2018 Abstract Booklet

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Sanitation- A Forgotten Foundation of Health

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CONTENTS

We would like to thank all authors, contributors and editors for their work.

Plenary 1: Sanitation Challenges

Title: Evidence into action: introducing a cross-sectoral toolkit for Menstrual Hygiene Management (MHM) into humanitarian response

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There is a significant gap in empirical evidence and practical guidance on addressing the menstrual hygiene management (MHM) needs of adolescent girls and women in emergency contexts. In response, a research collaboration was developed in 2015, led by the International Rescue Committee and Columbia University. This initiative sought to begin building the evidence on MHM during emergencies in addition to developing a cross-sectoral toolkit focused on improving the available guidance on how to effectively integrate MHM into response efforts.

Building on a global desk review, formative research with girls, women and staff in two emergency contexts(Lebanon and Myanmar),and interview with cross-sectoral global humanitarian practitioners, the toolkit was developed reviewed by a broad range of humanitarian response experts, and piloted in an emergency (refugee camps in Tanzania with Burundian and Congolese beneficiaries) to examine the feasibility and appropriateness of the content, and learn about the operational challenges and effective strategies for integrating MHM into response efforts.

This presentation will examine the key learning and challenges identified during the pilot in Tanzania, including issues related to menstrual waste disposal and management, the limitations of incomplete response efforts, the need for improved innovation and evaluation methods and strategies to promote cross-sectoral engagement. The toolkit content, launched in October 2017, will also be presented, highlighting tools, indicators, case studies and training resources.

Title: Latrine lighting- safe access of facilities at night

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The Humanitarian Innovation Fund is supporting Oxfam and WEDC in a three-country investigation into the impact of lighting of latrines on both improving latrine use and on reducing gender-based violence (GBV). Sanitation and to some extent, water collection, are amongst the few reasons that people, especially women and children, must go outside during the hours of darkness. A literature review and desk study showed plenty of policy support for lighting in humanitarian contexts but very little evidence for its efficacy. The challenges in previous studies were defining "adequate lighting" especially when the social and physical context is an important factor. Baseline studies have been carried out in refugee camps in Iraq, Nigeria and Uganda, using mixed data collection methods including questionnaires about perceptions of risk, focus group discussions, key informant interviews and physical observations. In each study area there will be a lighting intervention with lampposts or torches being provided and a repeat of the data collection exercise.

Initial findings indicate that there is lot more significance for sanitation provision than just lighting of toilets, such as user perspectives of design, location and acceptable risks. Usage (rather than coverage) of latrines can be much lower than previously assumed. Both very temporary and more permanent latrines had clear design faults from a user perspective, including location, privacy and sharing of facilities. People's fears include tripping or falling, snakes and scorpions, physical (sexual) attacks and voyeurism as well as social stigma with a range of (sometimes very serious) consequences, especially for women. Exploring people's coping strategies includes a very high incidence of informal container-based sanitation, with no provision for providing, emptying or cleaning suitable containers. A GBV perspective is providing valuable insights into sanitation provision.

Title: Mental health in emergency contexts: does poor mental health impair WASH-related behaviours in a vulnerable population of rural Malawi?

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Mental disorders, particularly depression and post-traumatic stress disorder, are common long-term psychological outcomes in emergency contexts arising from conflicts, natural disasters or other challenging environmental conditions. In emergencies, people suffer not only from the lack of external resources, such as scarcity of drinking water or food, but also from poor physical and mental health. Mental disorders can substantially impair daily activities in vulnerable individuals. WASH behaviors are daily activities that require effort, time, and strong internal motivation. Therefore, the question arises whether there is a relationship between mental health and WASH behaviors, and whether the motivational drivers of these behaviors are affected by mental health.

Our cross-sectional study conducted face-to-face interviews with 641 households in rural Malawi. We used a quantitative questionnaire based on the risks, attitudes, norms, abilities, and self-regulation (RANAS) approach to measure motivational psychosocial factors. Mental health was assessed using the validated Chichewa version of the self-reporting questionnaire (SRQ-20). We found significant negative associations between mental health and self-reported safe drinking water collection ($p = .01$, $r = -.104$), observed latrine ownership ($p = .01$, $r = -.171$), and self-reported handwashing ($p = .01$, $r = -.106$). The moderation analysis revealed significant interaction effects of mental health with some psychosocial factors and therefore on WASH-related behaviors. Impaired mental health impeded the influence of others' behavior, commitment, and remembering.

These results imply that populations with a significant proportion of individuals with impaired mental health will benefit from interventions mitigating mental health implemented before or parallel to behavioral change interventions for WASH. There is evidence that specific population-level interventions have a positive effect on mental well-being, and they have been successfully applied at scale. This research is especially relevant in emergency contexts, as it indicates that mental health measures before or parallel to any WASH interventions will make the latter more effective.

Plenary 2: Faecal Sludge Management

Title: Integrated mobile approach for faecal sludge treatment in emergencies using microwave irradiation

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Toilet facilities in emergency settlements fill up rapidly and consequently require frequent emptying, generating large quantities of fresh faecal sludge (FS) containing a high number of pathogens. Fast and efficient FS treatment technologies are therefore necessary for safe treatment and disposal of the FS in such conditions. This study explores the applicability of a microwave (MW) technology for the treatment of fresh FS in Jordan, which has received a high number of Syrian refugees. They are present in large refugee camps, but also spread over the country, exacerbating the poor sanitation situation in the rural areas in Jordan. The research is a joint effort between several partners such as IHE Delft, the German Jordanian University, The University of Zagreb and Tehnobiro.

