Trends, gaps and opportunities in emergency environmental health research

Emergency Environmental Health Forum 2016
Kathmandu, Nepal

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Overview

1. Trends in humanitarian assistance
2. Public health research in humanitarian settings
3. Opportunity

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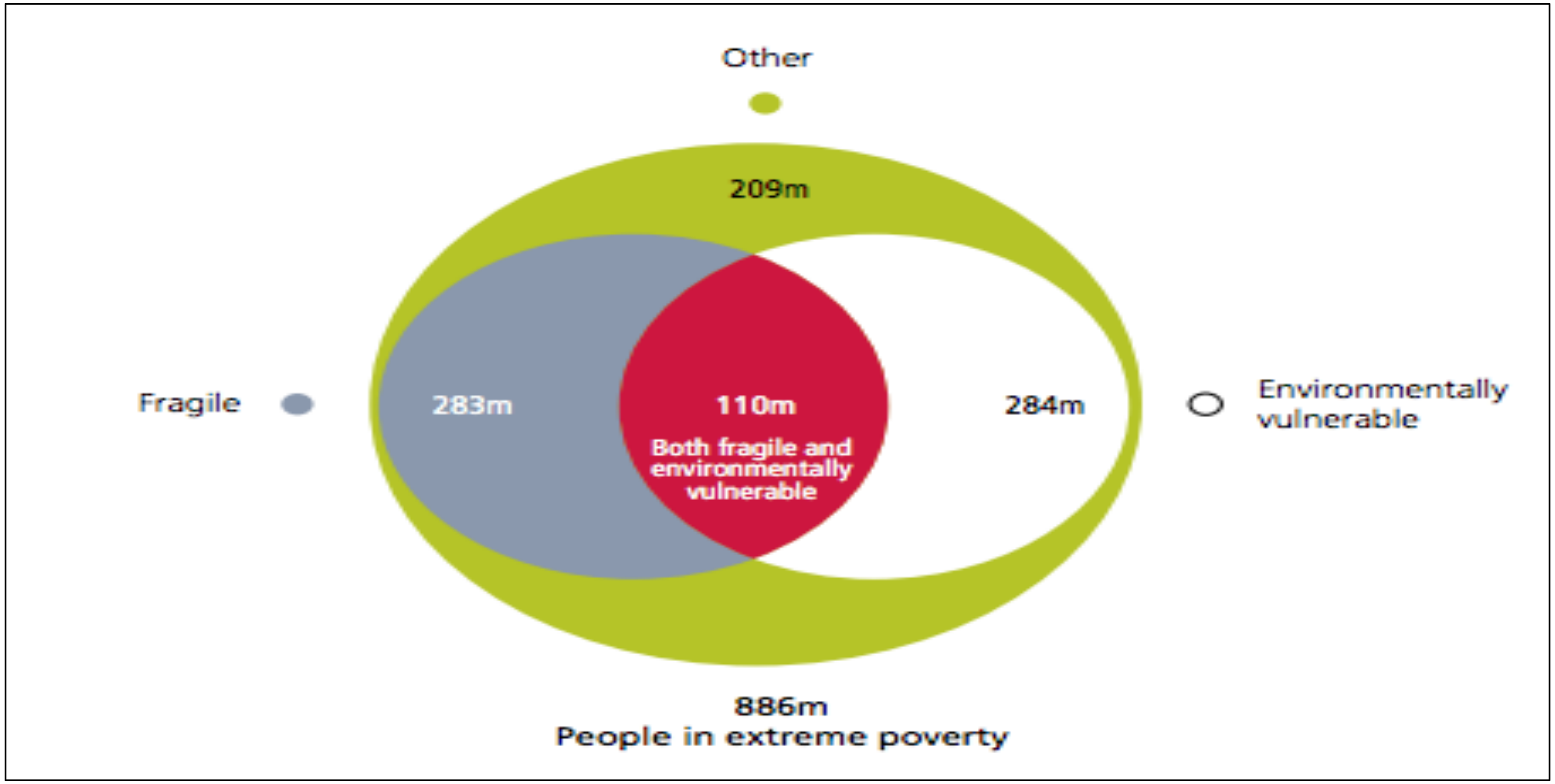
Humanitarian Trends

Almost a billion people living in extreme poverty:

284 mill. environmentally vulnerable

283 mill. politically fragile

110 mill. *both*



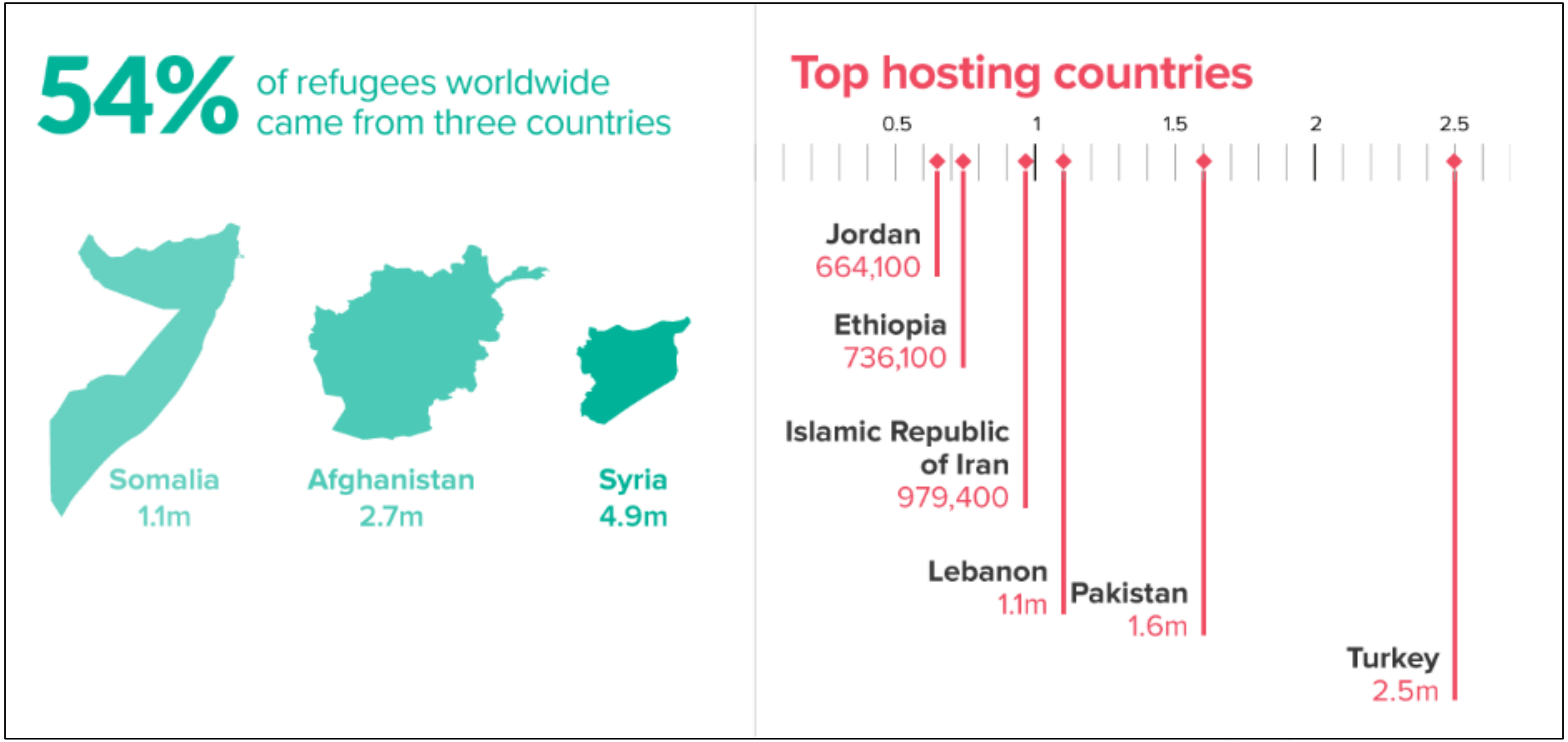
Source: WHTD Report, 2016

Humanitarian trends

Afghan crisis, 1970s-present

Somali crisis, 1980s-present

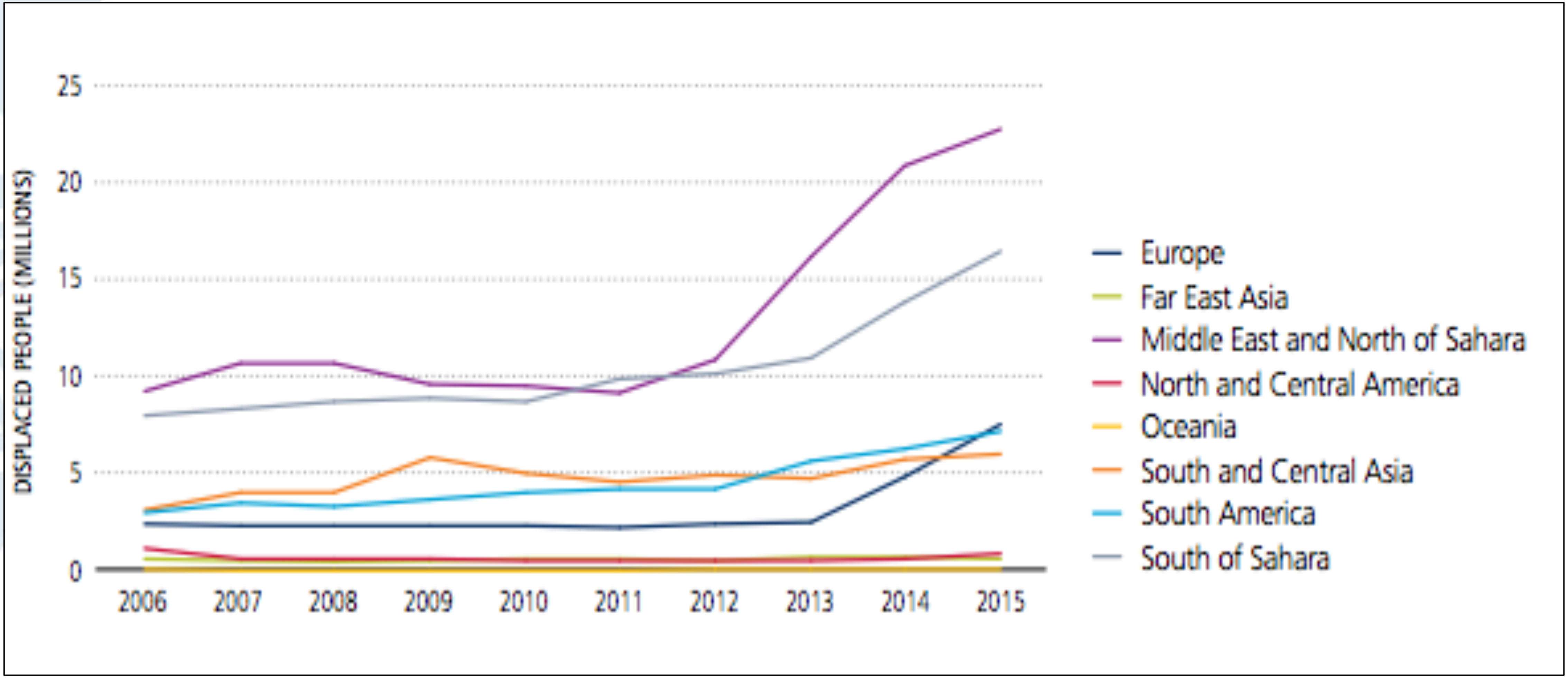
Syrian crisis – 2010s - present



Source: UNHCR 2015 Population displacement data

Humanitarian trends

Number of displaced people by region of host country, 2006-2015



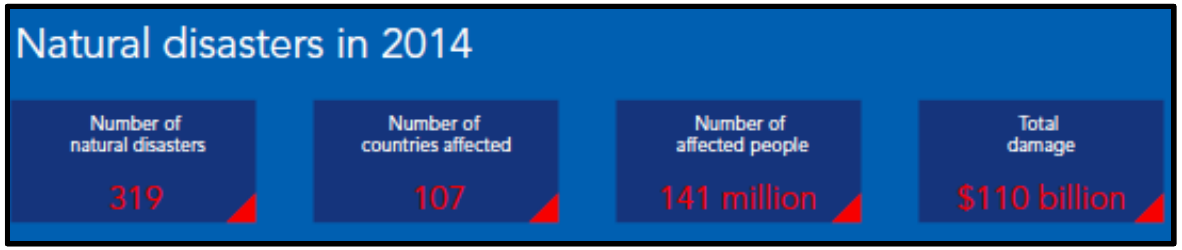
Source: WHTD Report, 2016.

