
9th Emergency Environmental Health Forum Report

18-19 JULY 2019



Contents

Acknowledgements	3
Executive Summary	4
Opening address	6
Key Note Speech: Disease outbreaks and their control	7
Panel Discussion: Capacity of the WASH Sector in epidemic and pandemic response	9
Plenary 1: Cholera - prevention and preparedness	12
Plenary 2: Handwashing, acceptability of interventions and community engagement	16
Plenary 3: Cholera - control and containment of outbreaks	23
Plenary 4: Hepatitis E and vector control	30
Plenary 5: Faecal sludge management and sanitation	37
Plenary 6: Household water treatment and safe storage	44

Acknowledgements

The 9th Emergency Environmental Health Forum (EEHF) was convened by Oxfam, International Committee of the Red Cross (ICRC), International Federation of Red Cross and Red Crescent Societies (IFRC), International Rescue Committee (IRC), Action Contre La Faim (ACF), Médecins Sans Frontières (MSF), CARE International, the United Nations Refugee Agency (UNHCR) and the United Nations Children’s Fund (UNICEF).

The event was supported by the Swiss Agency for Development and Cooperation (SDC), Global WASH Cluster, the London School of Hygiene and Tropical Medicine (LSHTM) and the participants of the EEHF.

We would like to thank Astrid Hasund Thorseth (LSHTM) for rapporteuring and writing the event report. We would also like to thank Aliocha Salagnac for all of their help preparing event materials and organising the venue.

Special thanks go to the EEHF Scientific Review Committee members:

- Andy Bastable (Chair), Oxfam
- Dominique Porteaud, Global WASH Cluster, UNICEF
- Tracy Wise, OFDA/USAID
- Will Carter, ICRC
- Oliver Cumming, LSHTM
- Murray Burt, UNHCR
- Lauren D’Mello-Guyett (Coordinator), LSHTM
- Robert Gensch, GTO
- Tim Grieve, UNICEF
- Liz Walker, IRC
- Nick Brooks, CARE International
- Peter Maes, MSF



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra





Executive summary

The 9th Emergency Environmental Health Forum took place from 18th -19th 2019 in Geneva, Switzerland. It brought together water, sanitation and hygiene (WASH) experts from organisations such as Action Contre la Faim (ACF), CARE International, Centers for Diseases Control and Prevention (CDC), the International Rescue Committee (IRC), Médecins Sans Frontières (MSF), Oxfam, the Red Cross/Red Crescent Movements (ICRC, IFRC), Save the Children, UNHCR and UNICEF as well as academic experts from institutions such as the London School of Hygiene and Tropical Medicine (LSHTM), Tufts University, University of Barcelona, International Centre for Diarrhoeal Disease Research Bangladesh (ICDDR'B), John Hopkins University and EAWAG. The private sector was also in attendance and represented by Aquatabs™, ARUP, FairCap and RealRelief. The forum provided an opportunity to exchange recent field experiences and explore innovative approaches amongst over 110 attendees and discuss ways for future action and interventions for WASH in emergencies.

This year's EEHF explored the themes of:

- Cholera prevention and preparedness
- Handwashing, acceptability of interventions and community engagement
- Cholera control in outbreaks
- Hepatitis E detection and vector control
- Faecal Sludge management and sanitation solutions
- Household water treatment and safe storage

With increasing numbers of vulnerable populations- both politically and environmentally- there is a need for effective use of interventions to greater impact the health of those affected. The EEHF highlights the need for a stronger link between WASH and Health.

In conclusion, there is a need:

- To build and improve communication between WASH and health sector practitioners;
- To build the evidence-base in outbreak prevention and preparedness programmes;
- To record, report and disseminate good and bad experiences to the humanitarian audience;
- To generate research questions at a practice, policy and research level for humanitarian WASH;
- To build new partnerships with donors, practitioners and researchers for research delivery.

All presentations and supporting documents can be found at:

<https://www.sharesearch.org/research/eehf-2019-presentations>



Opening Address

The 9th EEHF was introduced by Andy Bastable (Oxfam) who recalled the event's establishment through the informal Interagency WASH group. While previous forums have been technical focussed, the aim has been to steer the conversation more towards WASH in public health, a goal the EEHF are close to achieving based on the increasing number of academics and health professionals present at the conference. Under the umbrella objective of the forum to bring together research and fieldwork experiences to establish how current field practices can be improved, the focus this year was disease outbreaks, moving from endemic and epidemic cholera outbreaks onto a variety of other disease outbreaks, such as malaria and typhoid fever. He noted that the event is an excellent opportunity to disseminate recent information on the topic and to meet fellow WASH practitioners, academics and members of the private sector.

Objectives of the EEHF:

-  To share new research and learning
-  To discuss new approaches and innovation in the sector
-  To bridge silos between WASH and other humanitarian sectors
-  To identify research gaps in the emergency environmental health sector

The EEHF coordinator, Lauren D'Mello-Guyett, presented some key socio-demographic data for this year's EEHF participants. The presenters were made up of 18 women and 11 men. Out of the 110 participants, 38% were women and only 4 participants were under the age of 30. There was a lack of participation of nationals from countries we operate in and only two countries were represented and included Bangladesh and Yemen.

The EEHF recognised a lack of participation from nationals in countries we operate in. The forum was unanimous in wanting to make the event more accessible by next year holding the event in Africa or Asia, as well as to distribute the event invitation further and encourage participating organisations to send representatives from their country programmes.



Disease outbreaks and their control

This year's key note speech was delivered by the Lead of the Global Task Force on Cholera Control, Dr Dominique Legros. Dominique elaborated on the topic of disease outbreaks and their control starting with the key elements of success for control of infectious disease outbreaks in the Northern hemisphere, including:

- Advances in diagnostic and health care practices
- Development of vaccines and antimicrobial agents
- Early warning systems, for quick response and containment
- Implementation of prevention programmes
- Investments in water, sanitation and public health systems.

In outbreaks of Tuberculosis from 1855 to 1955, including outbreaks during World War 1 and World War 2, reported trends of reduced mortality was always visible before treatment was administered and the decline was attributed to better nutrition and WASH. Containing disease outbreaks is not only about medicine and treatment, it is attributed to a number of factors.

Outbreaks are destructive in nature. Dominique provided an example from the yellow fever outbreak in China in 2016 where the stockpile of vaccines were exhausted and other routine vaccination systems crashed for several months as the stockpile could not support an outbreak and the lack of preparedness to new outbreaks had several consequences.

A limited capacity to prevent outbreaks has major impacts on containment of disease transmission. It is critical that we reinforce control and prevention, and the case of cholera outbreaks today is the sad example of how unprepared we are. Improved WASH prevents and slows down outbreaks of cholera, as well as typhoid, dysentery and other diarrhoeal diseases. By strengthening people's access to services, which we all understand is a basic human right, we won't struggle with environmental diseases to the same scale every again. Dominique's take-home message underlined to importance of long-term investment in WASH prevention programmes.

**Six key
components
to reducing the
burden of outbreaks
of infectious diseases**

1. Effective surveillance and response systems
2. Strong health systems
3. Access to vaccines and medicines
4. Workforce capability
5. Effective prevention programmes
6. Investments in water, sanitation and hygiene

Capacity of the WASH sector in epidemic and pandemic response

The EEHF was kicked off with a panel discussion on capacity of the WASH sector in epidemic and pandemic response. The discussion was chaired by Dominique Porteaud (Global WASH Cluster Coordinator, UNICEF) and panellists were Monica Ramos (UNICEF/GTFCC), Eva Niederberger (Oxfam), Claudio Deola (Save the Children), Jean Francois Fesselet (MSF), Linda Doull (Global Health Cluster Coordinator, WHO) and Dominique Legros (GTFCC).

Question 1

What are the specific risks and activities associated with epidemic and pandemic response which are clearly the responsibility of the WASH sector? Or is this clear?

Eva explained that the responsibilities are sometimes unclear due to an unorganised overlap between the WASH sectors and health sector. With these two sectors operating in parallel without collaboration to achieve control in an outbreak setting, it's harder to slow down transmission. Claudio followed up underlining that in each outbreak we need to ask ourselves what is the main threat to health in this situation and how WASH can help. We are responsible for control of diseases that are a waterborne and as a sector we should be held accountable to respond effectively to outbreaks of diseases with these transmission routes. But to measure effectiveness is difficult. We could measure our response based on the number of latrines built per person. However, these measures may not be useful in emergency contexts. Another option could be to measure uptake of behaviour - although the question here still remains; "How do we measure behaviour?"

Dominique L. shared an example of failed response in an outbreak setting in South Sudan. Poor sanitation led to open defecation at health facilities. He stressed that if we cannot ensure that the point where people receive care has adequate WASH, then what are we accountable for in this sector. He followed up saying that it is unacceptable that health care facilities are the source of transmission. Linda referred to a recent review of the separate WASH and Health Cluster responses to a cholera outbreak. The findings included complete confusion of leadership between Ministry of Health and lead agencies within the clusters. As a result they experienced a disempowered MoH, failing responsibilities on coordination rather than operational and a lot of time solving problems resulting from the confused outbreak response.

Question 2

What actions do you know of – from your agency or others- that allows us to be better or more prepared to respond to disease outbreaks?

Save the Children have seen more successful response when their teams consist of individuals with overlapping professional competencies. This have helped bridge the gap between health and WASH, improving surveillance, community engagement and implementation of interventions. Claudio urged the sector to take up the One Health approach to improve multisectoral and collaborative outbreak response. Dominique L. mentioned that outbreak response is often delayed even with early detection leading to missed opportunities of containment at the beginning. Examples of this included the pandemic influenza in 2009 and the 2014 Ebola outbreak. The panel highlighted the urgent need to map and measure the capacity of government, partners and organisations in country, so that when an outbreak is detected and confirmed we can support their response instead of waiting for delayed international support. Linda shared that recently WHO have a similar mapping in a few countries, and they now hold data on technical expertise, health facility hygiene management, vector control capacity and more. An issue they faced was to get honest responses on the true capacity of organisations in country. Monica highlighted the importance of seeking partnerships in country in areas prone to outbreaks so that you have the necessary expertise to handle an outbreak. Eva shared examples reflecting the issue of lacking such a response; currently in Yemen (5 years into the conflict) they still do not have a good understanding of water infrastructure in key districts affected by WASH related diseases although multiple humanitarian actors are present in country.

Tom Heath (ACF) asked for the panels perception of field WASH staff's capacity to engage with Health sector. Robert Fraser (IFRC) shared on the positive experiences of IFRC including the WASH team as a part of the Health team. He was shocked at recent statements from health colleagues saying they don't do WASH as they are a humanitarian health organisation. The panel supported his statement, highlighting the importance of structurally and conceptually merging WASH and health. Overall, the theme of strengthen the bond between health and WASH came up repeatedly in the panel discussion.

