of these involved the use or distribution of chemicals). In terms of transmission, 45% of recommendations targeted community-level transmission, 35% targeted within-household transmission, and 20% targeted both. No single guideline included all recommendations or collated all available guidance, and interpretation of these guidelines may be difficult, particularly where recommendations are omitted or where they contradict one another. Guidelines should more explicitly consider strength

of evidence, efficiency and feasibility criteria when recommending different candidate WASH interventions.

The study produced a number of recommendations. Considering the different phases of cholera outbreaks, WASH interventions should target human-to-human transmission within the household and at community level for outbreak control, and environment-to-human transmission at a community level for cholera prevention in recurrent settings and areas where reinfection during outbreaks is likely. The number of different available guidelines should be limited, and the recommendations made more focused. Greater specificity is required in the language of the recommendations (e.g. specifying timing of responses, required coverage, minimum levels of service and modality of delivery). Programme evaluations and practice literature should be published or made available in order to strengthen the evidence base for guideline development, support national cholera control plans as part of the Global Roadmap for Cholera Elimination by 2030, and standardize approaches to development—including by considering the evidence base, whether from studies, programme evaluations or models, when deciding which interventions to recommend.

## Optimization of WASH and Cholera Research
*Monica Ramos, WASH Working Group Coordinator*

The GTFCC, the Wellcome Trust and DFID hosted a research meeting in July 2018 to identify six priority areas for the WASH Working Group. These are as folllows:

1. Commonly-implemented, severely under-researched (CISUR) areas
2. Community outreach response teams (CORTS) (formerly RRTs and CATI)
3. Minimum WASH packages for response
4. OCV and WASH synergy
5. Behaviour and practices motivators and barriers
6. Programmatic learning for integrated response for control and elimination.

This precipitated an 80-day CDC-funded consultancy effort by Epilinks, under the leadership of UNICEF, to outline a harmonized research plan that would guide and prioritize WASH and cholera research, and support advocacy and resource mobilization. This consultancy conducted a mapping of existing, ongoing and planned research and identified and prioritized knowledge gaps; developed a funding and advocacy plan; and developed a monitoring and accountability framework.

The first stage was a literature review of 62 publications. The search period was 2015-2019 and key words or phrases included "WASH," "cholera," "diarrhoea," "child health," "behaviour," "behavioural," and "policy." This was supplemented by 19 key informant interviews with members of the WASH Working Group involved in research, to explore research gaps further. The literature review and interviews identified 72 existing, ongoing or planned research projects, which were then mapped and analysed to remove duplication. This process identified 101 research gaps and 39 knowledge gaps across all priority areas. This information was shared with the GTFCC for inclusion in the development of the broader research agenda being supported by the Wellcome Trust through a consultancy with mmGlobal Health.

## Cholera Roadmap Research Agenda (CRA) using the Child Health and Nutrition Research Initiative (CHNRI) Methodology
*Melissa Ko*

Melissa underlined the important role that research can play in shaping policy with an example from

Kenya, where, despite existing evidence that zinc can help manage and prevent acute diarrhoea, community health workers used not to be allowed to dispense it to children. A research project trained and supplied community health workers with zinc and ultimately demonstrated impact in a large population in Homa Bay, eventually resulting in a change of national policy.

With such possible impacts in mind, a Cholera Roadmap Research Agenda is being developed in coordination with the GTFCC and Wellcome Trust, using the Child Health and Nutrition Research Initiative (CHNRI) methodology. With the launch of the Cholera Roadmap, it is important that the most impactful research is prioritized to help countries meet their Cholera Roadmap goals.

The Cholera Roadmap Research Agenda aims to act as a strategic guide for researchers, donors and decision-makers, and will outline a "to-do" list of research priorities, considering each pillar of the Roadmap and the full breadth of cholera research.

The CHNRI methodology was developed between 2005 and 2008, through numerous consultations with experts and researchers across the globe. Since then over 50 CHNRI exercises have been conducted and their results published. Melissa provided some examples of published articles, indicating the variety of topics and perspectives that have been considered. Prior to the CHNRI methodology, the prioritization of research activities was not transparent or easily replicable, and nor was it democratic, because it relied on discussions within a small group of experts. In contrast, CHNRI was designed to be: (i) consultative, as it involves all stakeholders and employs crowd-sourcing; (ii) replicable, as it develops a process that can be openly monitored and repeated; (iii) transparent, with clearly defined criteria and the ability to produce simple, intuitive, and quantitative outcomes; and (iv) comprehensive, as all types of research can be included and evaluated within the same framework.

Phase One of the development of the Cholera Roadmap Research Agenda was completed in April 2020 via interviews and surveys to collect input and feedback on barriers to implementing the Roadmap, and the potential criteria for prioritizing research. Information collected in Phase 1 is currently being used to define the context, develop a comprehensive list of questions, and finalize the criteria and weights. This will be completed in June. From July to September, the cholera community and its stakeholders will score each of the research questions, after which the project will analyse the scores. The Cholera Roadmap Research Agenda will be launched by early 2021.