Humanitarian trends

In 2014:

Conflict

Natural disasters



Emerging and re-emerging diseases

Source: WHTD Report, 2015.

1. Number of conflicts for 2014- Heidelberg Institute for International Conflict Research
2. Number of natural disasters for 2014- CRED EM-DAT, MunichRE
3. Emerging infectious disease threats- http://www.who.int/csr/disease/en/

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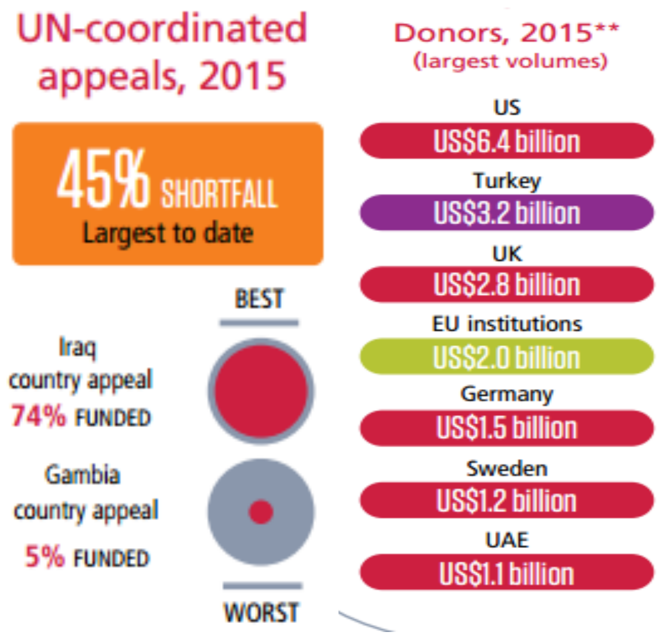
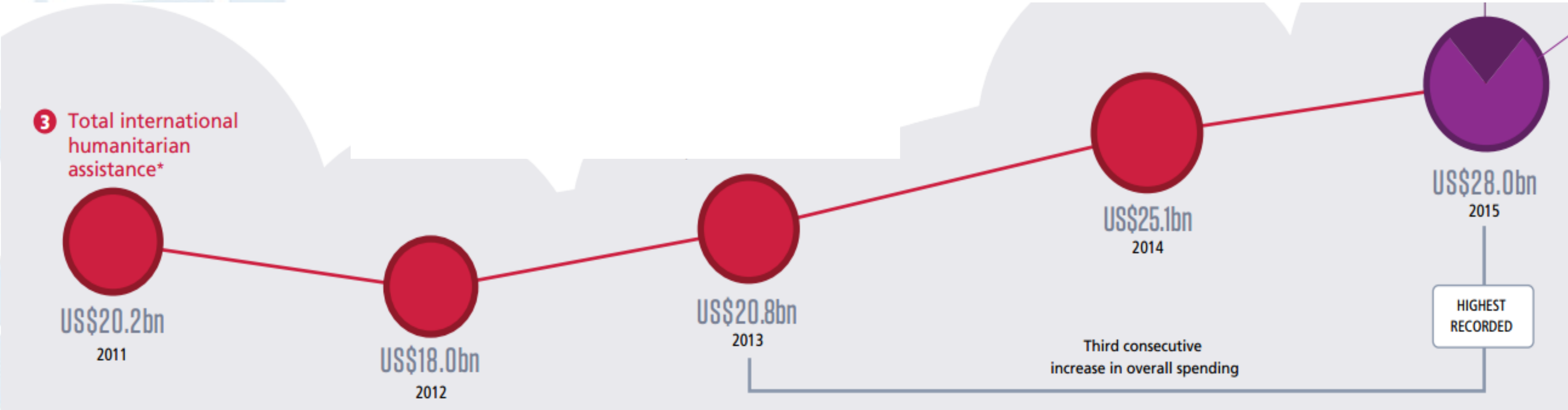
Humanitarian trends

Record high for humanitarian assistance $28.0 billion in 2015

Record shortfalls for UN-coordinated appeals

Source: OECD 2016





Humanitarian trends - summary

Global picture unchanged

Increasing levels of investment but needs remain unmet

Need for WASH interventions that are effective, efficient and sustainable

Important role here for research

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Public Health Research in Humanitarian Settings

1. Use of evidence from non-humanitarian settings
2. Establishing counterfactual is challenging
3. Need feasible but rigorous methodologies
4. Limited capacity for research uptake and scale up
5. National research capacity development needed

Source: Ager et al 2014.

development community in frugal design efforts. Efforts like The Gates Foundation's Reinvent the Toilet Challenge reflect the kind of integrative thinking that must occur at the beginning of a design initiative; support is being directed toward strategies to create a next-generation toilet that can not only manage waste but also harvest water and energy resources. The toilet will also need to operate without the usual infrastructure, be financially sustainable, and be valued by users. Although such competitions highlight important challenges, funders often solicit solutions with a high degree of technical innovation. An unintended consequence of this premium on innovation can be to complicate downstream implementation efforts. It is time for the engineering and international aid communities to adopt approaches that can improve global health in ways that can be sustained.

REFERENCES AND NOTES

1. The Lancet, Lancet 383, 1359 (2014).
2. Centers for Disease Control and Prevention, MMWR Morb. Mortal. Wkly. Rep. 60, 814–818 (2011).
3. P. Howitt et al., Lancet 380, 507–535 (2012).
4. Institute of Medicine, Evaluation of PEPFAR (National Academies Press, Washington, DC, 2013).

PERSPECTIVE

Strengthening the evidence base for health programming in humanitarian crises

A. Ager,[1] G. Burnham,[2] F. Checchi,[3] M. Gayer,[4] R. F. Grais,[5*] M. Henkens,[6] M. B. F. Massaquoi,[7] R. Nandy,[8] C. Navarro-Colorado,[9] P. Spiegel[10]

Given the growing scale and complexity of responses to humanitarian crises, it is important to develop a stronger evidence base for health interventions in such contexts. Humanitarian crises present unique challenges to rigorous and effective research, but there are substantial opportunities for scientific advance. Studies need to focus where the translation of evidence from noncrisis scenarios is not viable and on ethical ways of determining what happens in the absence of an intervention. Robust methodologies suited to crisis settings have to be developed and used to assess interventions with potential for delivery at scale. Strengthening research capacity in the low- to middle-income countries that are vulnerable to crises is also crucial.

Health interventions in humanitarian crises—situations where disasters or conflicts constitute a critical threat to the health, safety, security, or well-being of a population—are an important focus within the broader field of global health. Such crises affect increasingly large numbers of people worldwide (1). There have been notable advances in programming, specifically in immunization and treatment of acute malnutrition, over the past 20 years. However, despite the increasing professionalization and standardization of humanitarian work (2), there is a consensus that the evidence base for much current practice remains weak (3, 4).

It is not coincidental that the evidence base for health programming is frail in crisis conditions that cause high mortality and morbidity. Such health care contexts also present many challenges to scientifically rigorous research. Prime among these challenges is the acute vulnerability of populations (5), which requires prompt intervention rather than exploration of the comparative benefits and limitations of alternative approaches. In the face of acute needs and against a typical backdrop of limited funding, poor security, and shortages in human resources and logistics, simply providing immediate minimal standards of health services becomes an overriding concern. The space for research—particularly that involving experimental interventions or randomization or, more generally, offering different standards of care within the same population—dramatically shrinks (6, 7). Acutely vulnerable populations have a compromised capacity to give meaningful informed consent. Refusing study participation may be seen as rejecting vital medical assistance (8, 9).

The rapid response required in humanitarian crises contributes to an unpredictable programming environment. Although many health risks in the aftermath of disasters or conflict are predictable and minimum standards for response and best-practice interventions have already been established, health needs can evolve rapidly, and adaptable program strategies are required. Political sensitivities and security concerns may also have a substantial influence on the timing, coverage, and delivery of health interventions (10). Different sectorial interventions that affect health (including provision of shelter, water and sanitation, food security, livelihoods, nutrition, and vaccination) may be introduced with limited coordination and varying population coverage (11). This makes identification of comparison or control groups and attribution of outcomes to any single intervention methodologically challenging.

Difficulties in coordination are not only cross-sectoral but also reflect the more general complexity of multiple intervening actors and initiatives that characterize humanitarian responses. A population will typically receive services through a complex web of national and local governmental institutions, local civil society partners, United Nations agencies, nongovernmental organizations, and, in some emergencies, foreign

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Research in Humanitarian Settings

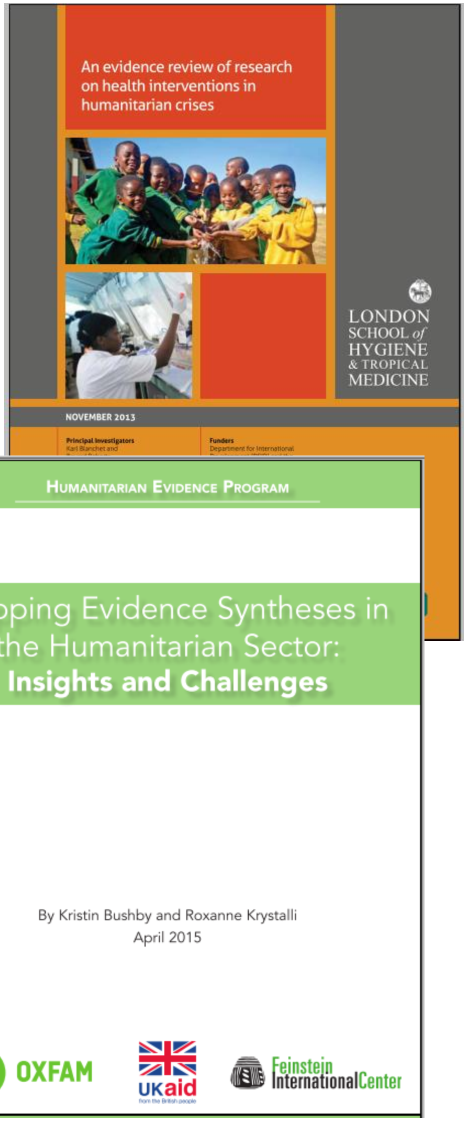
2013 ELRHA Report (Blanchet et al):

“Research on the effectiveness of health interventions in humanitarian crises has significantly increased during the last decade...”