Question 3

Does GTFCC believe that regional cholera platforms such as ESAR and WCA have a positive role to contribute in GTFCC road map on the mid-long term?

Dominique L. responded that the GTFCC wants to build on existing platforms and partnerships as the core of the roadmap is countries in the driving seats of their own cholera response plans. Jeff answered a question from the audience on how to make a case for stronger prevention measures to reduce number of outbreaks. MSF is well experienced with the financial burden of responding to outbreaks every year, and more effort needs to be taken by international agencies to collate this data response cost and compare it to prevention cost to strengthen the case for funders and government to invest in prevention and preparedness instead of response and containment of outbreaks. Monica followed saying we currently are not on the path to achieve SDG 6 - Clean Water and Sanitation for All. She invited her humanitarian colleagues in the room to have their organisations speak out about the realistic costs of reach this goal. Currently UNICEF and GTFCC are supporting countries to develop realistic cost effectiveness plans including health economists who are brought on board to help avoid estimates and make accurate social, institutional and environmental cost figures. Health for all has a BIG price tag.

To end the debate, Dominique P. concluded two main themes that emerged:

1. We need to acknowledge that we have to improve our response to epidemics and pandemics. Specifically, we must map which actions should be prioritised or already in action among NGOs, NPOs and UN agencies.
2. We need to create a facilitating environment to encourage communication and collaboration between the WASH and the Health clusters.



Cholera hotspots: bridging outbreak response to long term investment in cholera control and elimination



Authors and affiliations: Kate Alberti

Global Task Force on Cholera Control

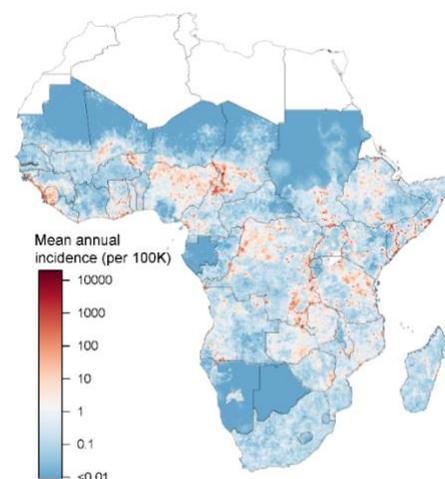
The global burden of cholera remains unacceptably high with 2.9 million cases and 95 000 deaths estimated yearly. Kate Alberti (GTFCC) introduced *Ending Cholera: A Global Roadmap to 2030* that was launched in 2017. The roadmap provides a multisectoral framework to reduce cholera deaths by 90% globally, and to achieve cholera elimination in up to 20 countries by 2030. Kate highlighted that recognition that cholera is not just a disease, but a symptom of a broader set of social, economic and political conditions is essential to the successful implementation of the strategy. The strategy is built on 3 main axes:

AXIS 1 Early Detection and immediate response to outbreaks

Early detection and rapid response to ensure immediate containment of outbreaks.

AXIS 2 Hotspot Approach

Cholera ‘hotspots’ are indicators of populations who are underserved, and lack basic infrastructure. Recent work by GTFCC partners has shown that 110 million people live in hotspots in sub-Saharan Africa. Recurrent cholera outbreaks are often predictable because they develop in and spread from hotspots. Investment Case based on the Ending Cholera Roadmap has recently been conducted to demonstrate the costs and long-term benefits of investing in cholera hotspots.



Cholera Hotspots in Africa 2010-2016. Source: A. Azman and J. Lessler, Johns Hopkins University

AXIS 3 GTFCC as an effective coordination mechanism

Targeting multi-sectoral preventive interventions against cholera in hotspots will prevent outbreaks and save lives, while decreasing emergency spending with benefits extending beyond cholera. The Investment Case provides the first comprehensive estimates of the staggering health and financial benefits generated by successful implementation of the Roadmap. The humanitarian community can contribute to the Roadmap both by responding rapidly and successfully to outbreaks, but also by advocating for long term control in the aftermath of outbreaks, effectively bridging preparedness and response with prevention and control.

Cholera in Yemen: a case study of preparedness and response in a conflict-affected state

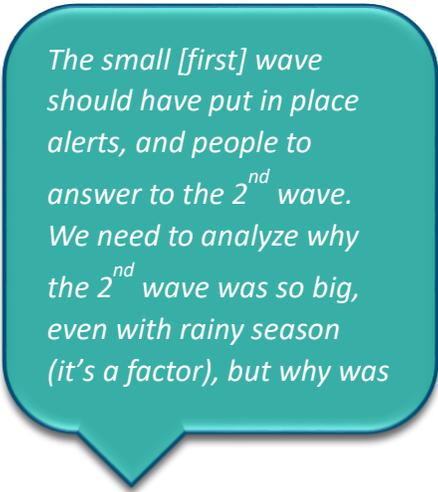
Authors and affiliations: Ruwan Ratnayake², Daniele Lantagne³, Nora Hellman¹, Mija Ververs¹, Moise Ngwa¹, Paul H. Wise⁴, Paul B. Spiegel¹

¹Johns Hopkins Center for Humanitarian Health, ²London School of Hygiene and Tropical Medicine, ³Consultant Public Health Engineer, ⁴Stanford University

From September 2016 to March 2018, approximately one million cholera cases were reported during two epidemic waves in Yemen. Daniele Lantagne (Tufts University) presented, on behalf of Ruwan Ratnayake (LSHTM), on the lessons learned across sectors to inform cholera control in emergencies. Their methods included a review of global and Yemen-specific cholera guidance, interpretation of surveillance data, and key informant interviews with practitioners on preparedness, surveillance and laboratory, case management and malnutrition, WASH, oral cholera vaccination (OCV), coordination, and security.

They included 114 documents and conducted 71 key informant interviews. From the start, a cholera preparedness and response plans were absent in Yemen. Airstrikes had damaged health and water systems, risking infection. Once detected, the Cluster System quickly developed a response plan, but it did not prioritize foundational actions (e.g., expanding culture capacity and hotspot analysis to guide the response). While the early warning surveillance system detected the outbreak, it could not be expanded to support outbreak-level data management and lacked laboratory trends. In the field, WASH emphasized system support over activities to interrupt cholera transmission until late in the second wave. Case management remained centralized, missing opportunities for rehydration in remote locations. OCV was not incorporated into the initial response plan, slowing consensus on its use. Coordination involved the Clusters, a cholera task force, and incident management system, but without direct complementarity. Near the peak of the second wave, several missing elements (e.g., cholera-specific WASH strategy, rapid response teams, robust data management, OCV) were rapidly initiated at scale.

Despite regional endemicity and conflict, cholera preparedness was a missed opportunity in Yemen. This weakened early response planning which provided the foundation for the response. Conflict-affected states, donors, and humanitarian partners must invest in preparedness planning and resourcing to rapidly contain small outbreaks.



The small [first] wave should have put in place alerts, and people to answer to the 2nd wave. We need to analyze why the 2nd wave was so big, even with rainy season (it's a factor), but why was

? QUESTIONS PLENARY 1

The Q&A session was chaired by Robert Fraser (IFRC) and respondents were Daniele Lantagne and Kate Alberti.

The first question was directed at Daniele and asked her to elaborate on their sample and whether local Yemeni actors had different perspectives on the outbreak in comparison to international responders. Daniele highlighted the main difference from three interviews with Yemeni NGO employees. Whereas Yemenis can freely travel around, foreign staff could not and this slowed down the response. Secondly, Yemeni staff felt that money was wasted in response as grants were given to organisations that were not able to respond with house-to-house on the ground campaigns. An important lesson from this context was that money and information should in insecure settings be transferred to the organisation that's most likely to have the most effective response. There's a strong argument for localisation of response, with international actors advising remotely.

Michelle Farrington (Oxfam) asked the panel about defined WASH prioritise when responding to a cholera outbreak in a hotspot. Daniele responded that the priorities should be to 1) break transmission in case households through household level interventions, 2) expand community engagement to nearby households and 3) Safely managed water sanitation and hygiene.

Picture (Under): Cholera Treatment Centre. Source: WHO





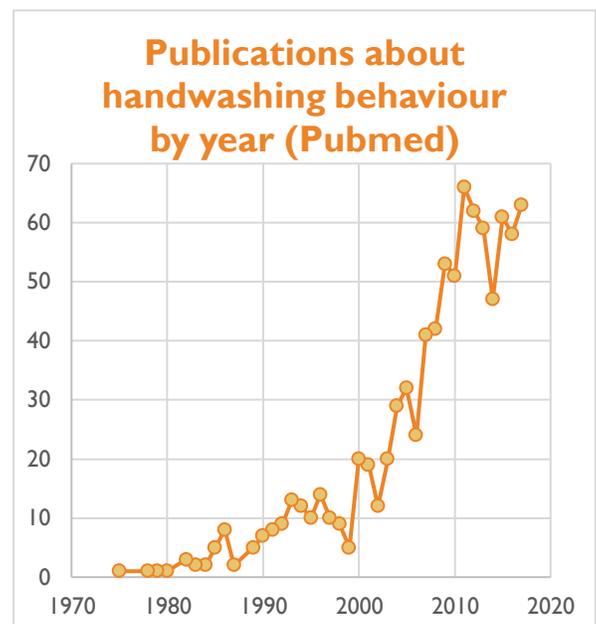
2

**HANDWASHING, ACCEPTABILITY
OF INTERVENTIONS AND
COMMUNITY ENGAGEMENT**

Determinants of handwashing behaviour: a summary of evidence from stable settings, outbreaks and crises

Authors and affiliations: Sian White
London School of Hygiene & Tropical Medicine

Handwashing with soap is recognised as a cornerstone of public health and disease control. Sian White, a Research Fellow at LSHTM, conducted a systematic review with three aims: to define and categorise the determinants that influence community-level handwashing behaviour; to appraise the quality of evidence around each behavioural determinant so to inform hygiene programming; and, further research to assess how the determinants of handwashing behaviour may differ between stable settings, disease outbreaks and crisis contexts.



The review highlights major limitations in the quality of evidence around the determinants of handwashing behaviour. It also highlighted a number of ‘quick wins’ for practitioners including how education and knowledge transfer about disease has no effect on handwashing while the presence of a desirable and convenient handwashing facility dramatically improves handwashing rates. Research on handwashing determinants during disease outbreaks tended to be theoretically biased with studies narrowly focusing on risk perception, rather than considering a range of factors that may influence handwashing behaviour. There is a paucity of evidence around the determinants of handwashing in other crisis contexts, making it hard to develop consensus at this stage.

KEY OUTCOMES

We still know very little about what determines our behaviour but improving handwashing facilities can drive improved handwashing.

Improving children's handwashing through play: a proof-of-concept study in an IDP camp

Authors and affiliations: Julie Watson¹, Robert Dreibelbis¹, Robert Augner¹, Claudio Deola², Katrice King², Susan Long³, Rachel Chase⁴ & Oliver Cumming¹

¹London School of Hygiene and Tropical Medicine, UK. ²Save the Children, UK. ³Field Ready, USA. ⁴Johns Hopkins Bloomberg School of Public Health, USA.

