

R2HC Study on Bucket Chlorination and Household Disinfection

Information for Potential Partners

Tufts

School of
Engineering

Cholera is a severe, acute, dehydrating diarrhea that results from infection with the bacterium *Vibrio cholerae*. Water supply and sanitation infrastructure has eliminated cholera in many countries. However, in 2016, 38 countries reported cholera. There are an estimated 1.4-4 million cases of cholera a year, with 21,000-143,000 fatalities. Cholera is transmitted by contaminated water and food. *Bucket chlorination* is one of a suite of water, sanitation, and hygiene interventions implemented to control cholera, and is intended to interrupt transmission of cholera via water. Due to contamination of surfaces in the household with the bacteria, household contacts of confirmed cholera patients are much more likely than community members to contract cholera. *Household disinfection* is another WASH intervention implemented to control cholera outbreaks, and is intended to prevent transmission from a cholera patient to household contacts and neighbors.

Approaches for Bucket Chlorination

Bucket chlorination is a source-based water treatment intervention where:

- A person is stationed near a water source.
- This person adds a known dose of chlorine directly into the water collection container of the recipient.

The perceived benefits of bucket chlorination include that trained personnel apply an appropriate dose of chlorine directly into water storage containers, requiring little household-level behavior change.



Bucket chlorination (IFRC)



*Household spraying (IFRC) and
Household Disinfection Kit Distribution (MSF)*

Approaches for Household Disinfection

Traditionally, the primary household disinfection intervention was spraying of the home of a cholera patient with chlorine solution by a dedicated response team (household spraying). However, recent concerns about the efficacy, effectiveness, and acceptability of household spraying have led agencies to reconsider practices. The current recommendations UNICEF recommendations are to:

- Not complete household spraying with chlorine solution; and,
- Instead, deliver and train household members to use an “*household disinfection kit*” of materials to support disinfecting their own homes.

Despite the recommendations, household spraying with chlorine solution is still commonly completed, as it is a known and visually prominent outbreak response activity.

State of Research on Bucket Chlorination

A systematic review of WASH in emergencies was recently conducted, which found that, despite the widespread implementation and longstanding use of bucket chlorination, (dating back at least to the 1930s):

- No evaluations of bucket chlorination were identified in the review, on either the potential efficacy or the effectiveness in actual field programs.
- Overall, there is a lack of both technical (water quality, including chlorine residual and *E. coli*) and programmatic (quality, dosage) information on bucket chlorination.

This Humanitarian Evidence Programme evidence synthesis on WASH in outbreaks can be found at:

<http://fic.tufts.edu/assets/WASH-Systematic-Review.pdf>.

State of Research on Household Disinfection

A systematic review of WASH in emergencies was recently conducted, which identified the following information on household disinfection:

- No evaluation of household spraying was identified in the review, neither the potential efficacy nor the effectiveness in actual field programs.
- Only one household disinfection kit evaluation was identified, which found that self-reported use of the disinfection kits was 98%, with 94% of recipients reporting that instructions were clear and simple. This kit included 0.5-1 kg of soap, a 14L bucket, a 10L jerrican, 3.8L of bleach, a cloth, a scrubbing brush, and an instruction booklet.

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Research Questions for R2HC Project

Tufts, with AAH, IRFC, and MSF, and funding from R2HC, is working to answer the following research questions:

- 1) What is the *efficacy* of bucket chlorination and household disinfection in the laboratory setting against the *Vibrio cholerae* bacteria?
- 2) What is the *effectiveness* of bucket chlorination and household disinfection as actually implemented by responding organizations in six to-be-determined outbreak situations?

This 3-pager is intended to provide information to potential field partners on the effectiveness portion of this project.

The field effectiveness study design is a mixed method protocol with three study populations: 1) program staff; 2) staff; and, 3) household beneficiaries, as shown below for bucket chlorination and on the next page for household disinfection. Please note the protocol and associated tools have been pre-approved by Tufts University ethics. Upon identification of emergencies for evaluation, a rapid final approval from Tufts and local approval will be completed. The full protocol and all tools have been reviewed by international partner staff, and are available upon request.