“…72 studies on communicable disease control interventions in crises settings…only eight on WASH interventions…and only three were of high quality”

2015 HEP Report (Bushby & Krystalli):

Recorded only 8/68 (12%) systematic reviews that mentioned WASH in the humanitarian research sector



Source: Blanchet et al 2013; Bushby & Krystalli 2015

WASH evidence

Brown et al (2012), Waterlines:

“Most disaster response experience related to WASH not recorded in the peer-reviewed literature…”

“There is an urgent need to learn more about how to do research in this context”

Ramesh et al (2015), PloS One:

“Only 6 published studies measured statistically significant change in health outcomes as a result of a WASH intervention”

“the current evidence base on the impact of WASH interventions on health outcomes in humanitarian crises is extremely limited…”

”There is without doubt a great need for studies evaluating cholera response interventions…”

Source:: Brown et al 2012; Ramesh et al 2015

Evidence based WASH policy

Numerous humanitarian WASH guidance manuals produced by multiple agencies

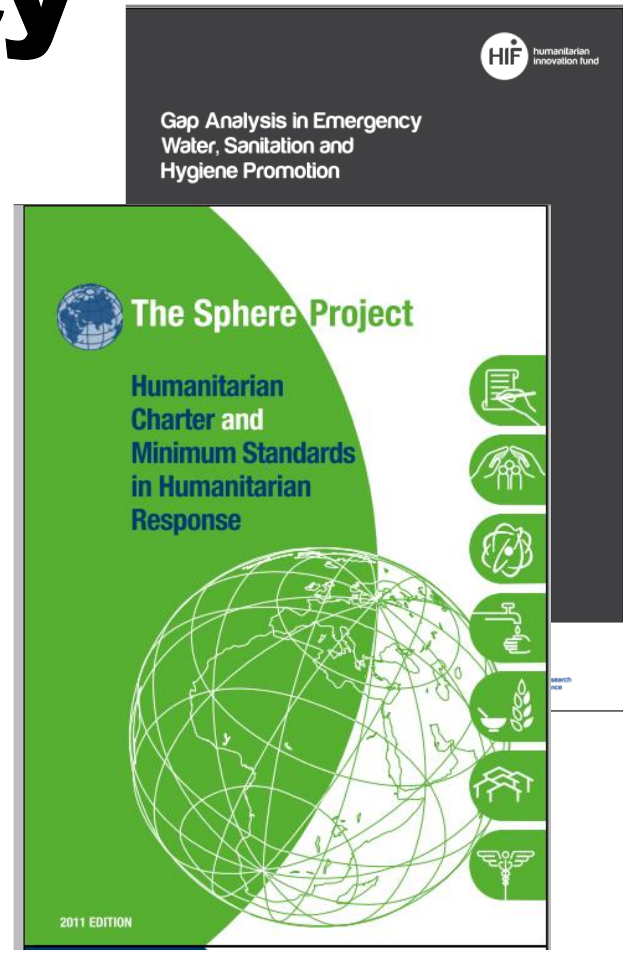
Sometimes with divergent or conflicting messages

Of the 346 indicators in the 2004 Sphere standards:

- 65% were not quantifiable
- 19% were quantifiable but not supported with published studies
- **16% were quantifiable and supported with published studies**

For the 58 WASH indicators:

- **Only 3 supported by published studies (n=4)**



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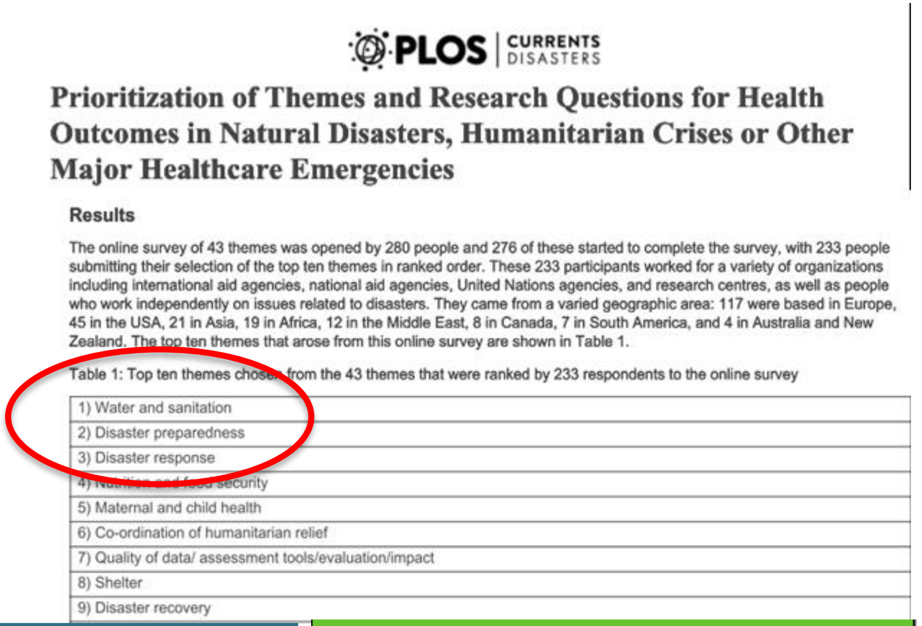
Source: Sphere Project 2011; Roberts et al 2009; Bastable & Russell 2013

The Opportunity – demand

At a **practice**, **policy,** and **research** level, there have been numerous recent calls to address the evidence gap for humanitarian WASH


PLOS | CURRENTS DISASTERS

Prioritization of Themes and Research Questions for Health Outcomes in Natural Disasters, Humanitarian Crises or Other Major Healthcare Emergencies

Results

The online survey of 43 themes was opened by 280 people and 276 of these started to complete the survey, with 233 people submitting their selection of the top ten themes in ranked order. These 233 participants worked for a variety of organizations including international aid agencies, national aid agencies, United Nations agencies, and research centres, as well as people who work independently on issues related to disasters. They came from a varied geographic area: 117 were based in Europe, 45 in the USA, 21 in Asia, 19 in Africa, 12 in the Middle East, 8 in Canada, 7 in South America, and 4 in Australia and New Zealand. The top ten themes that arose from this online survey are shown in Table 1.

Table 1: Top ten themes chosen from the 43 themes that were ranked by 233 respondents to the online survey

1) Water and sanitation
2) Disaster preparedness
3) Disaster response
4) Nutrition and food security
5) Maternal and child health
6) Co-ordination of humanitarian relief
7) Quality of data/ assessment tools/evaluation/impact
8) Shelter
9) Disaster recovery

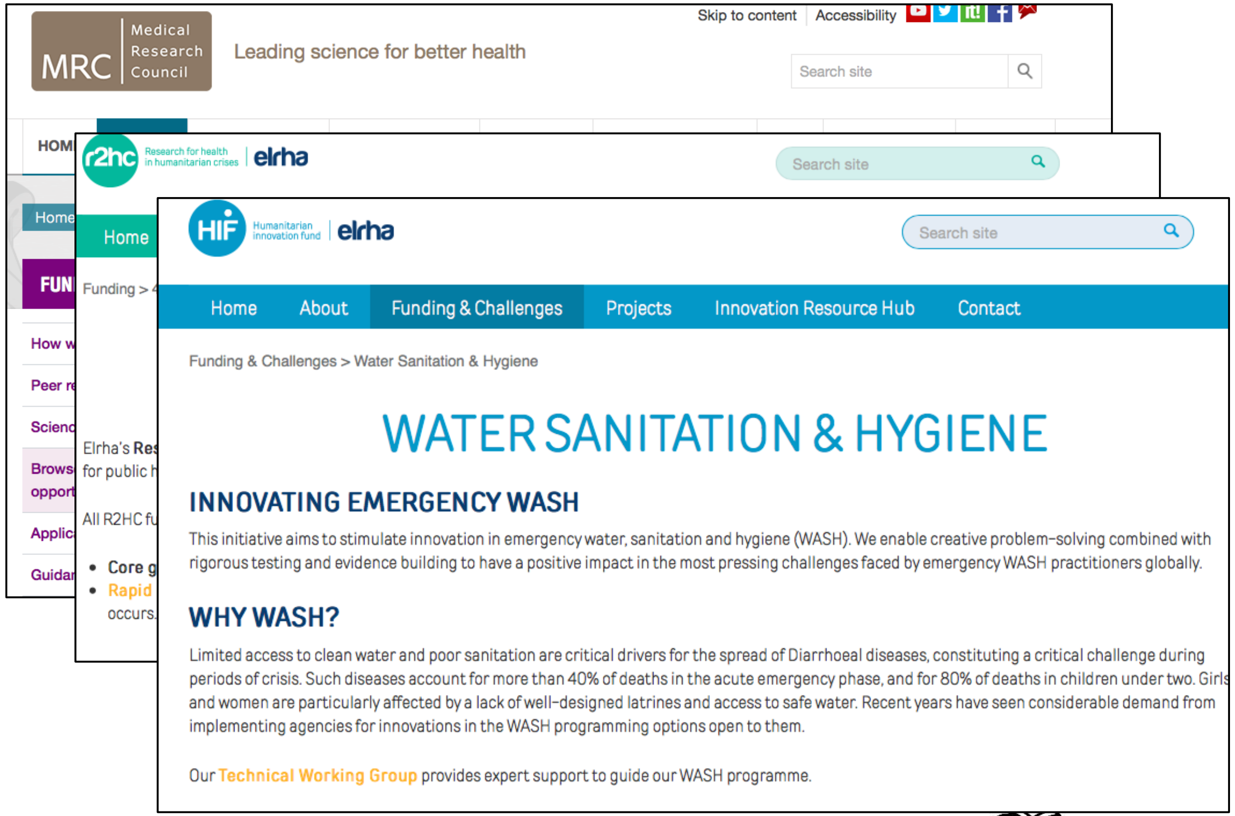
The Opportunity - resourcing

Numerous recent funding calls to support research on humanitarian WASH:

- ELHRA
- HIF
- R2HC
- USAID
- DFID

Resources available for a broad range of research activities:

- Literature reviews
- Technology development
- Programmatic innovation
- Operational research
- Epidemiological research



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The Opportunity – delivery capacity

- Building capacity to plan, implement and use research
- Embedding research capacity within implementing organisations
- Including capacity – and incentives - for internal dissemination and research uptake
- Case Study (Zachariah et al 2012)
  - MSF publications increased 5x when they had a full time research coordinator, data manager and medical editor