Julie Watson (LSHTM) shared the results of a study evaluating an unconventional handwashing intervention for children in humanitarian crises. In 2018, they designed and tested, for the first time in an emergency setting - a novel soap designed to motivate children's handwashing through play and curiosity. Toys were embedded inside of transparent soap and delivered to children in short, fun household sessions with no health-based messaging. The hypothesis was simple: children would wash their hands more often to reach the toy inside.

They tested this intervention in a controlled before-after study in a refugee camp in Iraq. Out of five total blocks within the camp, one was assigned to intervention and one to control. 40 households from each assigned block were then randomly selected for participation. Handwashing with soap (HWWS) at key occasions was measured at baseline and four weeks after intervention delivery. Children in the intervention households received the toy soap intervention and no health-based messaging and the control group received plain soap in a standard, health-based, household session.

At the 4-week follow-up, children in the intervention group were 4 times more likely to wash their hands with soap after key occasions compared to the standard intervention and based on comparison to the control group (adjusted RR = 3.94, 95% CI 1.59-9.79). They show that this rapidly deployable intervention can improve child handwashing behaviour in a humanitarian emergency and may be a valuable tool for use in disease control.

Future research on this topic might aim to answer: Can this intervention work in more challenging humanitarian contexts such as acute emergencies and in lower income settings? Does this intervention lead to habit formation over time? And lead to any short- or long-term health benefits? Julie shared that the study design is easily replicable in emergency context and could serve as a template for future research in humanitarian crises.



The SuperTowel™: assessing the efficacy and acceptability of a novel soap alternative for humanitarian crises

Authors and affiliations: Torben Larsen¹ and Sian White²

¹Real Relief, ²London School of Hygiene and Tropical Medicine, UK.



SuperTowel™ has been developed by RealRelief (a private Danish company) and LSHTM as a soap alternative for humanitarian crises. The SuperTowel™ presented at EEHF by Torben Larsen is a durable fabric with a permanently bonded anti-microbial treatment. SuperTowel™ is soaked and rubbed against one's hands to transfer pathogens to the towel where they will be killed. The towel reduces the amount of water needed for handwashing, is light, cheap, easy to transport, easy to use at any location, and remains effective throughout its lifetime.



RealRelief and LSHTM performed laboratory studies to compare the efficacy of the SuperTowel™ against handwashing

with water and soap. The studies involved artificially contaminating the hands of 16 volunteers who each tested several versions of SuperTowel™ in comparison to soap and water. The best performing version of SuperTowel™ proved to be almost a factor 10 better in terms of removing bacteria from the hands of the volunteers as compared to water and soap. The SuperTowel™ was put in a washing machine for 100 standardised washes and was still as efficacious as before the wash.

Results from a recent field study in Ethiopia that was performed in cooperation with LSHTM and Danish Refugee Council, indicates that SuperTowel™ is well accepted and highly appreciated by users. Torben and RealRelief are looking for partners to support field implementation and evaluation of the SuperTowel™.

Community engagement during the ebola outbreak, DRC, North Kivu 2018 - listening to and advocating for community priorities

Authors and affiliations: Eva Niederberger
Oxfam

Based on learning from the West African Ebola outbreak in 2014-16, Oxfam developed a community engagement model and framework to increase community control over the response impact by connecting communities with other emergency response stakeholders. The model was first trialled during the Rohingya refugee crisis, Bangladesh, in 2017-18. Core elements were then applied to the 2018 Ebola response in DRC. Eva (Oxfam) presented findings on how community feedback was used to adapt its programme on the ground and influence external coordination mechanisms.

“We must listen to the communities and actively use their feedback to make programmatic adjustments and bring their voice to policy and decision-makers in forums they may not be able to access alone.

The current Ebola outbreak in North Kivu, DRC, is set in a complex context marked by chronic insecurity, ongoing violence and longstanding mistrust of authorities. While the West African Ebola crisis highlighted the need for community engagement to build trust and confidence in the response system, the national response strategy promotes yet again a top-down approach to treatment and prevention - with little consideration of community concerns and solutions. Issues around vaccination, fear of treatment and people’s perception of Ebola as a “money making machine” increase levels of distrust and heighten the transmission risk.

Oxfam’s initial response started rapidly, using mostly conventional community mobilization activities underpinned by ‘sensitization’. With the facilitation and support of a community-based alert system in three hotspot areas in Beni city, Oxfam began to listen more systematically to community concerns and shared the analysis on a regular basis with coordination platforms. Acting as a bridge between the community and support services, Oxfam also put people in touch with vaccination and burial teams, provided by other agencies. Efforts to collect community feedback were further strengthened piloting the use of ICT to collect feedback via an app. This helped Oxfam teams to use real-time information to understand community’s barriers towards the Ebola response, identify enablers and adapt programme activities on an ongoing basis.



QUESTIONS PLENARY 2

The second Q&A session was chaired by Sunny Guidotti (UNICEF) and the panel members were Sian White, Julie Watson, Torben Larsen and Eva Niederberger.

The first question came from Andy Bastable (Oxfam) asking what the sustainability strategies are for products like SuperTowel™ and Surprise Soap. Julie responded that further research is required to determine sustainability of Surprise Soap. Currently the evidence suggests that the soap could be used in more acute emergency phases and replaced by elaborate, sustainable hygiene promotion in later stages of the emergency. She hopes that the toy soaps could be a tool to habitualise handwashing, reducing the demand for the embedded toy as time goes by.

The next question was directed at Sian and asked about links between handwashing practices and religion. Sian responded that handwashing might be practised more often in certain religions as a part of purity rituals, but not necessarily with soap. Conducting research to highlight differences in hygiene practices between different religious groups is a sensitive topic and one that Sian would not recommend to explore. We need to be careful not to stereotype certain religious groups.

Michelle Farrington (Oxfam) shared her experiences of limited benefit of health-based messages in hygiene promotion and outbreak response. She asked the panel about what humanitarian actors could do to change the way they respond to outbreaks in a way that leads to behaviour change. Sian responded saying health knowledge doesn't have a bearing on our behaviour. Published literature have shown that 70-90% of people can explain disease transmission - knowledge is already widespread in the target population. We need to re-think the way we do WASH promotion. Mum's Magic Hands and Wash'Em are good examples of tools that enables and promotes innovative hygiene programmes. We require more tools that make behaviour change accessible and easy to use in crises, as engaging with theory is challenging in resource poor crisis response.

Eva added that there is a heightened importance of connecting with your local community and figuring out their concerns and needs before conducting any community outreach. With the West Africa Ebola outbreak response as an example, Oxfam is now trying out new methods based on lessons learned, but even so they are constantly adapting their response and outreach programme for the current Ebola outbreak in DRC. A constant re-evaluation

about the way we communicate with the target population is paramount to effective outbreak response.

A follow up question from the audience asked Sian about what the embedded health messages should be in hygiene promotion. As previously mentioned, disease knowledge does not impact behaviour and therefore Sian would recommend focussing on handwashing with soap at 5 critical times (before preparing food, before feeding a child, before eating, after cleaning a child's bum and after going to the toilet). The largest issue is diarrhoea and handwashing with soap at these 5 critical times is what will have the largest impact on reduction of diarrhoea in humanitarian crises.

The next question from the audience asked Torben to elaborate on messaging around the SuperTowel™. Torben explained that this is an important part of the next stages of SuperTowel™ development. RealRelief want to explore ways of making the towel self-explanatory for easily deployment in crisis (e.g. through pictograms). One challenge they faced is to explain that dirty water can be used to activate the super towel, however they want to avoid generating bad habits from communities not valuing good quality water. They also want to ensure that the SuperTowel™ looks distinguishably different from other similar products (e.g. standard microfiber towels). The SuperTowel™ will be used as an alternative to handwashing with soap, not as a substitute. The aim is to bring the cost down to 0.5-1\$ per towel.

The final question from the audience asked Julie and Torben why the trials they have conducted in the field were small-scale. Torben explained that the SuperTowel™ is a work in progress that started off as an idea from the Humanitarian Innovation Fund's (HIF) Challenge "Re-imagine Soap". Julie added that both SuperTowel™ and Surprise Soap are products that can be tested and improved through results from small-scale trials. In humanitarian crises, large scale randomised control trials are difficult to conduct. Pilot/proof of concept studies should be encouraged as it will give some indication of whether an intervention works or not before you do a large-scale trial. They are also more feasible to do in unstable settings.

Picture (under): Hygiene Promotion for children in IDP camp in Iraq. Source: Julie Watson (LSHTM)





3

**CHOLERA: CONTROL AND
CONTAINMENT OF
OUTBREAKS**

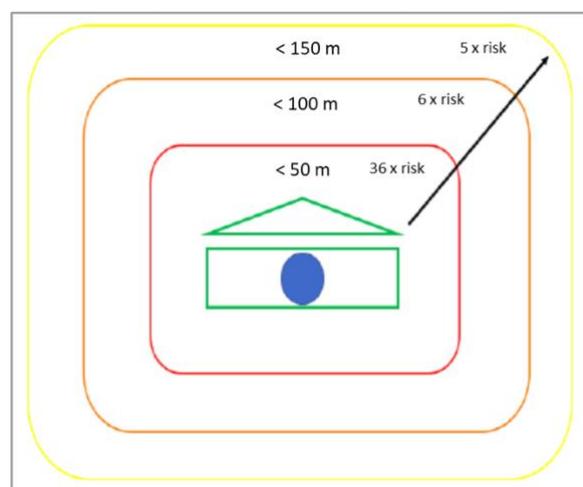
Rapid Response Teams (RRTs) in cholera outbreaks: a global review

Authors and affiliations: Monica Ramos & UNICEF WASH in Emergencies Team

United Nations Children's Fund (UNICEF)

In recent cholera outbreaks settings, investment in the use of Rapid Response Teams (RRTs) to support cholera response has increased. The RRT model provides a targeted WASH intervention to cholera-affected households and the surrounding at-risk populations with the aim of reducing local transmission. Using surveillance systems and available epidemiological data, RRTs have been used as part of a multi-sectoral cholera response in countries like Haiti, Yemen, Somalia, and the Democratic Republic of Congo (DRC).

A global review of the RRT model was conducted by UNICEF to better understand and document how RRTs contribute to breaking cholera transmission routes in four country settings: Haiti, Nigeria, South Sudan, and Yemen. A secondary data review of 80 pieces of published and grey literature and 28 key informant interviews were conducted with UNICEF's government and NGO partners. Key findings demonstrate that RRTs are an indispensable mechanism in supporting cholera response and prevention. Through early detection of cases, both at the beginning of and during an outbreak, the RRT model plays a critical role in reducing or 'slowing down' cholera incidences through an immediate and timely response. Key learnings identify the enabling environment required to ensure an effective RRTs response, including high-level political will, strong coordination mechanisms, predictable funding, timely epidemiological information sharing and accountability frameworks.