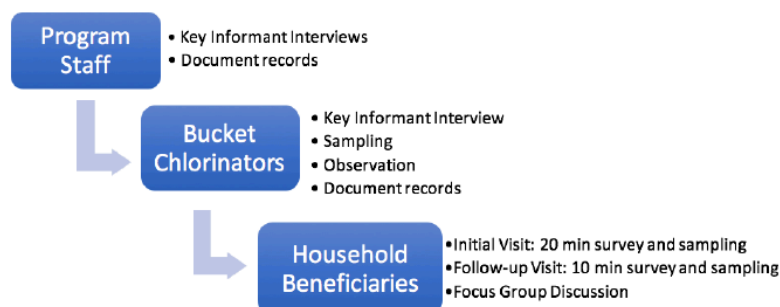
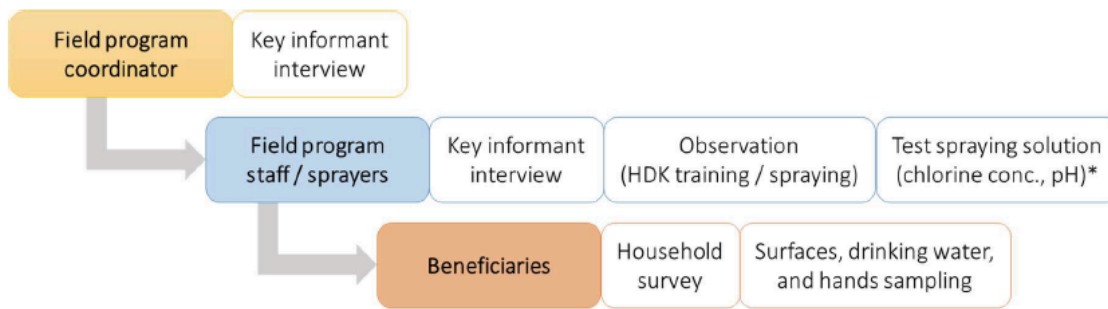


Figure 1: Overview of participants and associated surveys



**For household spraying only.*

Tufts University Responsibilities

- Conduct the evaluation, and manage staff in the evaluation.
- Provide all necessary documentation to partner.
- Complete any trainings required by the partner.
- Bring all necessary equipment for laboratory testing in checked baggage, with the exception of:
 - Ice / cold packs / way to keep samples at 4°C; and,
 - A source of power (car battery, mains, etc.).
- Be covered under the umbrella of the partner organization, for security and internal protocols.
- Adhere to partner organization security protocols and code of conduct.

Partner Responsibilities

- Assist in selecting appropriate emergencies.
 - Report outbreaks anticipated to last >1 month.
 - Report if you implement household spraying, household disinfection kits, or bucket chlorination.
- Agree to host and support the research.
 - 1 research is country for 2-3 weeks.
 - Facilitate access to sites and activities.
- Provide local contacts for:
 - Ethics review, translation, and staff (enumerators)
- Provide support for logistics, including:
 - Visa application, lodging, in-country transport, airport pick-up and drop-off, securing appropriate communication (e.g. cell phone), and, if appropriate, security clearance.
- Commit to 1-hour key informant interview.
- Commit to 3-hour debriefing meeting.

Please note that Tufts University will cover all costs for these activities, including direct payment for all expenses. There will be no financial costs or financial administrative burden for partner organizations in this work.

Data and Dissemination

Tufts University will own all study data, and partner organizations will:

- Receive all deliverables at least two weeks before submission or presentation.
- Have the opportunity to review and provide comments on all deliverables before submission or presentation.
- At minimum, all study partners will be acknowledged in all project deliverables.
- Exceptional study partners may become co-authors on appropriate deliverables.

Partner organizations may present results if they provide two weeks notice to Tufts for review. Partners can receive de-identified study data.

We are happy to answer questions: daniele.lantagne@tufts.edu, karin.gallandat@tufts.edu, and gabrielle.string@tufts.edu.



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