The approach is the application and testing of the performance and user acceptance of a novel pilot scale MicroWave (MW) irradiation system for FS treatment in case of a protracted crisis. MW irradiation is a very efficient way of pathogen kill off due to its unique nature in rapid heating, and promising for FS drying as well [1, 2, 3]. In situations were a lot of FS is produced, the MW system can be applied as a compact and easily portable as well as fast and effective FS treatment package system and reduced footprints [4]. The focus of the MW unit is on treatment (sanitization and drying). However, the end qualifications of the treatment product are related to the end-use options, reuse in agriculture, and as fuel generation, might be possible options in Jordan.

The MW treatment system for Jordan is constructed on the basis of the acquired knowledge and feedback. During a stakeholder meeting it became clear that the FS in Jordan might contain relatively large amounts of water, which can be divided into two waste flows: polluted water and concentrated sludge. The water flow, as well as the condensate from the MW unit will be treated with UltraFiltration (UF) and Reverse Osmosis (RO). RO is already widely applied in Jordan for brackish water treatment for drinking water production. The RO membrane of the reactor set-up is important as the water has to comply with the 2016 standards for restricted irrigation. At present sludge goes to landfills in Jordan, as there is no public acceptance for application. However, since 2006 the standard allows sludge as a soil conditioner and fertiliser for fodder. The system will be optimized and applied together with the German Jordan University, who will also investigate the application of solar energy for

optimizing the energy consumption of the MW system, and with involvement of the Water Authority of Jordan.

People in emergency camps are faced with inadequate sanitation solutions increasing the risk of being affected by serious health problems, including the onset of epidemics such as cholera [4]. Currently it is a challenge to provide these communities with improved sanitation in the short term.

This research focuses on FS treatment and disposal which can be rapidly deployed upon the event of an emergency and are effective under challenging conditions e.g. high water tables and flood-prone areas. The proposed FS treatment technology has the potential to mitigate the drawbacks of non-sewered sanitation solutions with a compact and efficient system, and thus is a serious effort to alleviate the health conditions of the less privileged people.

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Title: Disinfection of human excreta in emergency settings: a comparison of chlorine-based and hydrated lime-based disinfectant solutions

Authors and affiliations: Diogo Trajano Gomes da Silva[1], Kevin Ives[1], James Ebdon[1], Jean-Francois Fesselet[2], Huw Taylor[1]

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When infectious diseases, such as cholera occur in low-resource settings, the construction and operation of emergency healthcare facilities can significantly reduce mortality. However, such facilities also generate considerable quantities of human excreta that can result in the spread of the disease. Therefore, on-site excreta disinfection interventions are key to preventing further disease transmission. The following study compared the disinfection efficacy of various chlorine concentrations (0.5%, 1% and 2%) and hydrated lime ($Ca(OH)_2$ at 30% concentration), using simulated human excreta matrices containing increasing amounts of organic matter.

Experiments followed MSF guidelines for disinfection of human excreta in cholera treatment centres. Excreta matrices containing (i) raw municipal wastewater and (ii) raw municipal wastewater with 10% and (iii) 20% (w/v) of added faecal sludge, were disinfected in 14 litre Oxfam buckets containing 4.5 L of excreta matrix and 125 mL of disinfectant. Disinfection efficacy was determined after contact times of 10, 30 and 60 mins. Bacterial (faecal coliforms (FC) and intestinal enterococci (IE)) and viral (somatic coliphages (SOMPH)) indicators were used to determine disinfection efficacy.

Disinfection efficacy (measured as log reduction) improved as chlorine concentrations increased. Overall (median values) disinfection efficacies for 0.5% chlorine were: FC (1.66), IE (1.41), SOMPH (1.28); for 1% chlorine: FC (1.98), IE (1.82), SOMPH (1.79); and for 2% chlorine: FC (2.88), IE (2.60), SOMPH (2.38). The study demonstrated that 30% hydrated lime provided the greatest overall disinfection efficacy for FC (3.93) and IE (3.50), but not for SOMPH (1.67).

No statistical differences were observed between the various contact times for any of the treatments, suggesting that a contact time of 10 mins is sufficiently long for the majority of disinfection to occur. This study also indicates the potential of hydrated lime as a simple public health protection intervention, to disinfect human excreta in emergency settings.

Title: Development of a field lab for monitoring of faecal sludge treatment plants

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In urban or camp humanitarian aid settings, faecal sludge (FS) treatment is of utmost importance (Cumming, 2009; Fenner, Guthrie, & Piano, 2007). One of the worst examples of failed faecal sludge treatment is the 2010 cholera outbreak in Haiti (Piarroux et al., 2011) .
FS treatment processes, decision making tools for field use in humanitarian aid are currently being developed (Anderson et al., 2015; Zakaria, Garcia, Hooijmans, & Brdjanovic, 2015). The importance of the regular monitoring of FS treatment plants is stressed in literature (Mara, 2003; Strande, Ronteltap, & Brdjanovic, 2014). However, field ready analytical equipment for process and public health monitoring is missing. To close this gap, the Microbial Sludge Quality project, funded by the Humanitarian Innovation Fund, developed a field lab for the public health and process monitoring of field FS treatment plants.