Risk of contracting cholera surrounding an infected household. Modified from 2017 GTFCC presentation by D'Mello-Guyett et al.

UNICEF recognizes the importance that RRTs play as the first step towards broader preventive public health programs to bridge preparedness and response for cholera prevention and control. Through dissemination of key findings and learnings from this review to the broader humanitarian community, UNICEF promotes the replication of the RRT model in future outbreaks, as an essential component of an effective multi-sectoral cholera response. UNICEF advocates for increased evidence-based to measure effectiveness and impact of the RRT model, to further strengthen and promote best practice for cholera response in outbreak settings.

Monitoring and evaluation of rapid response teams during the 2018 cholera outbreak in Harare, Zimbabwe

Authors and affiliations: Andrea Martinsen¹, Gregory Bulit², Velma Lopez¹, Anu Rajasingham¹, Aidan Cronin³, Thomas Handzel¹

¹Emergency Response and Recovery Branch, Division of Global Health Protection, Centers for Disease Control and Prevention (CDC), ²United Nations Children's Fund (UNICEF) New York, ³United Nations Children's Fund Zimbabwe

As of December 12th 2018, there were 10,598 cumulative cases reported nationwide in Zimbabwe, 94% from Harare. In response to the Harare outbreak, UNICEF collaborated with the City of Harare Environmental Health Division, Oxfam, and GOAL to establish RRTs to deliver water and hygiene interventions to affected households may reduce transmission. RRTs work on the premise and previous studies that have suggested that the risk of contracting cholera among persons living within 50 meters of a cholera case is 36 times higher than among those living farther away. RRTs therefore respond to individual cases and trigger mechanisms for containment and control in the area surrounding a case.

In November 2018, 8 RRTs, composed of 3-4 trained environmental health staff, began responding to all cases from cholera treatment centres (CTCs) in Harare, as well as to cases of typhoid, to deliver WASH interventions to cases and neighbouring households. Anu (CDC) recalled how the CDC supported the development of a monitoring and evaluation framework for these teams. The average number of neighbouring households visited per case was 12. Soap, water treatment products, and hygiene education were provided to nearly 2000 households. On average, RRTs responded to 161 cholera-affected households and reached 95% within 48 hours. Monitoring of water treatment products use, of free residual chlorine, and implementation costs is ongoing.

As their use increases, more evidence on the performance and effectiveness of RRTs is needed but RRTs may be potentially effective strategy to combat cholera outbreaks, and this serves as a framework for future monitoring and evaluation initiatives.

Picture of cholera risk around case household

Effectiveness evaluation of household spraying in cholera outbreaks

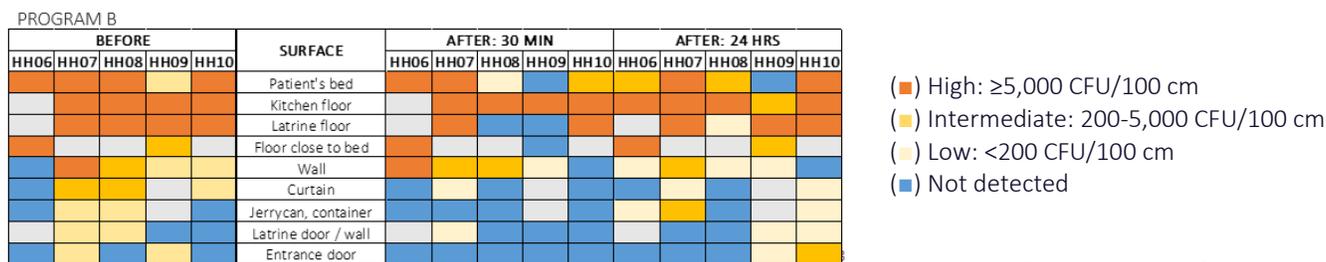
Authors and affiliations: Karin Gallandat¹, Gabrielle String¹, Daniele Lantagne¹

¹Tufts University

In cholera outbreaks, household spraying is an intervention where a response team is sent to disinfect affected households by spraying chlorine on surfaces. Household spraying is no longer recommended in international guidelines due to a lack of evidence to support its effectiveness, the difficulty to ensure adequate timeliness and coverage, and concerns about stigmatization.

Nevertheless, household spraying is still locally practiced. Karin (Tufts) presented a mixed-methods study designed to evaluate household spraying in four cholera outbreaks. Her methods included: key informant interviews and structured observations with programme staff; measurement of chlorine concentration in spraying solutions; surface sampling in households before, 30 minutes and 24 hours after spraying to detect indicator bacteria (*E. coli* and total coliforms) and *Vibrio cholerae*; and, household surveys with intervention recipients.

Three evaluations have been completed to date - two in the DRC and one in Haiti, for a total of 14 households. Preliminary results indicate that the highest levels of *V. cholerae* ($\geq 5,000$ CFU/100 cm²) were consistently found in the kitchen, close to patients' beds, and around the latrine. Contamination levels on surfaces varied between study sites but was significantly reduced by household chlorine spraying, with limited recontamination within 24 hours. However, the comparison between programs suggests that effectiveness depends on the procedure - i.e. the amount of chlorine solution (0.2-10 L) and time (2-10 min) spent at each household. Additionally, household identification and time to reach households (3-5 days after the onset of cholera) were identified as common challenges across programs, whereas opportunities exist for the deployment of hygiene promotion activities. Survey respondents found that the intervention was "very useful" (60-80%) or "useful" (20-40%). Karin noted the small sample size of this study and suggested further research is conducted before any changes to policy or guidelines is recommended.



V. cholerae on selected household surfaces in DRC (Orindi) before chlorine spraying, 30 min after spraying and 24 hours after spraying

A process evaluation of the implementation, context and mechanisms of impact of a cholera response in Kasai-Oriental, DRC

Authors and affiliations: Lauren D’Mello-Guyett^{1&2}, Sharla Bonneville², Rob D’hondt², Alexander Gorski², Rafael Van Den Bergh², Pierre Pech², Robert Dreibelbis¹, Adam Biran¹, Francesco Checchi¹, Peter Maes² and Oliver Cumming¹

¹ London School of Hygiene and Tropical Medicine ² Médecins Sans Frontières

PROCESS EVALUATIONS

Process evaluations are vital to understand how and why an intervention worked in a given context

For complex interventions where causality can be difficult to interpret, process evaluations provide important information on the intervention as delivered, the mechanisms of impact, and key barriers and facilitators to successful implementation.

There is a general lack of rigorous, published process evaluations of WASH interventions in humanitarian setting but particularly with regard to outbreak responses in general and cholera

Lauren (LSHTM) presented a study that evaluated the implementation, mechanisms of impact and context of an MSF intervention to distribute hygiene kits during a cholera outbreak in Kasansa, Kasai-Oriental, Democratic Republic of Congo. The study population comprised key informants from MSF (e.g. Field Coordinators, WASH Coordinators, Medical Coordinators, Health Promotion Managers, Logisticians and Supply Coordinators), key informants from other organisations active in the response (e.g. local government and other NGOs in the area of operation) and a prospective sample of households who had received hygiene kits.

Methods included qualitative in-depth interviews with 7 MSF personnel, 10 individuals from local government/other NGOs and 27 households who had received a hygiene kit.

Lauren presented the results of the implementation component of the cholera response. Overall, there was a significant delay in MSF’s response to the alert of confirmed cholera cases which had knock-on effects to supply and distribute hygiene kits within the window of the epidemic and prevent transmission among household contacts. Furthermore, the results highlighted issues with organisation priorities, supply chains, training of key staff and lessons to be learnt from delivery. The hygiene kit has demonstrated effect to reduce the incidence of cholera, but the context and implementation of the programme will limit that effectiveness including the resulting use by the population.



QUESTIONS PLENARY 3

The third Q&A session was chaired by Emma Tuck (UNICEF) and panellist were Anu Rajasingham, Monica Ramos, Karin Gallandat and Lauren D'Mello-Guyett.

The first question from the audience was directed at Karin if they had any plans to try a comparative study of effectiveness of spraying vs. provision of 'at home disinfection'. She shared that this was in fact, the original aim of the study. Currently UNICEF recommends the use of "household disinfection kits", but Tufts were not able to find any humanitarian actors in DRC or elsewhere that currently utilise this method. Daniele Lantagne (Tufts) shared that since Karin's study, researchers from Tufts have conducted key informant interviews with key operating organisations in country and that results revealed that there was a large divide between international and local responders, with international actors reporting of both household spraying and home disinfection kits actively being used but local responders reporting never to have heard about household treatment kits. Daniele argued that too much time is spent determining what intervention to use - this is valuable time where we should focus on arriving at a cholera affected household with the appropriate interventions and mechanisms already at hand.

Justin Hartree (Oxfam) asked the panel if we as WASH practitioners should advocate for household spraying to be a part of cholera response. Karin responded that in her opinion and based on her research outcomes she would not recommend it as a standalone intervention for cholera control. Additionally, her research was conducted on a limited number of households and further studies should be conducted to support this evidence. The panel agreed that further research could determine if household spraying has the potential to be a useful control tool for cholera intervention, particularly if it's used correctly and forms a part of a control package containing multiple interventions.

Madhav Pahari (UNICEF) raised concerns with the many unknowns in what may be the ideal, comprehensive WASH package to apply as a response to cholera outbreaks. The panellist agreed that no all-inclusive package is currently available and it is important to configure the tools chosen and used so they are appropriate to containment of outbreaks in each individual location. Lauren underlined the importance of keeping transmission routes at the core of our cholera response. Heightened risk of cholera is within the household and within 200 sqm surrounding the case. She recommended to choose interventions that are case-targeted and will demonstrate the most effect in control and containment of an outbreak.

Kate Alberti (WHO/GTFCC) responded to a question about integrative OCV with the case-area targeted intervention (CATI) approach and whether combined interventions could have an impact on transmission. She shared first that it is important to review your objectives when using OCV for containing active cholera outbreaks, as OCV takes 7 days to work. Additionally, OCV vaccine stockpiles are low worldwide and therefore use of the vaccine in response to outbreaks is difficult at scale.