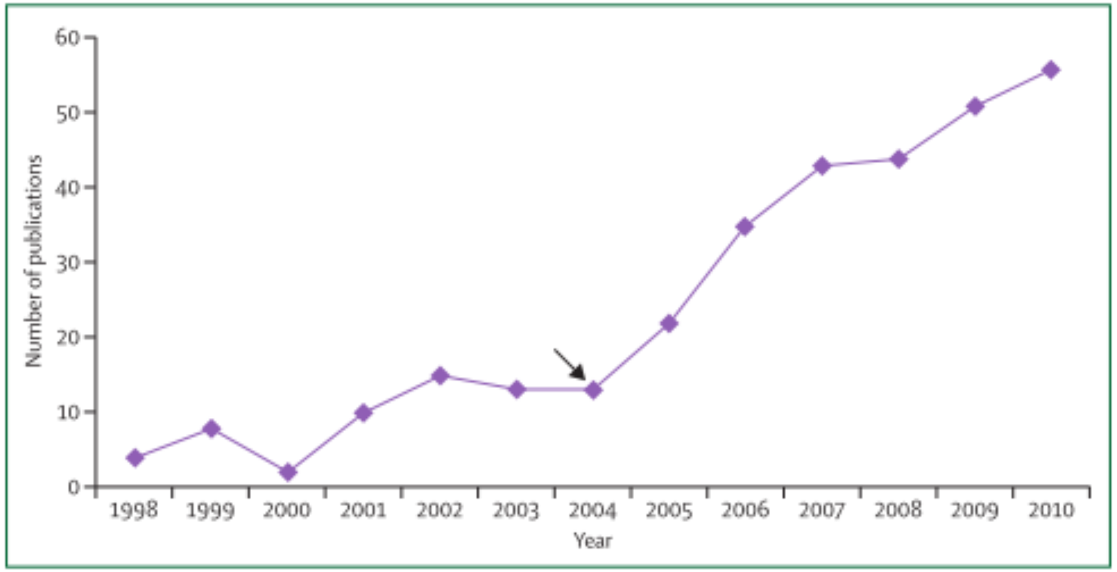

Figure 1 : Zachariah et al (2012)

The opportunity - collaboration

New partnerships for research delivery

Research questions jointly generated

Close collaboration between programme managers and researchers

Joint authorship of research papers

EEHF Themes

8 important themes to be covered here:

- Handwashing in emergencies
- UDDT and alternative sanitation technologies
- Water treatment and supply
- Waste treatment and sanitation
- Menstrual hygiene management and gender based violence
- WASH in health care facilities
- WASH and undernutrition
- Disease outbreaks

"Good enough" methods

How to apply modern behaviour change theory in humanitarian settings

Cholera transmission dynamics and role of hygiene and water supply interventions

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EEHF… heat, fuel and oxygen

Acknowledgements

Lauren D’Mello-Guyett (LSHTM)
Paul Spiegel (Johns Hopkins)
SHARE Research Programme Consortium
MSF (Peter Maes)
Oxfam (Andy Bastable)
UNICEF (Dominic Porteaud)
Global WASH Cluster
UNICEF Nepal

Thank you

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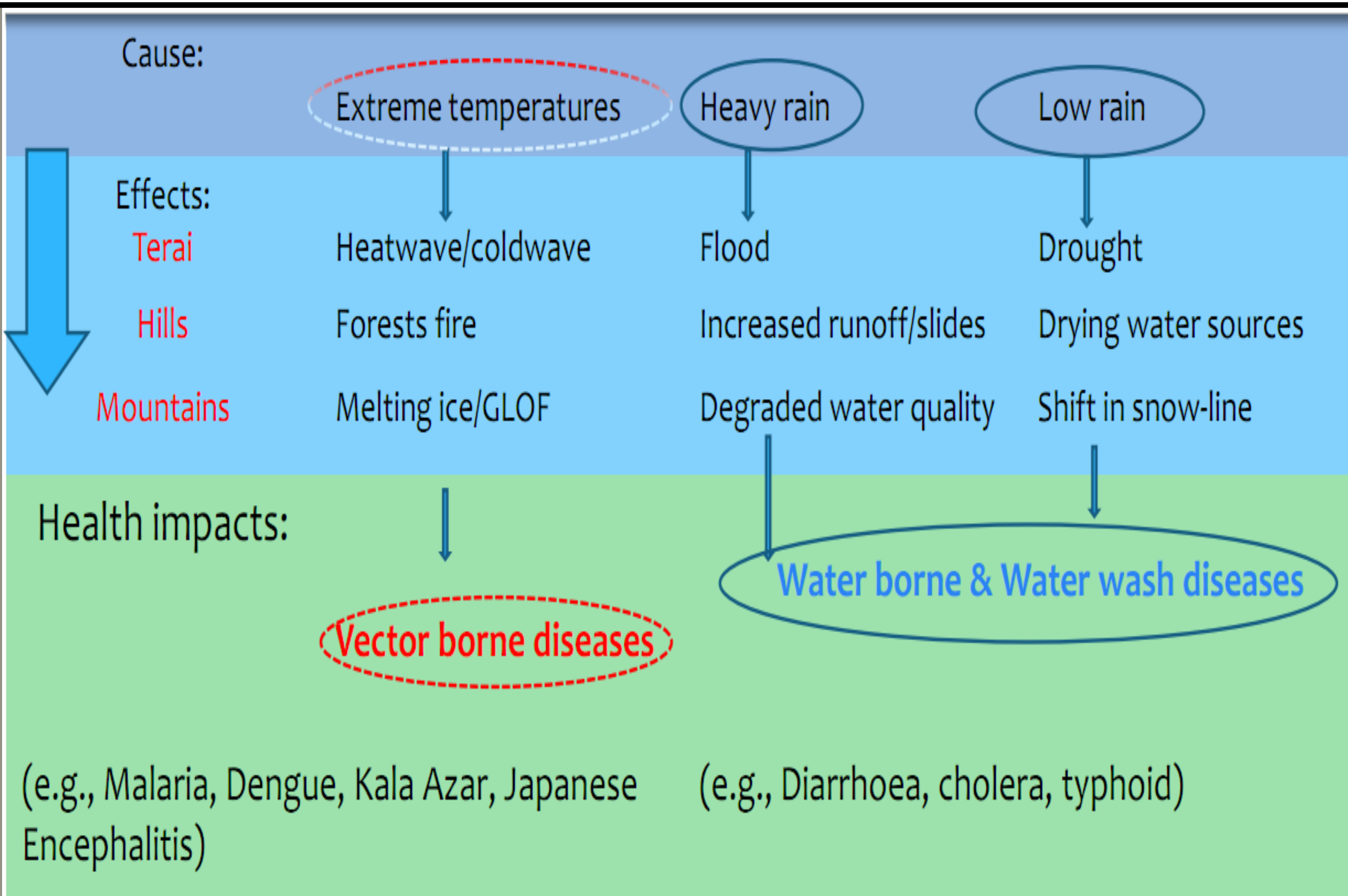
Climate Change and WASH in the National Context of Nepal

- Subodh Sharma

Key Impact Pathways in Nepal's context

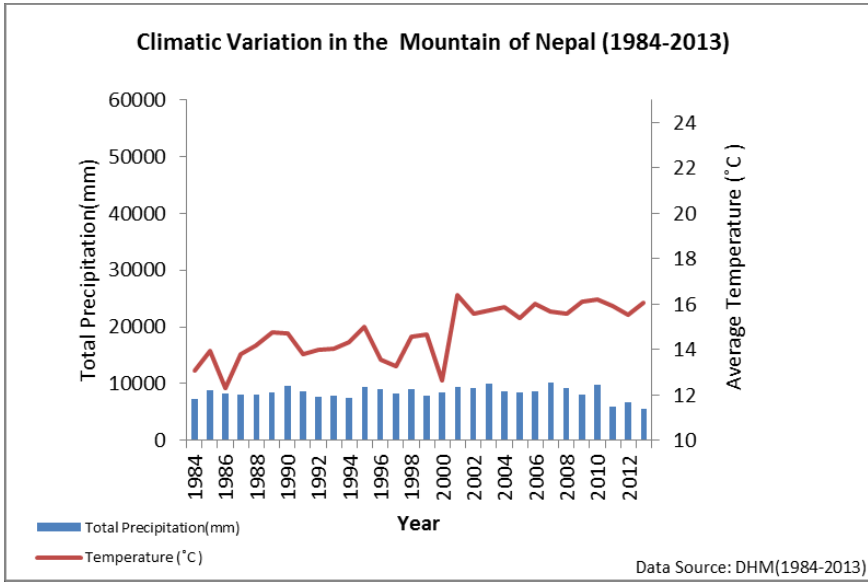


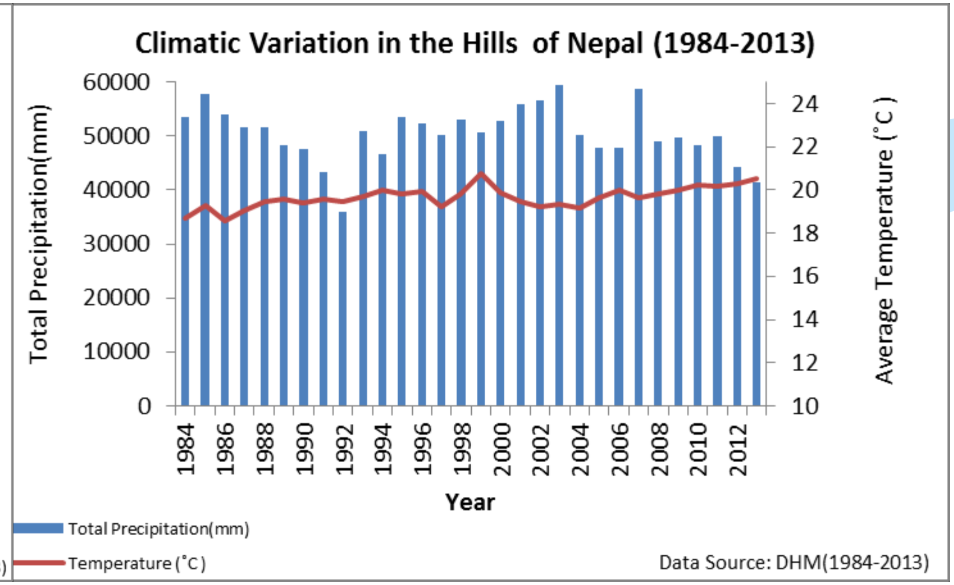
Climate change scenario in Nepal

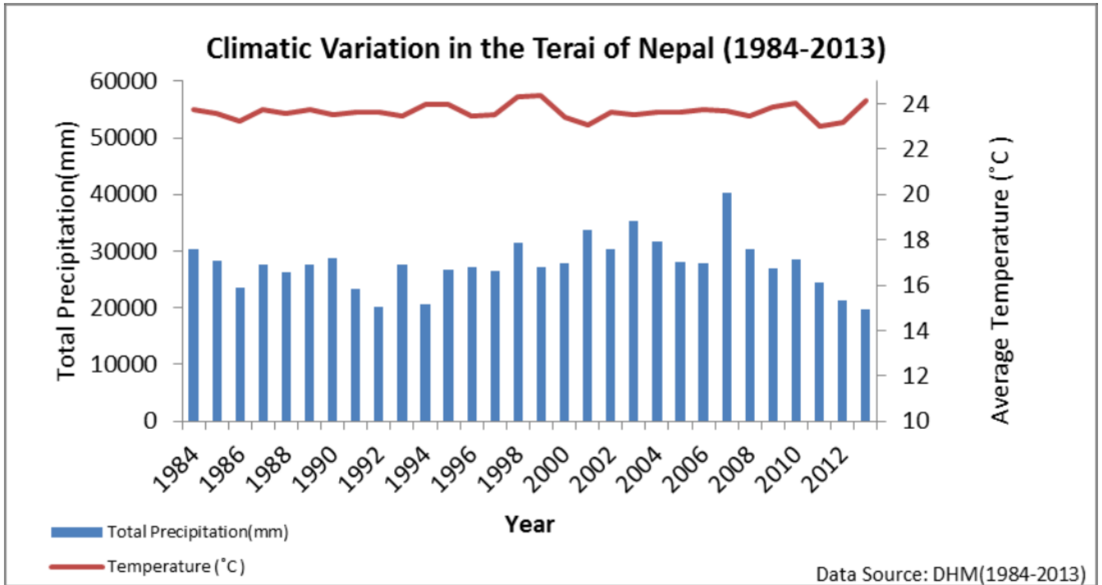
(data source: DHM 1984-2013)