The basic set of parameters for the field lab were established by a literature search. Each analytical method was tested for its appropriateness and if necessary adapted to field conditions (ruggedness, low power consumptions, easy handling). To ensure functionality each adapted method was cross-checked and compared to the results of its ancestor. Support equipment (e.g. power converter with UPS function and solar panels to recharge batteries) was added and tested to allow semi-independent operation of the lab. The prototype field lab was successfully field tested in Austria and for one month in Blantyre, Malawi. In Austria a household wastewater (WW) treatment plant and in Malawi five different WW and FS treatment plants were monitored.

Usage of the field lab should provide direly needed information on the effluent characteristics of field treatment plants at site and close in time. This information will allow treatment plant operators better control of their treatment process. Thus, ensuring better public health and environmental protection in humanitarian aid. The Microbial Sludge Quality Project was funded by the Humanitarian Innovation Fund (Large Grant 2016/17). The authors would like to thank HIF for the good cooperation and excellent support.

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Plenary 3: Outbreaks and Nutrition

Title: Community engagement in public health – Oxfam's response to the diphtheria outbreak in the Rohingya refugee crisis

Authors and affiliations: Eva Niederberger[1]

1 Oxfam International, Oxford, UK

Oxfam proposes presenting findings on how the community-centred approach to outbreak response has worked - including challenges and good practices. Since November 2017, diphtheria has spread rapidly through Cox's Bazar, Bangladesh. This outbreak adds onto an already alarming public health situation, with challenging access to latrine facilities and high-water contamination. As with many emergencies, speed was prioritized over quality – and working in partnership with communities remains a sector-wide challenge.

Over the past months, Oxfam shifted its WASH response towards a more community-centred approach. This, including model and framework, has been developed based on learning from the Ebola crisis. Applying its core elements requires a different level of analysis. Although the community engagement (CE) model was adopted over the past year across various emergency programmes, the Rohingya refugee crisis is one of the first emergencies in which the model is systematically trialled.

In view of the rapidly increasing numbers of suspected diphtheria patients, this model proved very effective for use in such types of disease outbreak – adopting a methodical but flexible approach.

The field level training of local (Rohingya) volunteers (Community Based Volunteers, CBVs) was used as an entry point to quickly develop a basic contextual understanding of risks, knowledge, practices, socio-cultural perspectives and norms. Building on local expertise, the PHP team mapped information gaps, barriers and enablers to support preventive measures and locally appropriate health-seeking behaviour. Understanding community structures and dynamics was identified as an important aspect to develop realistic outbreak response plans.

Together with CBVs, community stakeholders (who are instrumental in providing trusted information) were mapped and mobilised to inform and engage with different groups. Regular debriefings with CBVs were held to track information needs, concerns and rumours. This information feeds into development of communication content led by the Communicating with Communities Working Group, and is further shared with the affected population.

Title: First phase WASH response to plague in Madagascar

Authors and affiliations: Tom Heath[1]

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In 2017, an outbreak of plague began in Madagascar and expanded rapidly, with about two-thirds of cases transmitted as pneumonic plague, the most dangerous form of the disease. There were a total of 2417 cases and 209 deaths (case fatality rate 9%). Madagascar has very few emergency actors (but an active UNICEF) and very low WASH coverage. The presentation will overview the disease, it epidemiology and discuss how Action Contre La Faim (ACF) worked with the WASH cluster to respond (ACF is a WASH and nutrition actor in Madagascar).

At the start of the response, there was an Ebola mentality, a need for a fast response, for WASH to engage and be part of the response, to aim for containment of the disease and target the entire population (rather than just the most vulnerable). ACF decided to respond following alerts from MDM in country and international support was mobilised. The WASH clusters response was focused upon addressing the lack of infection prevention and control (IPC) in the 8 Centres for the triage and treatment of Plague. A new IPC protocol was developed and IPCs teams were recruited, equipped and trained. In addition to the IPC response, ACF established a community response supporting community sensitization and a plague blocking team and contract tracing.

The presentation will review the lessons learnt: impact of the WASH IPC teams (in place as the outbreak started to decline); no epidemiology data from government (this is a trend in so many responses, do we need another approach); Ebola vs cholera mind-set; community denial and role of MSF and WHO. The presentation will end with reflections on the role of WASH actors in medical responses, issues with WASH focused IPC protocols and replication of epi blocking teams.

Title: Effectiveness of a household water, sanitation and hygiene package on an outpatient program for severe acute malnutrition: a pragmatic cluster randomized controlled trial in Chad

Authors and affiliations: Mathias Altmann[1], Chiara Altare, Nanette van d er Spek[2], Jean-Christophe Barbiche[1] Jovana Dodos[1], Mahamat Bechir[3], Myriam Ait Aissa[1] and Patrick Kolsteren[4]

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Water, sanitation and hygiene (WASH) interventions have a small but measurable benefit on stunting, but not on wasting. Our objective was to assess the effectiveness of a household WASH package on the performance of an Outpatient Therapeutic feeding Program (OTP) for severe acute malnutrition (SAM). We conducted a cluster-randomized controlled trial embedded in a routine OTP. The study population included 20 health centers (clusters) from Mao and Mondo districts in Chad. Both arms received the OTP. The intervention arm received an additional household WASH package (chlorine, soap, water storage container, and promotion on its use).

The primary objective measures were the relapse rates to SAM at 2 and 6 months post-recovery. The secondary objectives included the recovery rate from SAM, the time-to-recovery, the weight gain, and the diarrhoea longitudinal prevalence in OTP. The study lasted from April 2015 to May 2016.