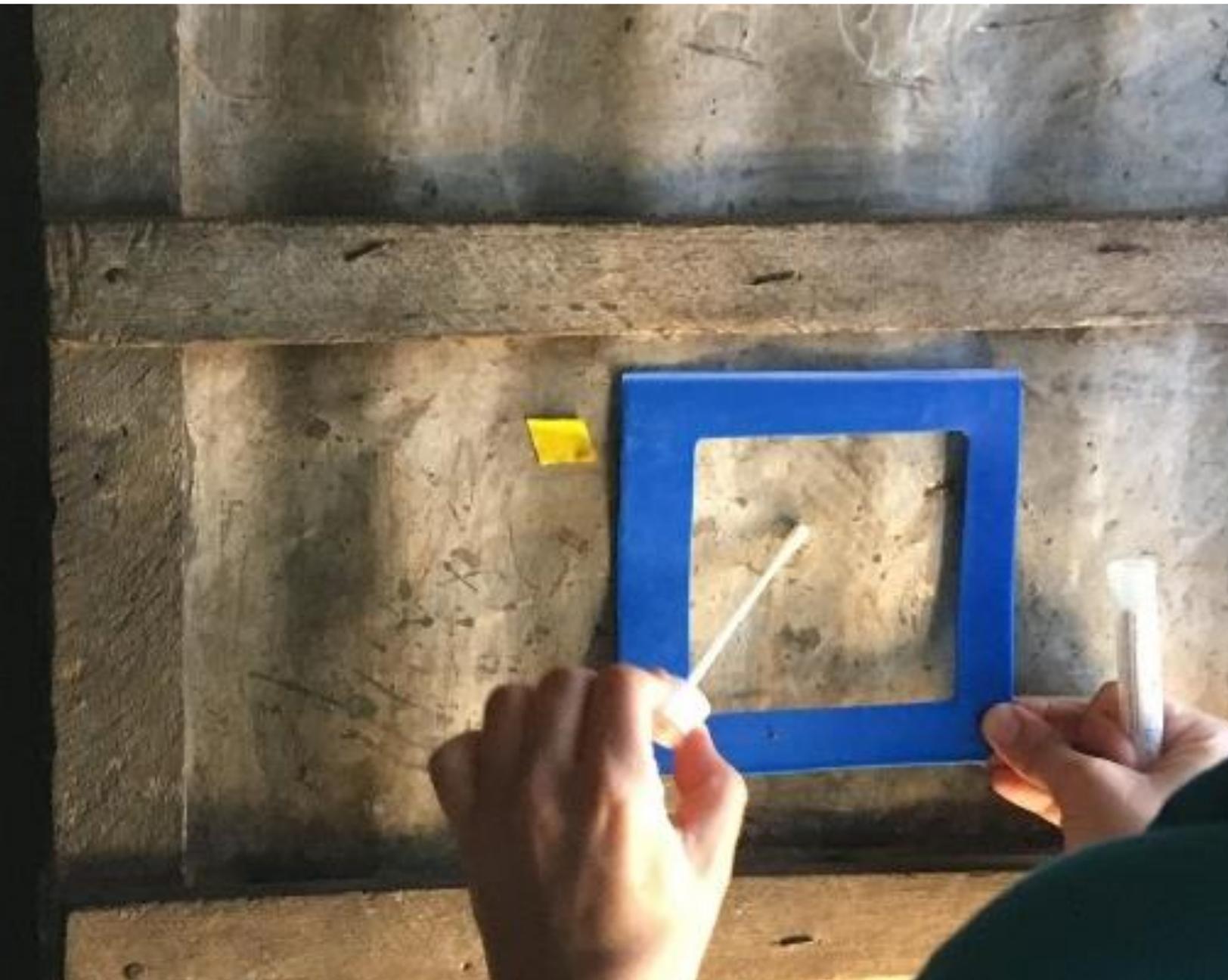
Parvin Ngala (Oxfam) expressed concerns with the lack of uptake and utilisation of hygiene kits by the target population during outbreaks as presented by Lauren. Parvin's experience from distribution of hygiene kits in Zimbabwe during an outbreak was that there was no continued behaviour change seen long term after distribution. Chlorine distribution led to a dependency on free water treatment chemicals and people's willingness to purchase chlorine with their own money was low. Lauren elaborated on parts of her study not presented in her EEHF presentation in which they looked into acceptability of hygiene kits distributed at CTC and its maintained use. In MSF's example, high utility of the kits was found 7 days after delivery. However, 21 days after delivery when perception and fear of cholera in the household decreased the use went down. People explained this was due to the items in the kit being used up quickly. Soap only lasted a week. Within the current study they were not able to follow up and distribute hygiene kits regularly over time to ensure high uptake of desired behaviours. Another reason for low use of the kits is the individual components being used for other purposes. A programme in Bangladesh experienced buckets intended for handwashing regularly being repurposed for storing rice. The panel agreed that there is a need to re-think and adjust kits to ensure they are fit for purpose.

Parvin followed up with a second question this time directed at Anu and Monica on the evolving role of RRTs outside outbreaks to maintain long term RRT capacity. Currently Haitian government and collaborating NGOs are facing this exact question. UNICEF know that donors are interested in a long-term integration of the RRTs in the health systems with evolving roles in advocating for health, nutrition and a broad range of infectious disease control messaging. This approach with evolving RRT roles has already been tested in Zimbabwe, said Anu. During cholera outbreaks the RRTs are activated full time and when the outbreak slowed down, the RRTs have for the last month responded to typhoid outbreaks instead. The evolving role of RRTs is a timely question that multiple governments and NGOs are trying to figure out at the moment. Kate took the opportunity to support the approach of integrating the RRT teams in health promotion teams in times of no outbreaks. This would also address the issue of rapidly getting information on cases and their location.

An emerging theme was the importance of available and updated GIS, health and household data. Emma Tuck who chaired the Q&A of this sessions asked the panel if we have any examples where data have been available and positively impacted cholera outbreak

response. MSF facilitates a positive relationship between epidemiologists and WASH coordinators at health facilities which in turn maintains a versatile mechanism where data is shared, increasing the efficacy of any implementation and locating cases. This method was endorsed by several members of the audience. Despite this there are always challenges finding households in the field due to lack of sound geographical information said Lauren. In the case of the RRT in Zimbabwe and Mozambique, Anu shared that the teams visited the CTC every morning to get accurate epidemiological data on cases. If they waited for the system to share this information, more than 72 hours would have passed from a reported case entered the CTC until the RRT reached the contaminated household. Emma Tuck shared that the same had been done to speed up RRT response time in Yemen.

Picture (under): Taking samples for *vibrio cholerae* and faecal coliforms of walls in households in DRC prior to household spraying with chlorine. Source: Karin Gallandat (Tufts University)





4

**HEPATITIS E AND
VECTOR CONTROL**

VIRWATEST and FairCap: towards preventing waterborne viral outbreaks in humanitarian contexts

Authors and affiliations: David Aguado¹, Eva Fores¹, Marta Rusiñol¹, Laura Guerrero-Latorre¹, Mauricio Córdova², Rosina Girones¹ and Sílvia Bofill-Mas¹.

¹ VIRWATEST (virwatest.org). Laboratory of Viruses Contaminants of Water and Food. Department of Genetics, Microbiology and Statistics, Faculty of Biology, University of Barcelona, Barcelona, Spain;

² FAIRCAP (FairCap.org);

Waterborne viruses cause a high number of acute hepatitis, gastroenteritis, meningitis and respiratory outbreaks. Viruses excreted in faeces/urine may contaminate water, food and be transmitted by person-to-person contact or through fomites. Diagnosis of water quality at the point-of-use provides data to design adequate plans to prevent waterborne outbreaks incidence. Commercial solutions for water testing in the field, all related to faecal indicator bacteria, do not guarantee absence of viral pathogens that survive longer time and remain infectious at lower doses than bacteria.

virwatest

Test for detection of enteric Viruses and viral fecal indicators in Water

Viral monitoring of water requires complex logistics. VIRWATEST, a HIF-ELHRA funded project, resulted in a portable and affordable method for concentrating water samples for detection of viruses at the point-of-use. Also, FairCap, another HIF-ELHRA funded project, developed filter devices primarily designed to reduce bacteria concentration in water samples which have been recently evaluated for its efficiency retaining viruses. VIRWATEST performance is equivalent to other methods used for viral detection and allows the concentration of water samples and shipment to reference laboratories at room temperature. When evaluated by Oxfam Intermon WaSH teams, VIRWATEST was useful for detection of human adenoviruses in groundwater samples. VIRWATEST may be part of an early warning system useful to improve water safety management.

FAIRCAP

Mauricio Cordova from FairCap demonstrated the use of new FairCap devices for elimination of viruses at domestic level. The FairCap Mini can fit on any standard plastic bottle (e.g. soda bottle) and the FairCap Family Virus filter can be fitted into a Jerry can lid and provides a high flow (2l/min) of clean drinking water, filtering 99% of viruses and 99,99% of bacteria and larger pathogens. The presenters added that further research and application to the WHO Water Treatment testing scheme are required before validating the product for use across humanitarian crises or among vulnerable populations. Both projects aim to prevent viral outbreaks in humanitarian contexts and are now seeking for funders and collaborators for further development, testing and implementation in the field.

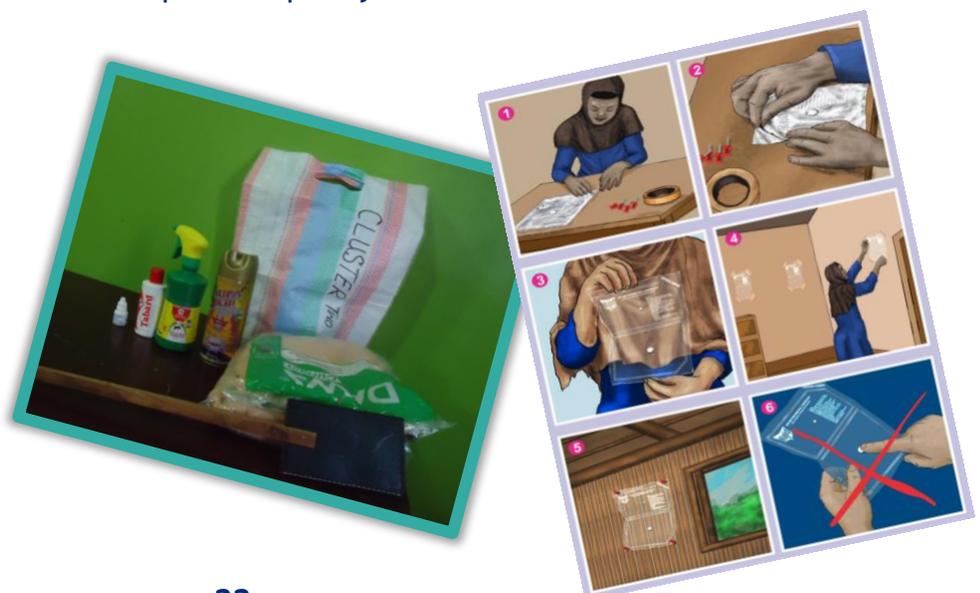
Functionality and user acceptance of a Family Vector Control Response Kit

Authors and affiliations: Andrew Trevett¹, Tim Grieve¹, Richard Allan², Nfornuh Alenwi², and Eric Ochomo³

¹UNICEF, ²MENTOR Initiative, ³KEMRI

UNICEF, the MENTOR Initiative, and Kenya Medical Research Institute (KEMRI) evaluated a novel UNICEF family vector control response kit that was distributed to 360 households at risk of vector borne disease in Wajir Town, Northeast (NE) Kenya at the end of the rainy season (January/February 2019). This region regularly experiences epidemics of vector-borne diseases during, and for several months after, rainy seasons. The study aimed to determine key outcomes when households were given different combinations of evidence-based insecticidal products, including adulticides, spatial repellents, larvicides, insecticidal window curtains, and personal protection, with simple picture-based application instructions only. The products were those commonly expected to be found in retail markets. A cluster randomised trial was performed where six different vector control kit configurations were distributed to six randomly selected clusters each of 60 households in Wajir Town. MENTOR measured the uptake, proper application, ability to follow directions for use, and acceptability at household level. The results of the research study provide an operational evidence-base as to the effectiveness of households managing their own control practices using these kits in a highly insecure and challenging operational setting. Spatial repellent, aerosol spray can and mosquito repellent coils were the most effective tools in reducing malaria mosquito density. The kits sustained a reduced density for 1-2 weeks.