Eco-region	Temperature (Annual average)	Precipitation (Annual average)
Mountains	↑ 0.099 deg C	12.28 mm ↓
Hills	↑ 0.036 deg C	80.67 mm ↓
Tarai	Non-significant	↑ 46.55 mm

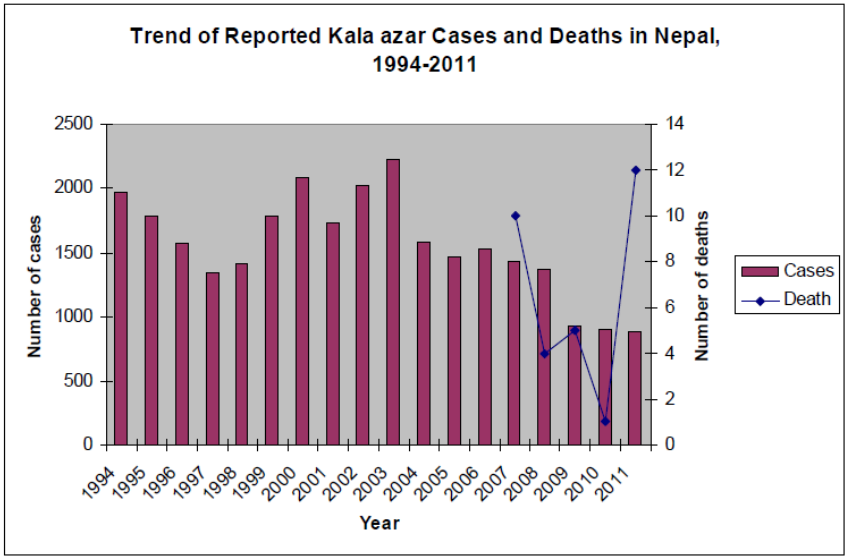
Documentation of the evidences of climate change in Nepal



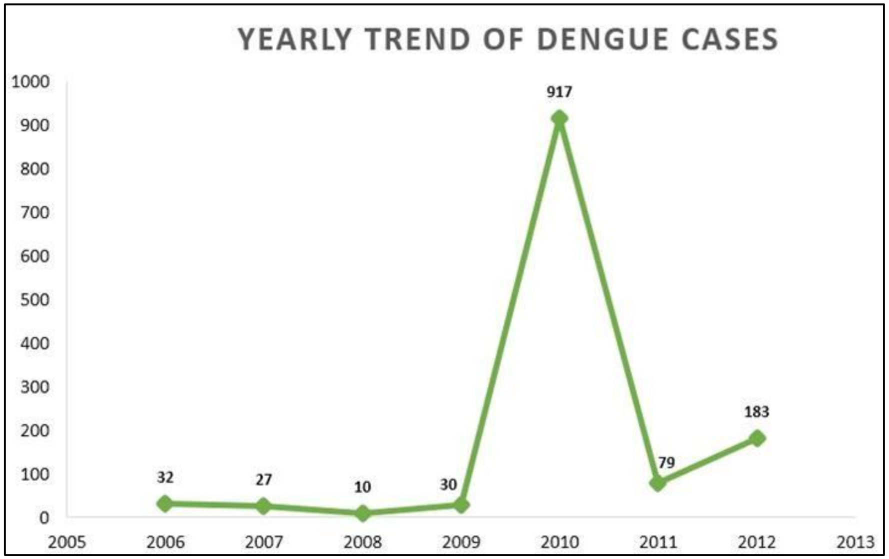




Climate Sensitive Diseases in Nepal



Source: http://www.searo.who.int/



Source: http://umeshg.com.np/dengue-control-programme

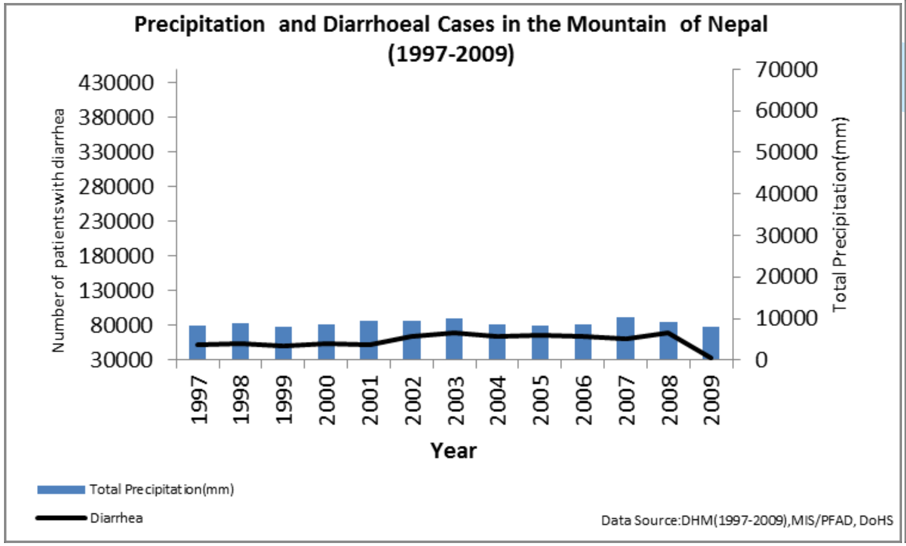
- A sharp decline in the number of cases has been observed since the launch of National Kala-azar Elimination program.
- But between 2007 and 2010, VL was notified from an increasing number of districts (from 14 districts in 2007 to 26 districts in 2010).

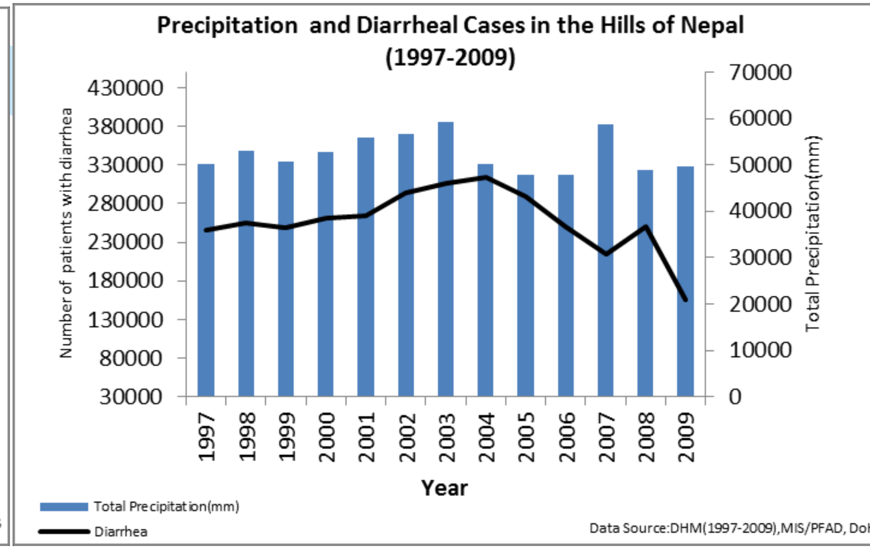
- Dengue outbreak in 2006 incurred 32 confirmed dengue cases (among the total cases identified, 94% were adults; male to female ratio was 4:1), followed by 27 cases in 2007, 10 cases in 2008 and 11 cases in 2009. The outbreak continued in 2010.

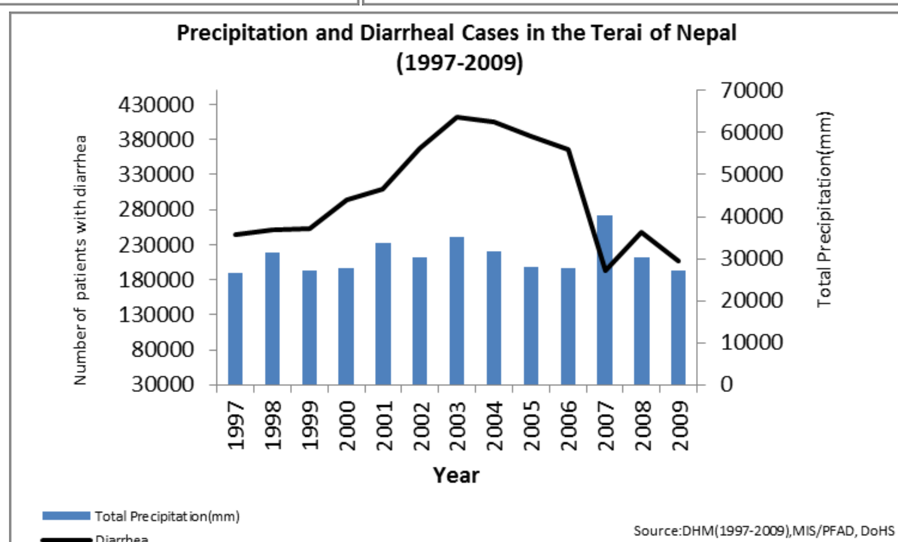
Precipitation and Diarrhoeal diseases outcome
(Data source: DOHS Annual Report 1997-2009)

Eco-region	Diarrhoeal Disease Outcomes (Annual Average)	
Mountains	342 cases	↑
Hills	3649 cases	↓
Tarai	433 cases	↓