Among the 1,603 recruited children, 845 were in the intervention arm and 758 in the control arm. No differences in the relapse rates were noticed at 2 (−0.4%; *P* = 0.911) and 6 (−1.0%; *P* = 0.532) months. The intervention decreased the time-to-recovery (−4.4 days; *P* = 0.038), improved the recovery rate (10.5%; *P* = 0.034), and the absolute weight gain (3.0 g/d; *P* = 0.014). No statistical differences were noticed for the diarrhoea longitudinal prevalence (−1.7%; *P* = 0.223) and the weight gain velocity (0.4 g/kg/d; *P* = 0.086). Our results showed that adding a household WASH package did not decrease post-recovery relapse rates but increased the recovery rate among children admitted in OTP. We recommend further robust trials in other settings to confirm our results.

Plenary 4: Sanitation Design

Title: UNHCR's Waste to Value Portfolio

Authors and affiliations: Simeneh Gebeyehu[1], Julian Parker[1], A.B.M. Sadiqur Rahman[1], Ryan Schweitzer[1]

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UNHCR is working to identify, pilot, and scale-up technologies and approaches that recapture the embodied energy or nutrient value of "waste" products (e.g. household solid waste, agricultural by-products and human/animal fecal matter).

UNHCR Bangladesh partnered with ACF and NGO Forum for Public Health to construct 76 biogas systems in Nayapara and Kutapalong Camps. These systems convert fecal matter from 185 latrine blocks (925 cubicles) used by 18,500 people into biogas used by 508 families (2,540 people) for cooking in communal kitchens. In Assosa, Ethiopia, UNHCR converts organic solid waste from 436 households into fuel briquettes (more than 4 tons to date). These projects offset household fuel demand (reducing domestic energy costs and environmental impact), improve environmental health in through reduced solid waste, reduce exposure of women/girls to sexual and gender based violence during firewood collection, and also improve refugee livelihoods through the sale of briquettes.

In Kakuma Camp, the Norwegian Refugee Council engaged a private entrepreneur, Sanivation, to provide 250 households with a 'container-based' toilet and bi-weekly fecal sludge collection service. The faecal sludge is treated and transformed into solid fuel cooking briquettes that are sold as a more cost-effective alternative to charcoal. The briquette income is used to offset the cost of the sanitation service.

In Jewi Camp, Oxfam constructed 134 Double Vault Urine Diversion Desiccating Toilets (UDDT) and 92 Tiger Worm Toilets building on previous experience from Somali Region. Both technologies provide on-site treatment of fecal matter to reduce pathogens and produce material with high nutrient content for use as a soil conditioner.

UNHCR's waste to value operational research agenda is driven by a need to reduce costs, protect the environment and provide refugee livelihood opportunities. Early results suggest these criteria are being met, but more research is needed to quantify the impact and potential economies of scale.

Title: User centred sanitation design through rapid community engagement - how to increase overall satisfaction and use of sanitation facilities in emergencies

Authors and affiliations: Kate Brogan[1], Katrice King[2], Ajay Paul[3], Omar Katerji[4]
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2 Save The Children, London, UK
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In 2017, the Humanitarian Innovation Fund (HIF) challenged WASH partners to create good practice guidance for rapid engagement with affected communities as end users, to generate actionable and practical solutions for user-centered sanitation in emergencies. Despite its perceived importance, Community Engagement (CE) is often limited in the first few weeks of a rapid on-set emergency. Furthermore, the limited availability of systematic and documented monitoring and evaluation of CE and sanitation undermines learning on best practice, which results in limited guidance for practitioners to draw upon for rapid-onset emergencies.

Through funding from HIF, Oxfam carried out a landscape review of CE approaches, looking at their appropriateness and impact on sanitation provision in rapid on-set emergencies. The review identified that poor practice comes from the absence of CE rather than weaknesses in those who do practice it, but the methods used within the 12-week period following an emergency go little further than conversations with groups of men and women.

As a result of these findings, the HIF is currently supporting three implementing partners working across different emergency contexts; from rapid on-set emergencies in Bangladesh and Uganda to protracted emergencies in Iraq and Lebanon, to test the hypothesis that greater community engagement (including empowerment, trust and mutual respect) leads to improved latrine construction that is timely, appropriate, consistently used and community-owned. Each partner developed their own CE methodologies and Oxfam developed a common M&E log-frame that will ensure comparisons can be drawn across all project locations.

The data gathered from the CE methodologies will be used to create a short and simple set of guiding principles/standards for CE in rapid onset emergencies that can be adapted to different contexts. Through a focus on the key outcomes of participation, satisfaction and on-going use and maintenance, these should ultimately lead to appropriate and effective sanitation.