This presentation ended with a high-level overview of the results of the interviews and surveys. 138 individuals located were consulted across in 32 countries, resulting in the collection of an additional 300 research gaps across all the Roadmap pillars. These research gaps were compared against those submitted by the GTFCC working groups and collated into 95 unique research questions. Finally, based on the feedback, the criteria were ranked by level of importance, with Relevance and Impact ranking as the highest criteria, followed by "Implementability" and "Answerability." "Fundability" was given the lowest level of importance in the interviews and surveys.


# Q&A

A short period of general discussion raised the following themes:

- The Uvira project in DRC is looking at the impact of improvements in water supply treatment networks, and will be linking up with the cholera vaccine working group to see how the implementation of oral cholera vaccine (OCV) changes the cholera epidemiology of the area.

**Chlorine use**

- The question was raised of whether HWT behaviours in Zambia are related to the use of chlorine alone, or whether they involve newly adapted products such as Aqua Salveo. Chlorine is the most available product, and others are not as common; it is also preferred by users because it is easy to use. The Zambian study did not see anyone use any other form of treatment—even boiling was considered too inconvenient. It should also be remembered that some products, such as Aqua Salveo, might be effective to treat water, but not necessarily to prevent cholera, which has other pathways for transmission.
- The feasibility of procedures is an important consideration: for example, with regard to spraying, the use of 2% Chlorine solution in sensitive spaces such as kitchen/hospitals is not advisable given the strength of the concentration—even if it is shown to be more efficient than 0.2%.
- Household spraying is often recommended in national protocols even though it is not in international guidelines.


**Guidelines**

- Work is ongoing to streamline and crosscheck the various international guidelines. The LSHTM team is in discussion with the international agencies that publish those guidelines about the possibility of updating them using the recommendations from the research.
- There is great disparity between the recommendations that international and local staff tend to use, so it is encouraging that the incorporation of national guidelines into the harmonized recommendations is being discussed.


**Use of prophylactic antibiotics in cholera response**

- Christine-Marie George was asked whether the John Hopkins DRC study had considered adding the use of prophylactic antibiotics in patients' households, a practice supported by the National Cholera Programme. This has not been included. However the evaluation of rapid response team core programming has been subject to ongoing discussion about the incorporation of prophylactic antibiotics, with both MSF and LSHTM working on it.
- There has also been discussion of antibiotic inclusion in the study in North Kivu in which UNICEF is working with provincial health authorities to activate rapid response teams. DRC does have an issue with antimicrobial resistance (AMR) and there is so far no clear recommendation from national authorities on antibiotic use, so inclusion in the study might be complicated.

**Rapid response teams**

- A number of other activities are happening, or have happened, around RRT evaluation. One 2018 project looked at hygiene distribution (like the CHoBI7 approach) in DRC, and two related papers, by LSHTM & MSF, will be coming out shortly. The UNICEF work in north Kivu has started but is on hold at time of writing because of COVID-19; the hope is to restart it soon and possibly expand throughout DRC. The next proposed step is a health impact evaluation, which has been discussed with Christine Marie George at Johns Hopkins, and is hopefully also going to be done in South Kivu; this will first look at performance; then at the impact on households surrounding cases. There is a great deal to be done on this strategy in order to meet the main research needs on this topic. UNICEF has also conducted a cost versus results comparison of RRTs between three or four cholera outbreaks.

**Hygiene kits**

- There was some discussion around the content of hygiene kits for cholera. The content is not standardized; they differ in different places, tailored to each setting through formative research. Some work has been done on this: a 2018 study in DRC looked at MSF's response to cholera outbreaks and the kits used at point of admission from cholera treatment centres in districts; households were followed up seven days later to examine the effect on symptomatic cholera infection, self reported diarrhoea, and food and water contamination in households. Analysis is being finalised at time of writing and results are positive, showing a reduction in symptomatic infection. The second component of this work (to be published by LSHTM & MSF) is a parallel process evaluation to improve understanding of the implementation, context and wider reception of the programme and the kits as part of a larger cholera response.
- The term "hygiene kit" is widely used, but often to mean different things. The UNICEF-led cholera response calls them kit "cholera kits" instead, as UNICEF has many other WASH/"hygiene"/"dignity" kits in different contexts, and the "cholera" kits focus specifically on helping block the most likely transmission routes within households. Arguably, the most important consideration, rather than naming, is to know what items are included, and to be able to justify each one.
- With that in mind, however, feedback from female users in some countries suggests that the term "dignity kit" is best avoided, as it implies a lack of dignity without a kit.
- There is very little research on kits—and much of the research that does exist is actually moving away from distributing kits to distributing cash. This whole area is CISUR; but research is being developed, and there is a real need to align on "when to think about cash versus vouchers versus kit distribution versus what's the point of it all." The question of cash is an important one, and the existing work in this area is being led by partners who more economic than public health researchers. There are very interesting links to explore here.

# Concluding remarks

While there is a desire across the GTFCC stakeholders to resume face-to-face meetings, this webinar series has shown that alternatives are possible. An evaluation form will be circulated soon.

It is always a salutary lesson to be reminded of how little we know about transmission routes and preventive practices for such an old disease, and it is crucial as we seek to improve out basic understanding of people's behaviour that the GTFCC and the Roadmap continue to put communities and individuals at the centre of our interventions.