Precipitation Trend and Diarrhoeal Disease Outcomes



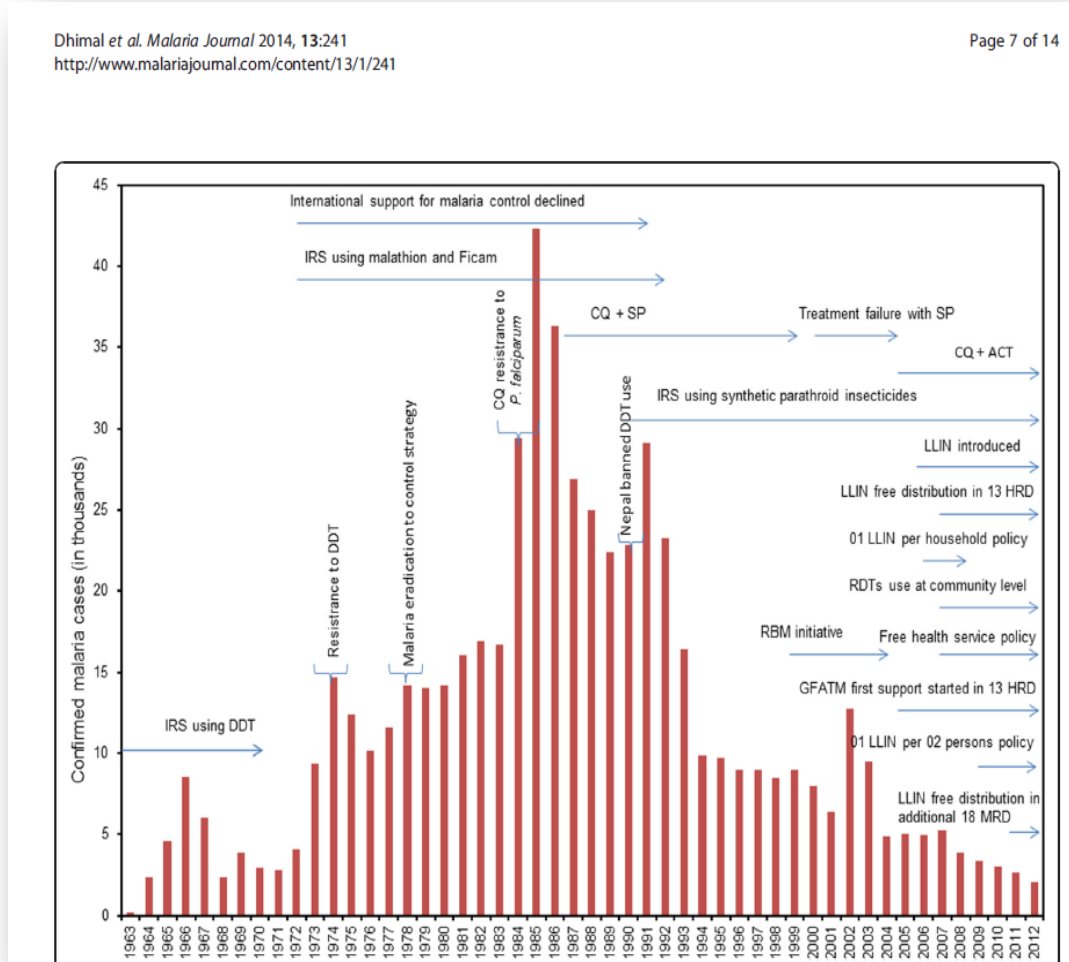




Temperature trend and malarial disease outcome

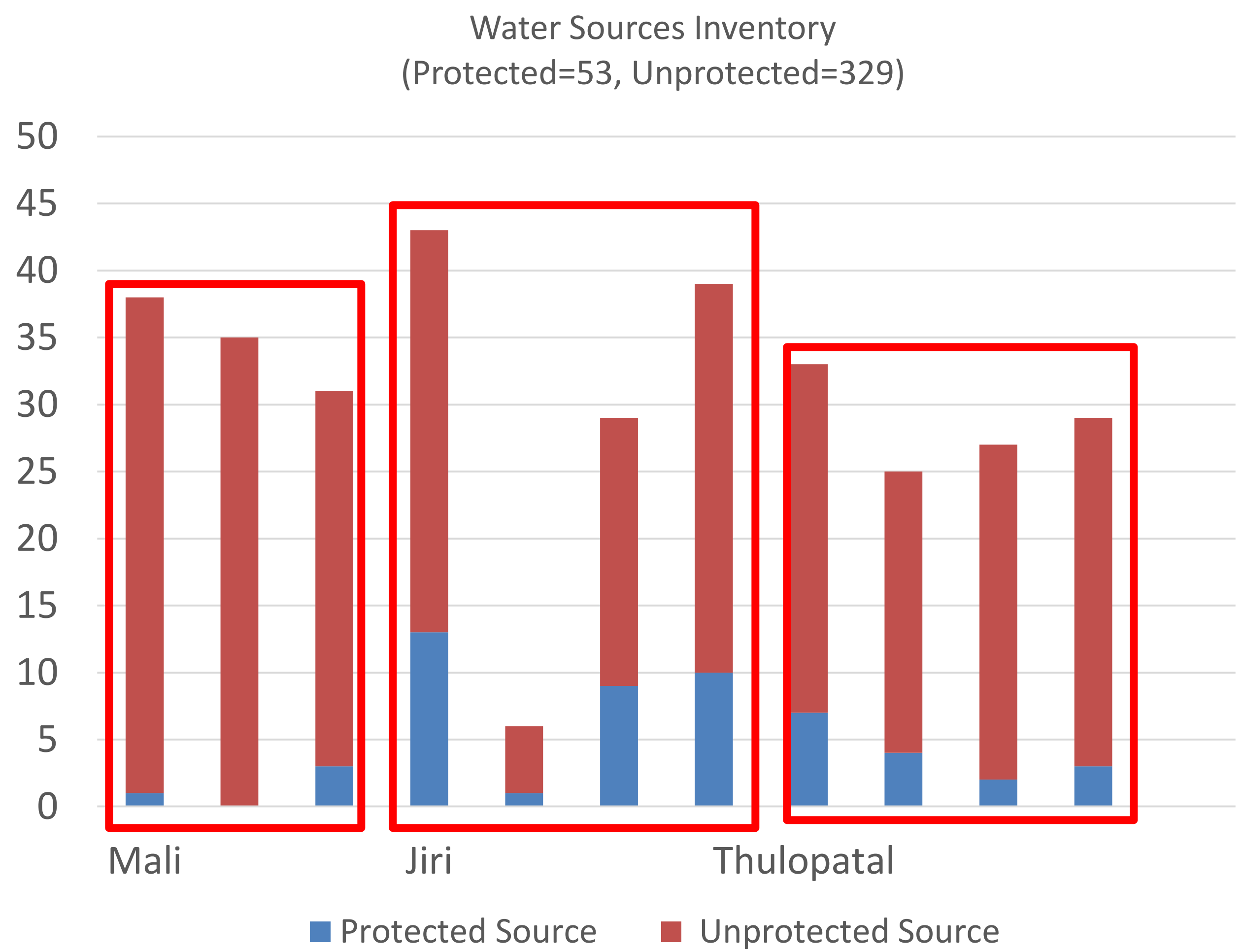
(Data source: DOHS Annual Report 1997-2009)

Eco-region	Malarial Disease Outcome
Mountains	↓
Hills	↓
Tarai	↓



Total confirmed malarial cases and important milestones on malaria control in Nepal (1963-2012)

Water Source Inventory

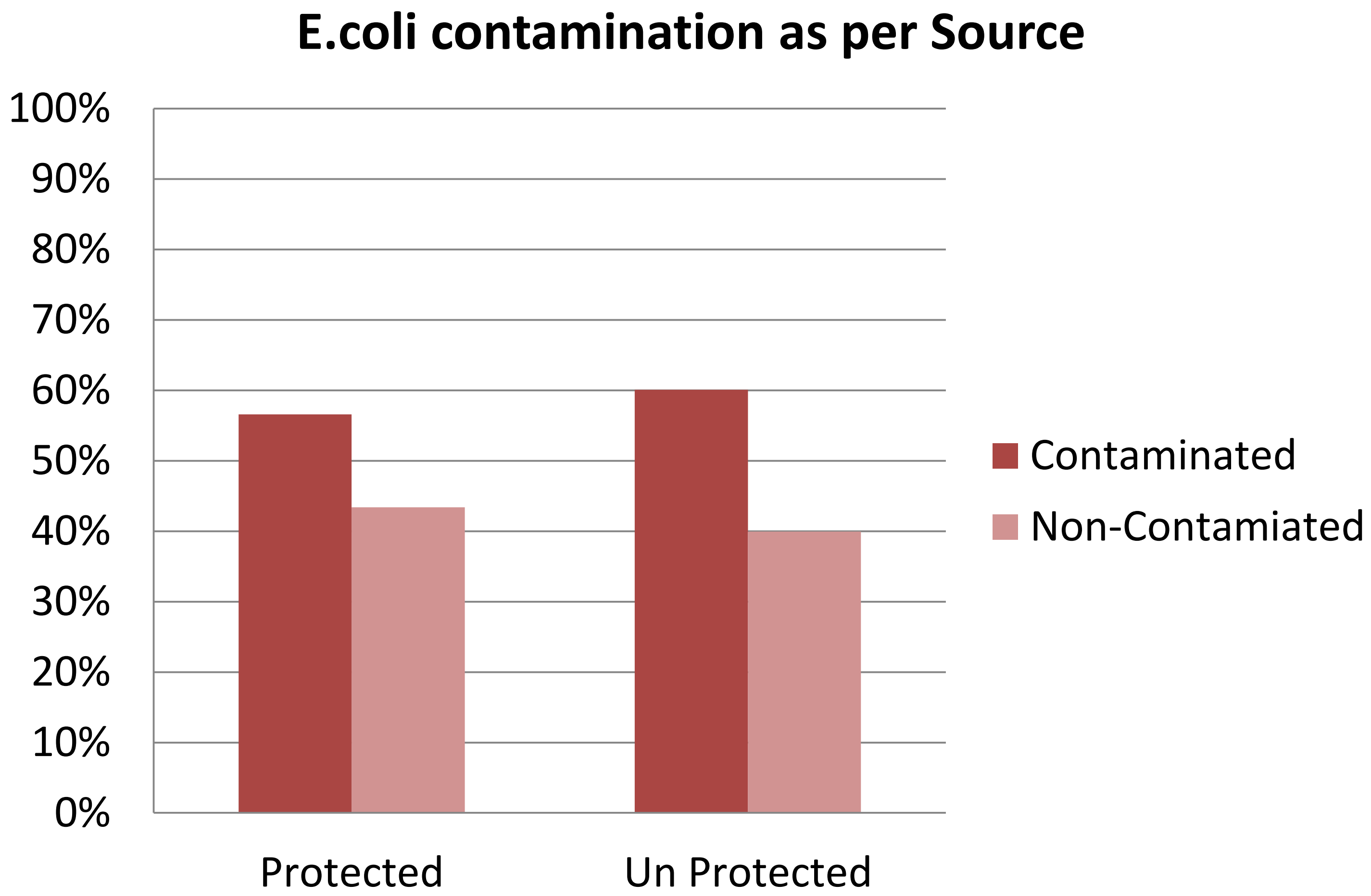


*GIS Mapping of source inventory is on progress

Water Quality and Quantity

- Among 329 sources, 192 were found contaminated.
- HH level PoU samples were found more contaminated *(data entry on progress)*

Water quality at Source



Range of Available WASH Interventions

Eight broad categories of interventions were identified which further was sub divided into 26 sub category.