Title: Save the Children (SC) & Eclipse Experience: child participation in sanitation design in emergencies

Authors and affiliations: Katrice King[1], Elli Panagopoulos[2], Oliver Kastner[2]

1 Save The Children, London, UK
2 Eclipse Experience, London, UK

Open defecation represents a serious public health issue in crowded displacement sites, where a faecal-pathogens-free environment is extremely important in preventing the transmission of faecal-oral diseases both among children and adults. A recent systematic review found that sanitation structure and design characteristics are associated with (sustained) latrine use."[1] This applied to both adults and children, even though all the studies reviewed were in developing countries rather than in emergencies.
HIF through its User Centred Sanitation Design through Rapid Community Engagement grant hypothesizes that better latrine design would also impact short term latrine use and that engaging the community in the design of latrines would ensure that the latrines would meet the structured and design characteristics preferred by the disaster affected community.[2]
To test these hypotheses, SC has partnered with Eclipse Experience, a user-centred research and design agency, to test innovative approaches to engaging disaster affected children in sanitation design with support from the HIF. Children were chosen as a target group both because of the agency's focus and because they represent over 50% of the crisis-affected population in most humanitarian crises; yet, they are rarely supported to participate in design and decision-making processes, resulting in a poor understanding of their specific needs and concerns.

SC is piloting interactive digital surveys and co-creation sessions to engage with children aged 5-12 and their caregivers in displacement camps in Bangladesh and Iraq.[3] The data collected, and insights gained from these methods will directly inform sanitation design decisions and work to deliver more child-friendly latrines in the aftermath of rapid-onset emergencies.

Our presentation discusses the findings of our pilot projects between December 2017 and April 2018. An increased children's uptake and consistent use of sanitation facilities in emergency settings would contribute to the reduction of children's open defecation; this in turn will decrease the environmental health risks related to sanitation in humanitarian contexts.

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[2] Community – and children - engagement and participation also represent a goal on its own for many humanitarian organisations, including Save the Children; see the Core Humanitarian Standard and the Grand Bargain Participation Revolution commitment
[3] For further information see: http://www.eclipse-experience.com/usercentredsanitation

PLENARY 5: Sustainable WASH in Emergencies

Title: Management systems for ensuring sustainable WASH facilities in humanitarian contexts

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1 Independent Consultant, Water Resource Management
2 Oxfam International, Oxford, UK

Large scale human displacement, either within or outside national boundaries, can result in densely populated camps and settlements. Every emergency is different in its details, but WASH (water, sanitation and hygiene) is a critical component of humanitarian response. The long-term management and sustainability of emergency WASH systems is particularly difficult. Four broad challenges can occur: emergency water supply and sanitation systems can be sophisticated and large-scale, community participation may be limited due to the beneficiary nature of emergencies, displaced communities may have limited ability to operate and maintain extensive WASH systems and limited (if any) user revenue is generated to cover recurrent costs. To help address this important management dilemma, we argue that several simple measures should be considered at the critical stage of the response. We use some simple case study examples to demonstrate what considerations need to be factored in when planning more durable WASH management models. We show that suitable management models need to be determined following an assessment of the prevailing conditions. We show that communities would not normally be expected to manage extensive water supply and sanitation systems. We recommend looking beyond community management models and looking at more professionalized management systems to generate and sustain higher standards of service delivery.

This work and presentation is a collaborative project between Oxfam and UNHCR and the outcome of 3-months of research, taking in five countries. The work included deskwork looking at 'best sector practice', country visits to refugee camps, IDP settlements and adjoining communities, and consultations with WASH sector specialists familiar with sustainability issues.

Title: Challenges and constraints of implementing community approaches for total sanitation in conflict areas: case study from Boko Haram-conflict area in Cameroon

Authors and affiliations: Faustin Ekah[1]

1 UNICEF, Yaoundé, Cameroon

Since 2014, due to the Boko Haram conflict, Cameroon is hosting 90728 refugees[4] and 241987 internal displaced population[5] in Far North region. There is limited or no access for humanitarian actors in some part of the region. 22% of its population practice open defecation (7% at national level)[6]. Between 2010 to 2016, 37556 cases and 1656 deaths of cholera was reported at country level[7]. The Far North host 45% of cases and 56% of death. Thus the region is at high risk of cholera.

Different options were discussed to ensure access to basic sanitation for population in conflict area. Community Led Total Sanitation (CLTS) approach was one approach recommended. A total of 133 villages hosting about 10,694 households and 66,366 Persons was selected for the implementation of CLTS by a Local NGO with support of UNICEF (including 7 IDP sites hosting 622 households and 4406 persons).

Mains difficulties encountered during project implementation was related to access to area, organizing community meeting, mobilizing community member, displacement of population, transport of partner staff and respect of national CLTS standard approach. Working with authorities including military, establishing good relationship with administrative, local authorities and other stakeholders, reviewing and adapting the approach, innovation in the monitoring have contributed to addressed the hygiene and sanitation issues in conflicts area.

As result, each IDP household in site have construct and used latrines. The access to latrines have increased from 24% to 100% in targeted village. A total of 9,341 latrines equipped with handwashing was constructed. Also, the project registered significant result including change in traditional rule related to the host of IDP which contributed to facilitate the access to basic sanitation for IDP.

[4] Fact sheet UNHCR Cameroun. November 2017.
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PLENARY 6: Cholera

Title: A systematic review and meta-analysis of the association between water, sanitation, and hygiene exposures and cholera in case-control studies

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Case-control studies are often conducted during outbreaks to identify cholera transmission routes. Water, sanitation, and hygiene (WASH) exposures can facilitate cholera transmission (risk factors) or interrupt transmission (protective factors), however there has not been a systematic analysis of the association observed between WASH exposures and cholera during outbreaks using case-control studies.

A systematic review was completed to close this gap, including describing the theory of change, developing inclusion criteria, searching and selecting studies, assessing quality of evidence, and summarizing associations (odds ratios) between cholera and seven predicted WASH protective factors and eight predicted WASH risk factors.