Richard (MENTOR) presented the first such study of its kind and has particular relevance adding new tools to the humanitarian response capacity for disease control across similar operational settings. It is envisioned that this family vector control response kit will provide a rapidly deployable and useable vector control tool that bridges the time it takes for organisations to establish larger scale disease control initiatives.



Impact of indoor use of Attractive Toxic Sugar Baits on malaria vectors in DRC

Authors and affiliations: Severin N'Do¹; Maite Guardiola-Claramonte¹; Marta Maia¹; Estrella Lasry¹; Christophe Boëte¹

¹Medecins Sans Frontières

Despite progress, the efficient control of malaria remains difficult in many parts of sub-Saharan Africa. Attractive Toxic Sugar Baits (ATSB) are then regarded with interest as a novel vector control tool. ATSB consist of containers with a poisonous solution for mosquitoes attracted to (or resting on) the bait. ATSB have already demonstrated some efficacy at killing sand flies, *Anopheles* spp., *Aedes* spp. and *Culex* spp. while being used indoors and outdoors mostly in arid conditions, where sugar sources are scarce.

Maite (MSF) presented a study conducted in 2018 using an ATSB based on a sugar and ivermectin solution in order to measure its impact on the population of malaria vectors (*Anopheles funestus* and *Anopheles gambiae*) in the lush equatorial environment of South Kivu. The ATSB was designed in order to present a resting site for endophilic (indoor resting mosquitoes). The study took place in Tchonka town. An intervention and control arm (23 households in each arm) was identified through baseline mosquito collection and ATSB was installed in the intervention households. Mosquito collections using CDC light traps were conducted every 3 or 4 days over 12 weeks following implementation.

A 18% net reduction in density of *An. gambiae* was observed in the intervention arm compared to the control arm. No significant reduction was seen in *An. funestus* density.

ATSB is a tool that can be made by local materials. It complements insecticide treated bed nets and can serve moving populations. However, renewing the ivermectin solution might be challenging.





QUESTIONS PLENARY 4

The fourth Q&A session was chaired by Nick Brooks (CARE) and panellist were Sílvia Bofill-Mas, Maite Gardiola and Richard Allen.

David Simon (UNICEF) asked Richard if the Family Vector Response Kit (FVRK) have an impact in eliminating breeding sites of mosquitoes. The malaria mosquito, *Anopheles spp.* breeds in diverse natural fresh water sources, such as still or slow running dams, lakes and rivers, swampy areas and even foot/h hoof prints filled with water after rainfall. Even if you eliminate all fresh water sources close to your home, a mosquito can fly for 1.5-2km with ease. The *Aedes spp.* mosquito, also known as tiger mosquito, breeds in man-made containers such as buckets, cups, water container and empty tyres. The component in the FVRK that aimed to eliminate breeding sites close to home was larvicides. This was the least effective component the Mentor Initiative used in their study. The FVRK is not cost effective in comparison to the pillars of vector borne disease control; indoor residual spraying (IRS) and long-lasting insecticide treated nets (LLIN). But in the initial stages of humanitarian crises, importing and implementing IRS and LLIN is not possible due to logistical constraints. The FVRK is therefore based on locally available products, to fill this gap of the first initial weeks or months of a crisis. Richard and the team want to reduce the cost by evaluating the components of it individually to only include the most effective tools in the kit. Maite explained that availability of vector control tools was key to the success of their intervention. The bucket for the solution was only \$USD8 per bucket, the prices of the ATSB solution varied. But the ingredients were all available locally, and once prepared was effective for up to 30 days.

The second question from the audience asked Richard if the assembly of the FVRK suffered the same limitations as procurement and mobilisation of traditional tools (IRS and LLIN). Richard responded saying the implementation of IRS takes months to prepare. Yearly campaigns are led by expert teams such as AIRS, PMI and ABT Associates. They build infrastructure in the district to dispose of waste chemicals, train locals to conduct the spraying, get permits to import the insecticides and equipment and spends months of sensitising the community to the intervention. When IRS is implemented a person comes in full PPE to your home and sprays chemicals - this is extremely intimidating and demands thorough sensitisation so the intervention is acceptable in the community. The advantage of the FVRK is that it can be a box dropped in the house with only pictorial instructions - no explanation needed. When you can make something that simple and intuitive to use, you remove a huge operational issue. When developing the pictograms, Richard and his

team made sure the pictograms were simple to understand, no text to reach illiterate groups and most importantly, the characters in the pictogram looked like the target audience. This adaptation needs to be region and country specific, to ensure the message is received and to achieve high acceptability of your intervention in the community.

After 3 years of working as WHO's focal person for malaria control, Richard reflected on the difficult position of vector borne disease control in humanitarian setting. Responding to yellow fever, chikungunya, leishmaniosis, malaria and other vector borne outbreaks in emergencies is complex as you have to work with 5 different clusters; the Cluster holds the vector control component, the Health Cluster for treatment, IC Cluster for education, the Shelter Cluster for adaptation of vector proof housing, the camp management cluster and non-food item kit cluster.

The next question from the audience asked if cholera response could learn from vector control practices, as household spraying is conducted for disease control in both fields. Maite responded that although it would be beneficial to have a multi-sectoral, integrated approach for disease control, the case studies for cholera and malaria vector control are very different. Indoor residual spraying for malaria is highly controlled, and demands rigorous training of staff prior to implementation. Additionally, the standards are high for the type of spraying equipment that can be used. Costs and complication related to importing the insecticide is also an issue. Indoor residual spraying is only an effective tool when implemented at large scale under controlled environments, managed by actors such as AIRS and PMI. Household spraying of chlorine for cholera control is easier and less restricted to carry out.

Astrid Hasund Thorseth (LSHTM) asked the entomologists on the panel if there is sufficient entomological expertise with NGOs and UN Agencies. She also asked that with the increasing burden of vector borne diseases, are we as a sector prepared to respond. Richard responded saying that if NGOs do not have the entomological expertise required to fully respond to vector borne diseases then they are morally required to skill up. Vector borne disease burden is increasing by the year due to climate change and Richard urged the room to reflect on whether their organisations were prepared to respond. Currently 80% of deaths due to malaria is happening in 8 countries. These countries rely on support from NGOs and UN agencies to control malaria and it is therefore crucial that we have the expertise. Maite added that recently MSF have taken this step to skill up and do now have

“Sectoral fragmentation is a disaster for vector borne disease outbreak control and management. Vector Control is the worst fit for a cluster system as it sits under Health, WASH, Shelter and probably others”.

- Richard Allen

WASH



entomologists in all of their main offices, and several field-based entomologists to support their larger programs.

Another participant inquired if the FairCap family virus filter had been tested in the field. Mauricio Cordova (FairCap) confirmed that field testing has been completed in Lebanon in low income households in Beirut and refugee camps. Further testing is planned in Mozambique. The FairCap team have acquired funding from the Humanitarian Innovation Fund (HIF) to conduct further testing and are looking for partners in the field to collaborate with. Mauricio confirmed that testing had not been conducted in the WHO testing scheme but they had attempted to adhere to the WHO testing protocols and the filters adhered to the standards. The current price for the bottle filter is 5\$. The price for the jerrycan filter is to be calculated.

The final question from the audience asked the FairCap team what the similarities are between their filters and the LifeStraw™. Mauricio said that many of the functionalities are the same, but the reported acceptability for the FairCap filters are higher as seen in camps in Lebanon. Andy Bastable (Oxfam) suggested that it is a similar product to the LifeStraw™ and that further, more rigorous research of the both acceptability and effectiveness of the filter is required before it can be recommended for crises settings.

Picture (under): MSF Entomologists emptying CDC light trap used to capture mosquitoes overnight in Democratic Republic of the Congo. Source: Maite Guardiola (MSF)





Comparison of the different FSM plants in Cox's Bazar, Bangladesh

Authors and affiliations: Anna Grieve

ARUP

In the response to the massive influx of Rohingya into Bangladesh from Myanmar an unprecedented number of agencies have implemented FSM projects. There are approximately 9 different technologies being used in various ways across Cox's Bazaar. These included:

Decentralized Biological treatment

- Up-flow anaerobic filters
- Planted de-watering beds/vertical flow construction wetlands
- Biogas plants

Decentralized Chemical treatment

- Lagoon lime treatment with dewatering bed
- In barrel treatment with gravel bed dewatering
- In barrel treatment with geotextile and gravel bed dewatering

Centralized Biological-Chemical treatment

- Oxfam-BORDA faecal sludge treatment plant

On site treatment

- In barrel on-site lime treatment
- Septic Tanks
- Biodigesters with bacteria inoculum
- Biofil latrines
- Anaerobic filters

The aim of this evaluation was to compare the various methods of FSM in use in the Bangladesh Rohingya camps in order to determine which is the most efficient and effective in different emergency contexts for both which technologies should continue in CxB and which should be promoted for use in future humanitarian crisis. In the short term, lime treatment FSM is the best option. Benefits include speed of set up, stability of the treatment process and a good effluent quality. However, the method has a high OPEX and is therefore not an appropriate long-term solution for FSM. Long term solutions that score well against key indicators include up flow filters (decentralised) and Anaerobic lagoons (centralised).