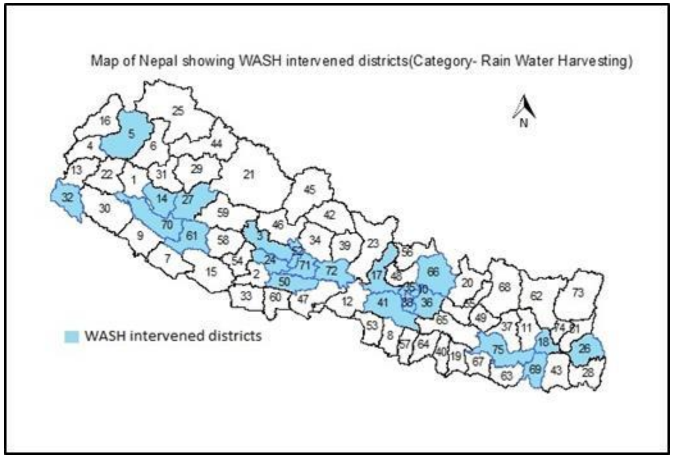
Namely the broad Eight Categories are:

- **I. Water**
- **II. Sanitation**
- **III. Hygiene**
- **IV. Rain Water Harvesting**
- **V. Fog Water Harvesting**
- **VI. Retention and Recharge Ponds**
- **VII. Overall WASH Advocacy at National Level**
- **VIII. WASH in case of Disaster Events**

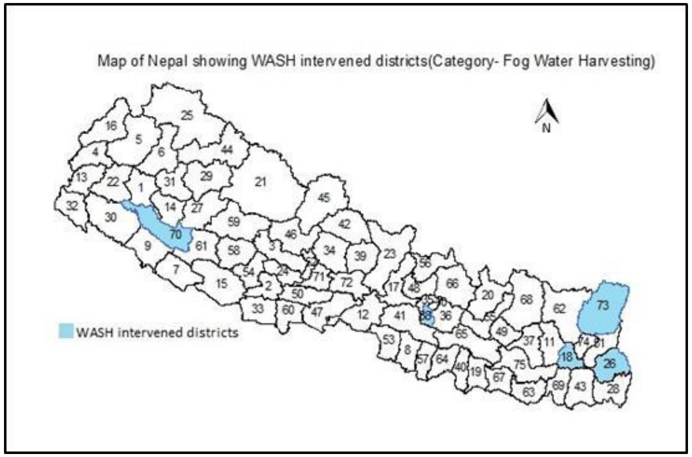
WASH interventions as Working Area by different organizations in Nepal

Category		Working Area (n=32: AIN, 2012)
I	Water	90.60%
II	Sanitation	84.40%
III	Hygiene	53.10%
IV	Rainwater Harvesting	12.50%
V, VI, and VII	Others (Fog, Retention, Advocacy	6.30%
VIII	WASH in case of Disaster Events	6.30%

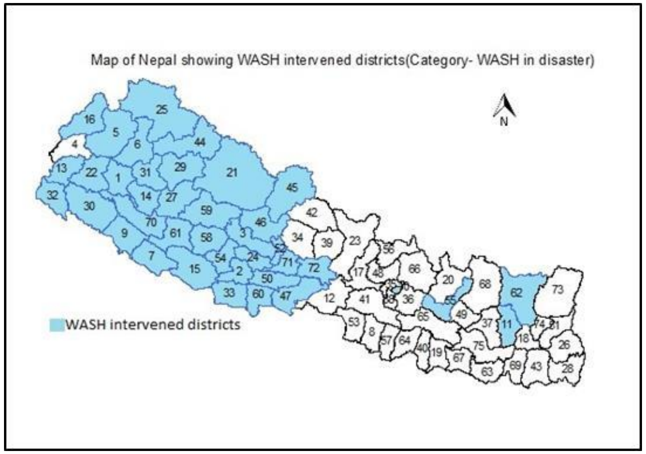
Note that most of the organizations were having multiple development regions as working area (details can be seen in brief organizational profile).



Rainwater Harvesting sector covers 23 districts

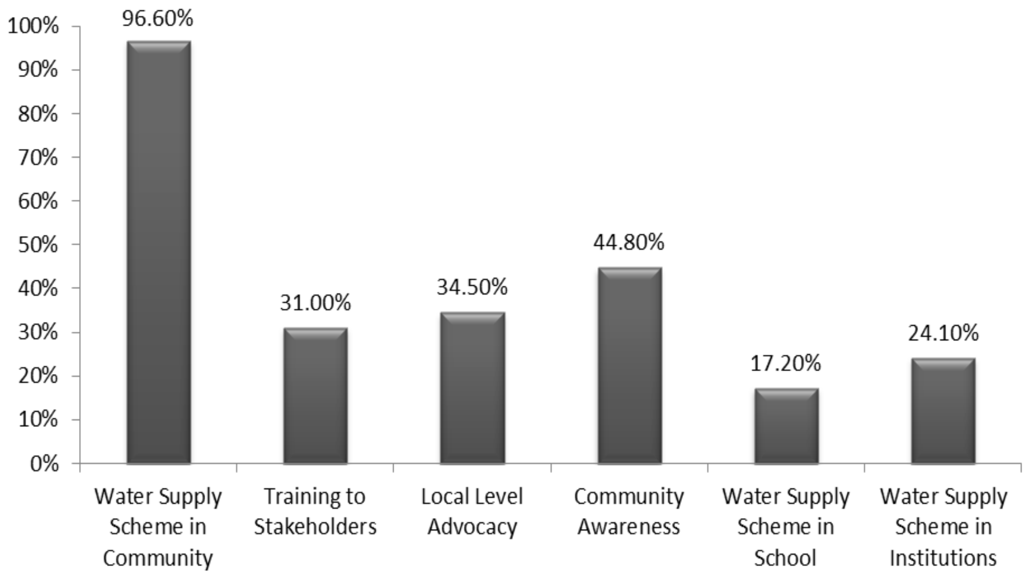


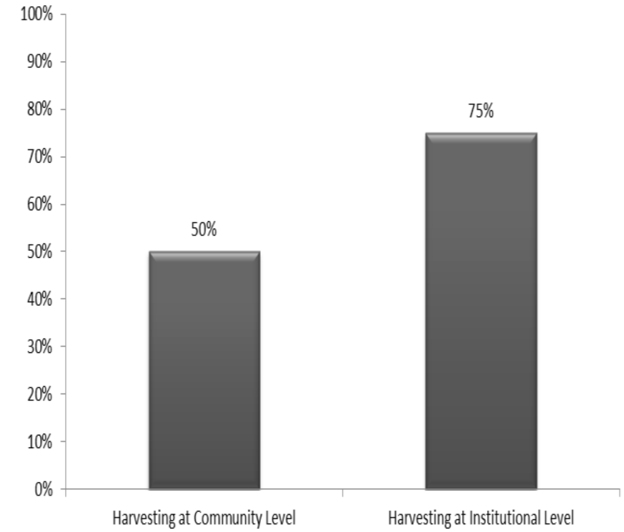
Fog water harvesting covers 5 districts

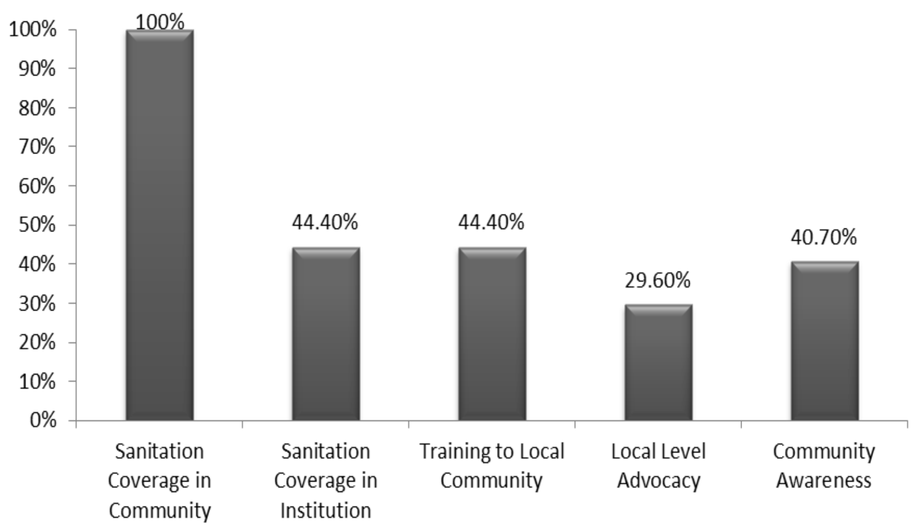


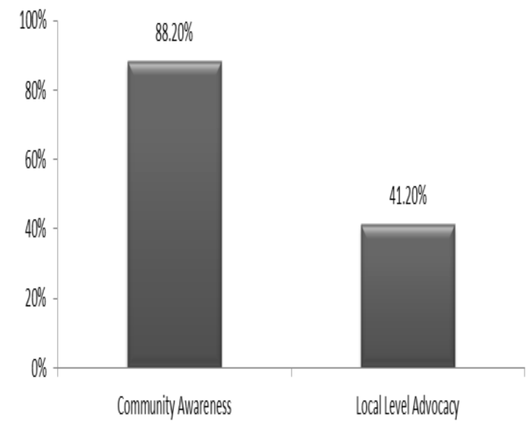
WASH in disaster covers 39 districts

Specific WASH Interventions in Nepal









Major challenges and uncertainties

* The existing climatological stations are generally located in the lower elevations – Uncertainties in data precision
* Not enough money in O&P, and WASH in schools and institutions – Ineffective WASH interventions
* The disaggregated data clearly show the inequality of service - coverage among subgroups of the population
* Web based monitoring and evaluation system not in place – uncertainties in effective monitoring and evaluation in the remote locations

Acknowledgements

DoHS, OXFAM, DHM, UNICEF/Nepal for access to literature, and WHO/Nepal for financial support

Thank you

prof.s.sharma@gmail.com

Source: WHO/Nepal 2014. Building adaptation to climate change in health in LDCs through resilient WASH, Output 4.1

7th Emergency Environmental Health Forum November 2016 Nepal

Objectives

1. WASH practioners share field learning and experience
2. Documented field practice is used to stimulate discussion on best WASH practice
3. Options for future WASH research questions are identified and discussed

In Memorium

Dr Jeroen H.J. Ensink

10.11.1974 – 29.12.2015

Jeroen Ensink Memorial Scholarship Fund

https://www.lshtm.ac.uk/study/funding/jeroenensinkscholarship.html

Using Emotional Motivators to Promote Handwashing with Soap in Emergencies.

Sonya Sagan, Foyeke Tolani and Marion O'Reilly

Emergency Environmental Health Forum, Nepal. November 24, 2016.

*Oxfam, Global Handwashing Day 2014, Philippines

OXFAM

Background

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Facts and figures

- Diarrhoeal disease causes 40% of deaths in the acute phase of the emergency, 80% of which are among children under 2 years[1].
- The presence of soap in the household was associated to 27% fewer episodes of diarrhoea in a refugee camp in Malawi when compared to households without soap[4].
- Washing hands with soap can reduce the risk of diarrhoeal diseases by 42–47% and interventions to promote handwashing might save a million lives.[2]
- There is limited evidence on non-health related motivators and barriers around HWWS in emergency contexts.