Overall, 51 case-control studies from 30 countries met inclusion criteria. All eight predicted risk factors were associated with higher odds of cholera (OR 1.9-5.6, heterogeneity (I^2) of 0-92%), while five of seven predicted protective factors were associated with lower odds of cholera (OR 0.35-1.4, I^2 57-91%); exceptions were insignificant associations for improved water source (OR 1.1, I^2 91%) and improved sanitation (OR 1.4, I^2 68%).

In meta-analysis results, predicted risk factors were associated with cholera; however, predicted protective factors were not consistently protective, and no sanitation factor or improved water source (with the exception of bottled water) was significantly protective. The inconsistency of protection is attributed to both cholera transmission via multiple routes and variation in WASH intervention implementation quality. These results emphasize that intervention effectiveness depends on, among other factors, appropriate targeting of disease pathways and program design accounting for beneficiary preferences to ensure correct and consistent use. To better understand which WASH factors are most effectively protective, it is recommended that: 1) interventions be well-implemented to ensure field effectiveness matches theoretical efficacy, and 2) case-control reports detail intervention characteristics so factors leading to success or failure can be more directly assessed to determine factors contributing to disease prevention.

Title: Evaluating the effect of an MSF hygiene kit intervention on domestic transmission of cholera among household contacts of cholera-infected patients: a study protocol

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MSF guidelines for cholera control include the improvement of water supply, water quality, sanitation, and hygiene promotion as well as the distribution of hygiene kits. Hygiene kits are also recommended by many other humanitarian agencies during outbreaks. Evidence shows that domestic intrahousehold or human-to-human transmission, as opposed to environment-to-human, is often the predominant transmission route in outbreaks. Models suggest that interventions targeting domestic human-to-human transmission such as hygiene kits could be a more effective way to control cholera in outbreaks than interventions in the public domain. A recent systematic review identified seven studies evaluating the use of hygiene kits in crises, but none measured effects on health. However, one recent trial of a hygiene kit however, published in 2017, showed a reduction in secondary transmission rates of cholera among household contacts but this study was conducted in an endemic non-crisis setting and the results may not be transferrable to an emergency and epidemic setting.

Based on this, we have designed a prospective cohort study to assess the reduction of secondary transmission from use of the hygiene kit during an MSF cholera response in a complex emergency. This study will enrol the household contacts of cholera-infected patients admitted to the MSF Cholera Treatment Centre with hygiene kits distributed to these households. Environmental samples (water, at source and point of use, and food) will be tested for faecal indicator bacteria and *Vibrio cholerae*, and stool samples from primary household cases and household members will be tested for cholera case confirmation by Rapid Diagnostic Test. To our knowledge, this is the first study conducted in an outbreak setting combining quantitative exposure and infection assessment to evaluate the impact of hygiene kits on cholera transmission. We will obtain estimates of the effectiveness against, and population attributable fraction reduction in, cholera clinical disease and asymptomatic infection, by fitting a statistical model of cholera risk among household contacts, as a function of extent of hygiene kit us, as measured during cohort follow up.

Title: Pre-Crisis Market Analysis (PCMA) of WASH NFIs for cholera mitigation and emergency preparedness in Haiti

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After 7 years of direct interventions to respond to cholera outbreaks in Artibonite, Haiti, Action Against Hunger/Action Contre la Faim (AAH), with Rezodlo SA, conducted a Pre-Crisis Market Analysis (PCMA) to explore the capacity of the market to supply 3 common WASH items: soap, chlorine, and water containers.

The market for soap is well established, products are available and affordable. 90% of households had at least one soap in their homes; more than half had 2 types or more. Systematic distributions of soap during outbreaks seem questionable. Only 6% are however equipped with a handwashing device. This issue isn't prioritized, despite its importance to support handwashing behaviours. 94% of households had at least one water bucket, 53% even owned at least three. However, only 25% had a bucket with a tap, from aid donations. More than 90% of the buckets are purchased on markets, mainly vegetable oil recycled containers. 60% had chlorine in their homes. The main discovery was a well-established market of HTH granules for households, parallel to the official channel provided for free to the water networks committees. HTH is imported in bulk by an agro-supplier, sold through a network of 50 shops to middlemen, and then repackaged in 15g sachets, without indication of brand, safety or conservation recommendations. These sachets are widely found on local markets, and in 35% of the surveyed households. Actual water treatment chorine tablets or solutions were found in 24% and 11% of houses, respectively.

Market-based emergency responses are largely underutilized in WASH. This study was one of 4 PCMAs conducted by Oxfam and AAH, with support from OFDA, to evaluate the applicability of the methodology to WASH markets, and to contribute to building good practices and the capacity of the sector. Following the study, a marketing scheme offering the retrofitting of taps to households-owned buckets for the purchase of chlorine-solution was successfully piloted to support resellers and to increase their local visibility and clientele. Another pilot linking local Water Committees to private HTH wholesalers to avoid shortages at critical moments stalled as it was not possible to strike an agreement with the Water Agency responsible for free HTH provision.

Additional recommendations currently explored for internal emergency preparedness: consider vouchers over in-kind donations; save costs on bucket distribution by only providing taps. Working with HTH middlemen to ensure user safety and disseminate prevention messages, and develop a market for handwashing devices, would also be relevant interventions in the context. The study provides opportunities to review current practices, including some unsuspected information about availability of products, and stronger evidence confirmed trends that were included without data in programming and national strategies.