Lime Treatment FSM



Up flow filter (decentralised)



Anaerobic lagoon (centralized)

A collapsible septic tank kit to improve sanitation in emergency camps

Authors and affiliations: Thorsten Reckerzügl

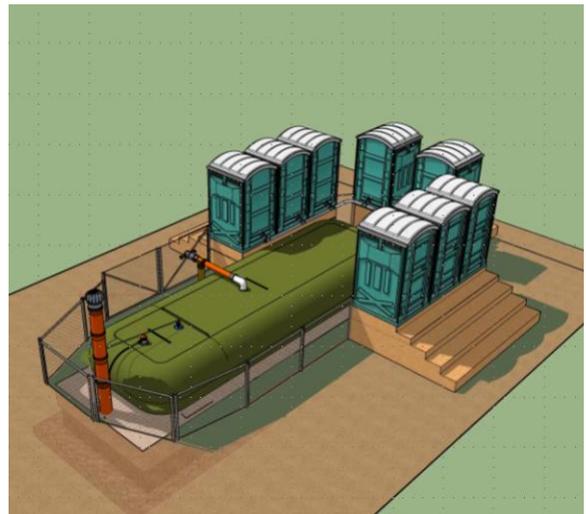
BORDA

Thorsten Reckerzügl from BORDA presented a non-permanent, inexpensive and safe system for wastewater management in camps. The system was developed in collaboration with Oxfam and comprises a bladder, two chamber septic tank made from tarpaulin and can be easily manufactured, stored, transported (also by air) and assembled. One system serves about ten toilets for up to 500 people. It provides anaerobic stabilisation and safe storage for faecal sludge for a period of about six months. Costs are between 1,000 and 1,500 € per unit. It can also be complemented by different modules, e.g. underground infiltration boxes, biogas utilization.

A prototype of the system has undergone first successful tests jointly with the Federal Agency for Technical Relief (THW). Field tests are planned in Bangladesh together with Oxfam and in Iraq jointly with partners from the WASH cluster. The septic tank kits will be made available to relief organisations in case of an emergency.

In advance organisations will be trained on installing the system as well as on operation and maintenance.

Besides contributing to mitigate disease outbreaks in an early phase of a disaster the system provides the option for different disposal options as well as for safe utilization of treated wastewater and sludge. Thus a substantial contribution to the SDG's, especially to SDG 6.2/ 6.3 can be achieved.



Reducing risk of water related disease through sustainable sanitation solutions in Bangladesh

Authors and affiliations: Murray Burt¹, Graham Alabaster² and Julian Parker¹

¹ United Nations High Commissioner for Refugees, ² United Nations Human Settlement Programme

Responding to the needs of over 900,000 forcibly displaced Myanmar nationals, the WASH Sector in Bangladesh has faced the challenge of providing sanitation services in a difficult environment. After the initial response, there is a need for durable sanitation solutions. Current methods of faecal waste management rely on either manual haulage or pumping to designated faecal sludge treatment plants. The facilities include: planted sludge drying beds and lime-stabilisation pits combined with land application. In addition to the generation of black water, the communities were provided with bathing shelters for personal ablutions and many have established “wet areas” in their dwellings, which discharge into a network of drainage ditches. Additionally, the drainage from the thousands of shallow tube wells and tap-stands discharges directly to the environment, without soakaways.

The current public health risks are significant. Perhaps the only reason there has not been any major outbreak of diarrhoeal disease is the high level of water availability. This however could change. The high level of water use results in large volumes of both black and greywater. In addition, greywater is highly contaminated. Test results show that surface water in the drainage channels, and also from the taps stands, has similar levels of faecal coliforms. Due to high water use, the percent solids in the pit latrine contents is very low (between 1-3%). An initial wastewater characterisation study was also conducted and indicated that the blackwater in the toilet pits is equivalent to low strength domestic wastewater (COD 400 - 600 mg/l and a total solids concentration of 1-3%).

The public health objective is to capture and treat as much black and greywater as possible, to ensure treatment effluent is bacteriologically safe. A technical and financial analysis identified the optimal solution to be: a solids-free sewer network with treatment via waste stabilisation ponds. Where possible the existing “twin pit” latrine pits will be incorporated in to the solid-free sewer network, and will function as interceptors. The twin pit system will enable rapid implementation of this solution and a “modular” concept design. An initial selection of available sites for the piloting of solutions has been made and will be undertaken in 2019. This presentation summarises the design criteria, operation data, and packaged designs that have been produced.

Women focused sanitation research to changes in practice

Authors and affiliations: Andy Bastable¹, Eva Niederberger¹ and Tanya Glanville-Wallis¹
Oxfam

Oxfam's HIF funded Sanitation Lighting research found an average of 40% women in camps not using agency latrines - even in daylight. Reasons included lack of privacy, sexual harassment, vermin, no lighting nor locks. This shows a significant discrepancy between technical standards, what specific user groups want & need, & how programmes are designed & implemented. Consequently, people (mostly female and children) resort to open defecation/use vessels that are not properly cleaned/disposed of, with huge health implications (diarrhoea rates). Equally worrying is the link between poor quality latrines & risk of sexual abuse.

The HIF User-Centred Sanitation Design project posits that better community engagement in design as well as iterative cycles of adaptations will lead to better take up & sustained use. Initial findings indicate a range of initiatives need to be implemented, not just a design users would be happy with. This implies the right initial exchanges with targeted users - vital to managing expectations, ensuring people are heard & responded to. The benefits of this approach lead to an environment free from faecal matter, increased access for women, children, young girls and for the disabled and elderly and increased perception of safety and dignity.





QUESTIONS PLENARY 5

The fifth Q&A session was chaired by Liz Walker (IRC) and panel members were Andy Bastable, Thorsten Reckerzügl, Murray Burt and Anna Grieve.

The first question came from Robert Fraser (IFRC) who asked Andy why humanitarian WASH actors do not collaborate more with developmental WASH actors on sanitation. Andy responded saying our main issues in camp settings are communal toilets. Development WASH actors tackle household level latrine solutions, and in most acute phases of an emergency we are not able to build family latrines. He did however believe we could do more to do shared family latrines, where a certain number of families who know each other are identified and given a latrine to use and maintain between them.

Madhav Pahari (UNICEF) asked the panel if we are ready to start collaborating more as a sector to save resources and funds on design of new interventions. Currently individual NGOs develops their own solutions for pit latrines, faecal sludge management, hygiene kits etc. Could we not benefit from working together and creating a portfolio of solutions we all agree to use? The panel agreed that having a set number of agreed principles of a good latrine would be ideal. Andy warned that if the instructions are too specific, NGOs may simply use the recommended design instead of adapting it to what the target community actually need. We must not forget consulting the community on what they need and want before implementing an intervention.

Richard Allan (Mentor Initiative) asked whether it was not possible to take it one step further and support communities with self-build interventions that communities take responsibility for themselves. Andy responded saying that in initial stages of an emergency this is a difficult ask, as the focus is to supply basic sanitation services at this point. Recently in Mozambique, this approach resulted in a number of very shallow pit latrines being built and only working for about a month before they had to support the community building new ones. It is still possible, but requires a clear communication strategy to ensure latrines are built to reach requirements of an improved latrine.

Franck Flachenberg (Concern Worldwide) referred to Andy's presentation and asked why NGOs did not pay attention to detail when building the latrines, resulting in infrastructure not fit for the community. Andy responded saying it's an increasing problem that NGOs have become so used to working in these environments, doing the same thing over and over again without changing our approach. This leads to NGO sloppiness. We need to ask ourselves why we do not get the expected response from beneficiary groups and also why

the sector is failing or not meeting standards of good practice. Currently Oxfam have hired an anthropologist to evaluate their response in Bangladesh. It's important that NGOs allow for self-critique and that this leads to improved response.

Robert Fraser (IFRC) asked Murray whether there is a conflict when long term development funding arrives in humanitarian context. Murray explained that development funders are re-thinking their financing models to ensure that we achieve SDGs. One new model allows for refugee populations to receive grant funding through governments and host communities receive loan funding. In Bangladesh, this is an approach that's been well accepted by the government as the amount of grant funding for the 800 000 Rohingya refugees is beneficial and only a small portion for the host population of 300 000 is loan funding. A follow up question asked what the role of NGOs and UN Agencies are in these new financial models. Murray shared an example from UNHCR Global Compact on Refugees that encourage government to include refugees in national development plans and to recognise these populations as a part of a national responsibility.

A question from the audience directed at Murray asked if a centralised heavy infrastructural approach compatible with the fact that the Bangladesh government do not want refugees to stay there long term. Murray appraised the question as a complicated one. Although you would imagine that the government would not like to invest in heavy infrastructure due to the politics, there is a discrepancy between the political arm and the technical arm of government. The technical arm does in Murray's experience deal with the reality: they remember the cholera outbreak in 2017 due to low investment in infrastructure in Cox' Bazar. Because of this the technical arm of government is happy to invest in solutions that will protect the public health of the population and avoid spread of disease into the national population. This attitude sometime differs from the political rhetoric coming from higher up.

Eyad Aldubai (UNICEF) asked the panel what their plans for operation and maintenance of their interventions post implementation to ensure continuous functionality of services provided. Murray responded giving an example from Bangladesh. In theory, the Department of Public Health Engineering in conjunction with the Refugee Commission of Bangladesh will be responsible for long-term operations and maintenance. But what we know we know from reality is that it will probably fall back on UNHCR and IOM. Murray recommends when choosing interventions to keep in mind that the costs for maintenance should be low and low-tech.

The final question from the audience asked Thorsten if there was a plan to develop smaller septic bags for household level use. Currently Thorsten and his team had not considered this as their focus was on upgrading and making easier existing systems. But he thinks it is feasible, as long as a regular emptying service is established.



Chlorine tablet use for household water treatment in emergencies: development and field piloting of tablet selection guidelines

Authors and affiliations: Marlene Wolfe¹, Mustafa Sikder¹, Daniele Lantagne¹

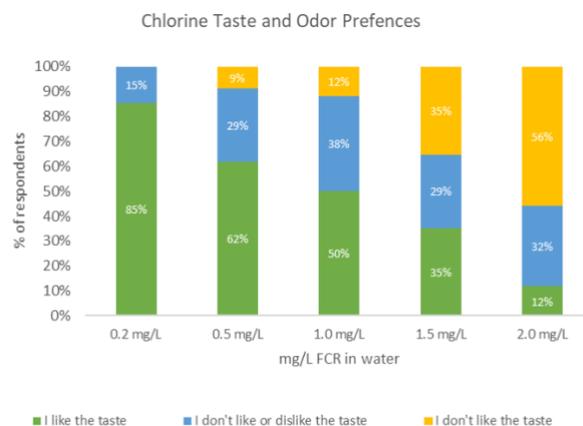
¹ Department of Civil and Environmental Engineering, Tufts University

Chlorine tablets are commonly distributed in emergencies because they are widely available, effective and cost-effective, easily transported, and simple to use. Currently, there is no process for selecting a technically and socially acceptable tablet to distribute. Thus, multiple tablets are often distributed in one community, creating confusion for users.

A working group of responders, academics, and business leaders convened to write a guidance document outlining a process for selecting a chlorine tablet(s) appropriate for a particular emergency context. The process was field tested in Cox's Bazar, Bangladesh.