PLENARY 7: Handwashing and Hygiene Promotion

Title: Motivators and barriers to handwashing behaviour during humanitarian emergencies

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Diarrhoea and acute respiratory infections (ARI) account for 30% of deaths among children displaced due to humanitarian emergencies. Handwashing with soap prevents both diarrhoea and ARI. Little is known about motivators and challenges to handwashing during emergencies. In 2013, we conducted key informant interviews with 12 international experts supporting emergency water, sanitation and hygiene services to understand hygiene promotion strategies for emergency-affected populations. Subsequently, in-depth interviews with 18 mothers of children <5 years and 4 group discussions with camp residents and hygiene promoters were administered from June to August 2015 to identify motivators and barriers to handwashing in an internally displaced persons camp in eastern Democratic Republic of Congo (DRC).

Key informants reported that emergency behaviour change strategies lack specific goals, communications expertise, and understanding of emergency-affected populations' pre-existing handwashing behaviours and motivators. These experts recommended developing contextualized behaviour change approaches to improve handwashing promotion in emergency settings. Study results showed that in the DRC camp, hygiene promotion activities lacked adequate resources, cultural acceptability, innovation, and adaptation for sustained behavioural change.

Camp residents reported that handwashing was motivated by preventing illness, particularly diarrhoea disease, with many mentioning a heightened need to wash hands during diarrhoea outbreaks. Emotionally- and socially-related motivators such as "feeling clean" or "maintaining a good image" were also reported to stimulate handwashing with soap. Interviewees indicated that the harsh living conditions forced residents to prioritize procuring basic survival needs over good hygiene. Illness-based messages may be more effective in emergency settings where disease poses an ongoing threat compared to non-emergency contexts. However, failure to use emotive and social drivers known to stimulate handwashing in development settings may present missed opportunities to improve handwashing in camps. Study findings reinforced the need to involve behavioural change experts and develop contextually-relevant handwashing strategies in humanitarian emergencies.

Title: Pre-test findings of a new interactive handwashing promotion program – Mums Magic Hands in emergencies using emotional and health motivators.

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In a bid to develop effective handwashing promotion programs in emergencies, Oxfam, in partnership with Lifebuoy Global, Unilever in 2014, conducted formative research with emergency affected mothers in 3 Asian countries (The Philippines, Pakistan and Nepal) to better understand what motivates mothers to wash their hands in emergencies. The results of the research show that nurture and affiliation were common motivators in the three research areas and this was shared in 2016 Environmental Health Forum held in Nepal. Subsequently, the research findings were used in the development of Mum's Magic Hands (MMH); a hand washing with soap (HWWS) promotion program. A set of materials (including a story board) was developed and pilot tested in Nepal and proved to increase HWWS practice at two critical times however, there was a need to pre-test the materials in additional contexts to determine suitability outside of Asia. As such, focus group discussions and key informant interviews were conducted to collect information from various stakeholders in Zaatari camp, Jordan and Bidibidi settlement, Uganda to pre-test the materials for cultural proximity, comprehension, appropriateness, appeal and persuasion.

Findings from both contexts suggest that although mothers understood key messages, found the materials attractive, persuasive and could identify with the narrative, they felt the visuals did not accurately reflect their cultural/religious milieu. However, most of the complementary activities were found relevant.

The pre-testing of Mums Magic Hands affected Oxfam programming by giving context specific information to modify what was initially created, the findings was used to improve on the initial version to match the different contexts that the materials were tested in and as a result, there are now three versions of Mums Magic Hands (the first version used in Asia; the second for low income/low literacy contexts in Africa and the third for global use in multicultural contexts). We are doing further testing of the different versions in more locations with the aim to confirm their effectiveness and scale up the use of Mums Magic Hands.

The act of pre-testing the MMH materials in additional contexts proved significant in verifying its versatile possible applications. Overall findings from these pre-tests have now resulted in three sets of MMH which are available and can be used globally to help increase HWWS and reduce morbidity and mortality particularly related to diarrhoea. It also reinforces the need to find out what are the motivators and barriers to good hygiene practices even in emergency contexts since health may not be the only motivator for improved practices.

Title: Do we need to do hygiene promotion differently in humanitarian emergencies? Findings from exploratory research in Iraq and the DRC.

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Literature reviews and practitioners acknowledge that hygiene promotion in emergencies is often ad-hoc, generic, not grounded in evidence and is insufficient to result in behavioural shifts. In an emergency many of the determinants of handwashing behaviour (e.g. social networks, physical infrastructure, risk perception, etc.) are disrupted and we know little about how behavioural adaptions are made.

Qualitative research was conducted in two field sites: Iraq and the Democratic Republic of Congo (DRC) using participatory methods to explore handwashing determinants.

The research in Iraq documented an increase in handwashing in the wake of conflict and displacement. Handwashing was motivated by an increased perceived risk of disease; a heightened sense of disgust towards their surroundings; and a desire to re-establish familiar routines in attempt to reclaim agency and normalcy within their lives. The influence of social networks and norms decreased due to separation from 'valued others' and because the psychological toll of the crisis led less sociality.

The fieldwork in DRC took place during a cholera outbreak. Although cholera is feared, it is so widespread that fear is insufficient to motivate handwashing behaviour. People made psychological trade-offs which resulted in soap rarely being purchased and only being used for laundry and bathing. In both settings, attractive and easy-to-use handwashing facilities were critical for enabling practice yet were rarely available.

This research identified which determinants increase or decrease in importance in times of emergency. It found that creating the right setting for handwashing behaviour to take place is the most important factor for enabling behaviour. In emergencies hygiene programs should consider the psychological state of the population and help to facilitate agency and dignity. These findings should facilitate a shift from educational approaches to more innovative, evidence-based and context-specific interventions.

PLENARY 8: Waste Water Treatment and Sewers

Title: The needs for low cost and sustainable wastewater management practice in protracted emergency: a case study from Rakhine State, Myanmar

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Due to the horizontal conflict between two communities in Rakhine State on 2012, more than 124,026 people were displaced into over 30 camps in Rakhine State in Myanmar. These camps are located in over four townships, namely in Sittwe, Pauktaw, Myebon, and Kyakphyu Township.

Following the latest Myanmar WASH cluster 4Ws report on 2017, the coverage to improved drinking water in IDP camps has reached 99 %, while the coverage of access into sanitation facilities reached 77 %. The access to sanitation system is dominated by pour flush latrine. To serve the internally displaced people, there are 6,188 latrines available in camps. In regular basis, desludging activities are carried out by dedicated WASH agency in every camp, while the wastewater treatment are centralized in 5 locations. There are three wastewater water treatment facilities available in IDP camps, namely in STMG in Sittwe, KNP in Pauktaw, and STM Camp in Pauktaw township. The total capacity of these three wastewater treatment facilities is nearly 100 m3/d. While, there are two basic stabilization ponds available in Ngat Cheung camps.

The overall results effluent analysis Sittwe wastewater treatment indicates that Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD) of three wastewater treatments are within tolerable level. However, the operation and maintenance cost of these facilities are challenging and currently supported by six international agencies in Rakhine State.

Due to the uncertainty of the relocation of the IDP, there is a need to improve the wastewater management in all camps in Rakhine State. However, cheaper and sustainable wastewater management and practices are needed in protracted emergency situation.

Title: Solid-free sewer networks

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In November 2016 we were invited by UNICEF to develop a sanitation plan for the circa 4000 Informal Tented Settlements for Syrian Refugees. More than 15 international humanitarian organizations deliver water and sanitation to the inhabitants. Mainly providing a toilet with sludge holding tanks and trucking fecal sludge to (in)formal disposal sites. The costs of desludging of the tanks mounts to 5 million dollars annually.

The Lebanese government is worried about the increase of water pollution, but at the same time does not allows durable (concrete) sanitation structures in the camps.

The team presented at the end of 2016 a plan to install in most settlements a standardized solid free sewer network syphoning the sewage liquid from sludge holding tanks, followed by a wastewater treatment in an ABR and vertical flow constructed wetland. The quality of the effluent would meet local waste water discharge standards. The system offers better sanitation services for 10 % of the current O&M sanitation costs. In case UNICEF and its partners would introduce the option in all settlements the investment costs would be twice the current annual UNICEF budget for sanitation. There after the O&M cost are reduced to 10% of the current annual costs.

We argue that a sewer system is a viable option for small and large refugee camps that can be introduced shortly after the establishment of the camps. It will reduce the movements of large vacuum trucks, allow for simple effective treatment of sewage, and may eventually become a solution for long term settlements and surrounding local communities.

The system offers a comfortable and social safe alternative compare to other emergency sanitation options and allows under controlled circumstances the use of treated waste water for agricultural activities.

Preparation, planning and standardization are key elements of the success of this semi-structural sanitation option. The system does require simple though regular O&M by locally trained staff.

The system is less suitable for flood prone areas and does require a water consumption of minimal 10 liter per capita depending on the size of the network.

We promote a more thorough preparedness of sanitation services presenting prospects of adaptation and by local communities.

Title: Evaluation of the waste water treatment systems in MSF hospitals

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In the countries where Doctors without Borders (MSF) works, waste water management is very basic. Sewage is usually treated by septic tanks and infiltrated or released into surface water. New technologies are appearing on MSF fields to improve the treatment, but up to day, there is no monitoring of the quality of the effluents. Mindful of the impact of its activities on the environment and on public health, MSF wants to develop a laboratory kit for sewage analysis and investigate the quality of its effluents released into surface water.

MSF has launched a campaign of sewage analysis on its 3 hospitals in Haiti, with two main aims: compare the efficiency of the different waste water treatments used before releasing the effluent into surface water that are septic tanks, anaerobic filters and rotating biological contactors (RBC); and allow the development of a laboratory kit for sewage analysis, easily usable on the field, by non-specialists.

Analysis results showed that RBC gives the best performances on the main parameters. Anaerobic filters decrease turbidity, but their maintenance is difficult and can drastically affect their performance. Septic tanks are pretreatment but give different efficiency according to their design and sizing.

The use of the kit showed difficulties in analyzing DBO_5 and biological parameters. The method used for DBO_5 is the simpler option available but was still hard to use. Furthermore, the analytical uncertainty is high for this parameter, so MSF should reconsider the relevance of monitoring the DBO_5. The kit should be able to analyze the following parameters: Temperature, pH, COD, suspended solids. Phosphorous and nitrogen could be monitored for information, knowing that the treatments used by MSF don't impact them.

The comparative study will help MSF choose the most appropriate technology regarding the context. The kit developed could be deployed on the fields in order to monitor the impact of MSF activities on the environment and adjust the treatment.