Over a series of 6 phone calls, 24 people met to develop the guidance document, which includes sections on: 1) gathering key information, including tools to conduct assessments, and 2) undertaking a tablet selection process, along with further resources on chlorine tablet programming. The information to gather includes: water quality parameters, chlorine demand of representative waters, taste and odour acceptance thresholds, and average container size and storage time. Tools are provided to gather this information via transect walks, household surveys, focus groups, jar testing, and key informant interviews. After information is gathered, a selection process begins with choosing tablets that meet technical requirements of maintaining appropriate FCR throughout storage; that choice is then adapted after additional consideration of qualitative parameters such as taste and odour preferences. In Cox's Bazar, respondents identified needing to chlorinate 10 L of water for 24 hours of storage, and taste and odour rejection was high beginning at 1.5 mg/L FCR. A 17 mg tablet was selected, resulting in an FCR of 0.6-0.8 mg/L for 24 hours.

Using a structured process to select an appropriate tablet can alleviate confusion and result in distribution of tablets that are appropriate for the context. The next steps are to finalize and disseminate the guidance for use in emergencies.



Efficacy of jerrycan disinfection methods

Authors and affiliations: Marta Domini¹, Gabrielle String¹, Hanaa Badri¹, Trang Vu¹, and Daniele Lantagne¹

¹ Department of Civil and Environmental Engineering, Tufts University

Gabrielle (Tufts) proceeded to discuss how jerrycans are commonly distributed in outbreaks for safe water storage. Recipients may use rocks, bleaching powder, or other local materials to clean jerrycans via shaking. Biofilm growth inside jerrycans can be a microbial reservoir, re-contaminating drinking water and causing chlorine residual decay. Gabrielle String from Tufts university presented work where they studied the impact of cleaning on biofilm development in jerrycans.

In the laboratory, 72 jerrycans were kept at 35° C for 3 months. Jerrycans were stratified by: with/without regular Aquatabs addition; 5 or 50 NTU water; and, six cleaning methods (NaOCl; pebbles; sand; NaOCl and pebbles; NaOCl and sand; none). Each combination (“with Aquatabs/50 NTU/pebbles”) was tested in triplicate. Jerrycans were cleaned and filled with new *E. coli* spiked water every day (Month 1), every other day (M2), and once a week (M3). Every day, FCR was measured at 1, 4, and 22 hours after water addition. Every week, *E. coli* in water was measured. Every month, one jerrycan per combination was destructed and samples cut from the bottom, middle, and top surfaces. *E. coli* in the biofilms on these surfaces were enumerated and imaged.

Preliminary results indicate that average FCR decayed from M1- 3 in both 5 NTU (1.18-0.55 mg/L) and 50 NTU (0.38-0.07 mg/L) jerrycans with Aquatabs. FCR was <0.1 mg/L in jerrycans without Aquatabs (even when cleaned with NaOCl).

Biofilms were NOT PRESENT in:

- 5 NTU Aquatabs-treated jerrycans.
- Most 50 NTU Aquatabs-treated jerrycans.
- 5 NTU no-Aquatabs jerrycans cleaned with “NaOCl” or “NaOCl and sand/pebbles”
- 50 NTU no-Aquatabs jerrycans cleaned with “NaOCl and sand/pebbles.”

Bottom surfaces of jerrycans in no-Aquatabs containers usually had the most *E. coli*. Biofilms developed rapidly in jerrycans without regular treatment; chlorine combined with abrasives inhibited biofilm development across all test combinations; and, bottom surfaces were the most challenging to clean.

To prevent contamination of jerrycans, Gabrielle *et al.* recommended to use chlorine tablets daily, to use chlorine to clean 5 NTU, to use chlorine + abrasive in 50 NTU and to not use abrasive methods alone.

Assessment and monitoring of bucket chlorination programs in Cox's Bazar, Bangladesh during the 2018 monsoon season

Authors and affiliations: Anu Rajasingham¹, Andrea Martinsen¹, Brooke Yamakoshi², Rafid Salih³, Patson Kaendesha³, Travis Brown¹, Stephanie Doan⁴, Martin Worth³, Thomas Handzel¹

¹Emergency Response and Recovery Branch, Centers for Disease Control and Prevention; ²United Nations Children's Fund, New York;

³United Nations Children's Fund Cox's Bazar; ⁴Center for Global Health, Centers for Disease Control and Prevention, Country Office-Bangladesh

To reduce the risk of waterborne disease outbreaks in Cox's Bazar, humanitarian partners distributed household water treatment products (NaDCC tablets) and started implementing bucket chlorination at tube wells. In April 2018, a water, sanitation, and hygiene (WASH) survey was conducted among 3,576 households. Only 13% of respondents reported treating their drinking water with NaDCC tablets. Given the low levels of household water treatment, evidence of contamination in stored household water, and concern over the flooding associated with monsoon rains, the WASH sector decided to scale-up chlorination activities during the 2018 monsoon season.

Anu (CDC) presented the results from a CDC collaboration with UNICEF to conduct rapid assessments in one camp to compare chlorine levels in stored drinking water from households receiving NaDCC tablets to households near bucket chlorination points. Based on these results, a pilot bucket chlorination expansion program was initiated with a monitoring system to document free residual chlorine (FRC) levels at chlorination points and in households.

Of the 444 households visited as part of the rapid assessment, 156 (35%) used a bucket chlorination point and 113 (25%) had NaDCC tablets in their home. Among households that used a bucket chlorination point, 59 (38%) had detectable FRC in their stored drinking water compared with 10 (9%) of those with NaDCC tablets. Monitoring data included 121 visits to bucket chlorination points and 648 visits to households near bucket chlorination points. Of these 648 households, 447 (69%) collected water from a bucket chlorination point; and of these, 290 (65%) had stored water with FRC greater than 0.2 mg/L, the recommended level. Assessment and monitoring results will be presented. Findings suggest that bucket chlorination can be effective in increasing household FRC levels, but challenges to scaling up bucket chlorination in this setting remain.



Evaluation of the effectiveness of bucket chlorination

Authors and affiliations: Gabrielle String¹, Mustafa Sikder¹, and Daniele Lantagne¹

¹ Department of Civil and Environmental Engineering, Tufts University

Gabrielle presented on the evaluation of the effectiveness of bucket chlorination in outbreaks

and emergencies. They developed a mixed methods protocol for assessing six bucket chlorination programs, including key informant interviews, structured observations of the chlorination point, chlorine concentration testing, focus group discussions, and household surveys. Water samples collected at the source and in the household were tested for FCR and microbiological indicators 30 minutes after treatment.



To date, five evaluations have been completed, in DRC (2), Cox's Bazar (2), and Haiti (1). Data from 4 programs has been analysed, including 40 chlorination points and 702 associated households. Preliminary results indicate variability in program implementation. While all programs used 15g HTH:1l water to manufacture the chlorine solution, the average chlorine concentration ranged from 0.18-3%. Additionally, solution storage time ranged from 24-72 hours, one program used transparent containers for storage, two programs provided sufficient PPE, two programs provided shade to protect the solution/agents, three programs tested turbidity, pH, and FCR, and one program tested microbiological indicators. All programs established dosage with an initial jar test.

Despite variability in program implementation, *E. coli* levels were reduced at least 1-log from source to storage in 73% of households when source *E. coli* >100 CFU/100mL. Average household FCR ranged 0.3-1.1 mg/L across programs. The only program to continually jar test also had all households with FCR >0.2 mg/L; 81 households throughout other programs had <0.2 mg/L. Variable FCR and the presence of total coliforms in 80% of all households indicates the risk of recontamination and importance of safe household management practices.



QUESTIONS PLENARY 6

The sixth and final Q&A session was chaired by Kit Dyer (Norwegian Church Aid) and panel members were Daniele Lantagne, Gabrielle String and Anu Rajasingham.

The first question came from Georg Ecker (Red Cross Austria) who asked the Anu about the iron levels in the water in Bangladesh refugee camps and whether they had any problems with oxidation and how this was tackled. Some areas had 5mg/L iron in their water and this gave the water a visible red colour. What they found was that households did not use this water for drinking or food preparation, but personal hygiene and cleaning.

The second question came from Michelle Farrington (Oxfam) who asked if there were any incidences of double chlorination - where buckets were chlorinated at water collection point and at household level. Anu responded saying that this had never occurred to her knowledge. NGOs have done a great job separating processes and although some areas of the camp have water treatment at collection point and some at household this has not overlapped.

Justin Hartree (Oxfam) asked the panel if bucket chlorination was optional and what the acceptability was in the community. Gabrielle responded saying that all programs they evaluated using chlorine was optional. If a family was using a specific bucket of water for household chores they often rejected chlorine treatment. They also asked in their household survey if there were specific groups that did not accept bucket chlorination, and found that there were specific groups in each community that refused chlorination. However, all groups had different reasons ranging from them already having chlorine at home, dislike of the chlorine taste or religious reasons for not accepting chlorine.

Mahbub Ul Alam (ICDDR'B) asked the panel if there should be individual recommendations for chlorination based on which pump the water originates from. Daniele responded saying there should be a range of water treatment options available adapted to local context, including chlorination, filtration, mixed methods and multi-barrier methods. In their context they had funding to evaluate bucket chlorination and they make no statement on whether this was the correct approach in this setting. Daniele said that the mixed reviews of Aquatabs™ use in humanitarian emergencies are due to the different distribution methods. Distribution must happen in conjunction with some form of community engagement. Danielle also believes if high iron concentrations is an issue, we should

consider other treatment methods as the amount of chlorine required in this water exceeds the taste and odour acceptability threshold.

Jean Francois Fesselet (MSF) asked the panel about the reason for them using different minimum levels of chlorine. Gabrielle specified that the minimum level was not the minimum accepted free residual chlorine level, but the levels tested in their samples. In each of the 4 programs tested in Gabrielle's study the organisations set their own guidelines for what the acceptable free chlorine residual should be at the conclusion of a jar test. For some programs they would accept whatever starting dose that would provide 0.5/0.8mg/L free chlorine residual at 30 minutes after treatment. Other programs said 0.8-1mg/L. The panel agreed that varying standards of free chlorine residual levels leads to confusion on what to recommend to chlorination programs.

Picture (under): Cox's Bazar in Bangladesh. Source: Anu Rajasingham



Closing remarks and plans for the next EEHF

The forum was concluded with an evaluation on the 2019 EEHF. This year, 76 voting participants strongly agreed that the EEHF had met their expectations, 80% of which felt there was a good balance between presentations and discussions and 75% felt the balance between research and field practice was “perfect”. In addition to the evaluation, 95% of voting participants agreed that we should continue to hold the EEHF alongside the Global WASH Cluster meetings and 81% were happy to continuing paying a small fee to attend in future.

The participants were asked for their opinion on potential additions or improvements for future forums, including:

- Improving the diversity of attendees and increasing the number of field staff attending the EEHF including local partners
- Engage with non-conventional actors and those from other sectors (Health, Nutrition, Shelter) to attend the EEHF
- Start video recording presentations to share to wider networks and to field staff

We would like to thank all the participants for their active engagement and participation in the EEHF. We value your feedback and time