OXFAM

The Research

- In partnership with Unilever and Lifebuoy, Oxfam conducted formative research predominantly around non – health related motivators and barriers to HWWS among mothers affected by an emergency in the **Philippines**, **Pakistan** and **Nepal.**

- In order to identify cross-cutting motivators and themes that could be used to produce generic materials to promote HWWS for use anywhere in diverse emergency contexts.

- Results used to design HWWS promotion resources and activities targeting mothers in emergency contexts.

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Study Objectives, Locations and Methods

Objectives of the research

1. Profile the target audience
2. Identify cross-cutting barriers to practicing handwashing with soap
3. Identify cross-cutting emotional and physical motivating factors that drive hand washing with soap in target audience
4. Understand communication channels used by the target audience

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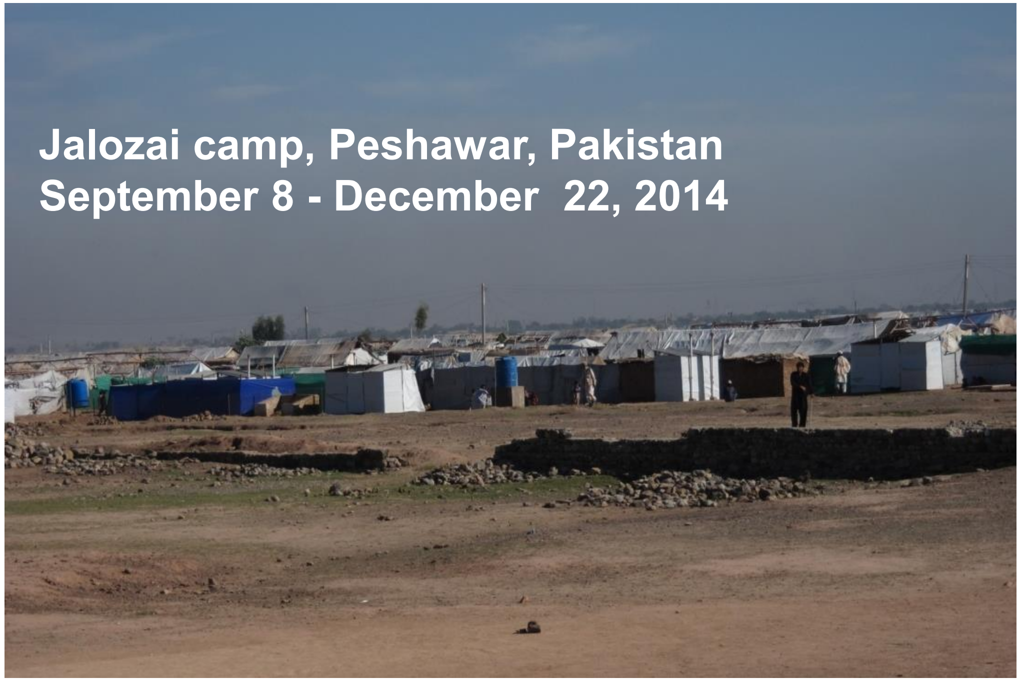

Study locations

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Data collection methods

- Key informant interviews
- Focus group discussions
- Structured observation
- Household survey
- Behavioural trial (Pakistan and Philippines only)

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Results

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Audience profile

- **Mother** in crisis situation - natural disaster, conflict, disease outbreak
- **Female: 18-80 years** of age, with children of all ages

What was found:

- **She is resilient** – despite crisis situation, does her best to ensure her children are cared for and have a neat, clean appearance
- **She enjoys discussions** with friends and neighbours for **social support**, sharing stories, challenges
- **She** feels it is important to maintain a certain **image** in front of others
- **She** wants to give her children the best chance at **success**
- **She dreams of** regaining a sense of **normalcy**

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Mother with her 3 children in Tacloban, Philippines, urban context, 1 year post typhoon

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Mother with her 3 children in Jalozai camp, Pakistan, typically use basin and lotta for HW

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Mother with her newborn in Tudhikel camp, Kathmandu, Nepal

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Barriers to HWWS among mothers affected by an emergency in 3 countries.

Type of Barriers	Pakistan	Philippines		Nepal
		Rural	Urban	
Cross- cutting	▪Prioritise immediate needs (food, water, shelter) ▪External locus of control ▪Child's immediate needs ▪Access to soap and or water ▪Lack of designated HW place in Household/communal area ▪Visibly clean is clean ▪Socio-cultural beliefs and practices ▪Habit			
Context specific	▪Increased workload ▪Soap prioritised for men		▪Busy	▪Busy

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Emotional motivators for HWWS among mothers affected by an emergency in 3 countries

Type of Motivators	Pakistan	Philippines		Nepal
		Rural	Urban	
Cross - cutting	▪Affiliation ▪Nurture			
Context specific	▪Purity	▪Disgust ▪Comfort ▪Shame		▪Purity ▪Disgust ▪Comfort

Cross-cutting motivators around HWWS in emergencies

Nurture

"The kind of care and teachings that a child receives from her mother will become part of her habits. If she was nurtured in a good way she will become a person with good character and eventually she will become successful in life".

Rosalinda, age 32, Tacloban, Philippines

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Cross-cutting motivators around HWWS in emergencies

Affiliation

"*When we eat together from one plate with clean hands, it signifies that we are united and strong as a tribe".*

Rahida, age 21, Jalozai camp, Pakistan.

"*Fitting in is important to me because we naturally follow others; in doing this we can belong to a group and be viewed in a positive light from others in the circle*".

Sangita, age 30, Kathmandu, Nepal

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HWWS Communication channels

Type of Barriers	Pakistan	Philippines		Nepal
		Rural	Urban	
Cross-cutting	▪Interpersonal ▪Group* ▪Print			
Context specific	▪Storytelling	▪Radio ▪Mobile phones ▪Television ▪Film	▪Television ▪Radio ▪Mobile phones ▪Film	▪Television ▪Mobile phones ▪Radio ▪Drama/street theatre ▪Film

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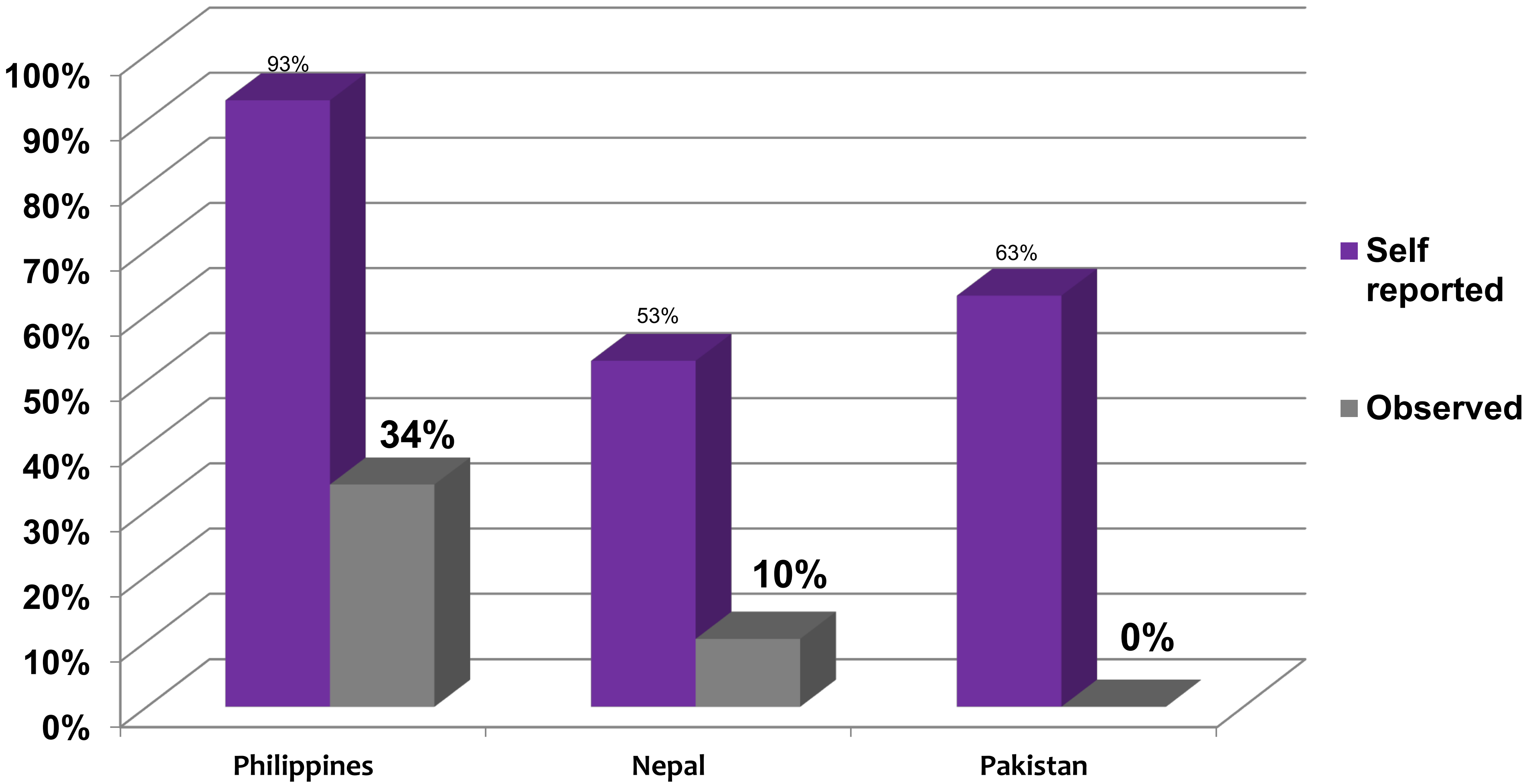
Other key findings: Self-reported versus observed HWWS practice before eating



Conclusions & Recommendations

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Conclusions from formative research in Nepal, Pakistan and Philippines

- Experiencing an emergency crisis adds additional **stressors** and responsibilities to a mother's existing routine activities.
- Despite stressors, mothers tend to be resilient, find the strength to carry on and ensure that their children are **nurtured** and groomed for future success in life.
- Mothers rely on the **support** of other mothers who have been through a similar situation and they seek solace from each other.
- Using emotional motivators such as **nurture** and **affiliation** to promote handwashing with soap in emergencies has the potential of being more effective than using health benefits alone.
- Findings of this study were used to develop a set of generic HWWS promotion resources and activities targeting mothers and caregivers in diverse first phase emergency contexts.

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Recommendations

- Mothers in these samples already had knowledge related to handwashing; it was important not to undermine this and to always find out what motivates them to help in handwashing promotion program design.
- The use of nurture and affiliation (rather than health benefits alone) should be considered in HWWS communication materials and activities targeting mothers affected by an emergency.
- Findings from the 3 countries show differences in knowledge-practice gap. As such, it is important to **observe** and understand baseline handwashing practice when developing handwashing promotion materials or strategies.
- Communications channels should be context-specific.

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Acknowledgements

THANKS TO…

- Mothers in Pakistan, Philippines and Nepal who provided their valuable time to participate in the study.
- Teams in Pakistan (Nisa Bibi, Rizwana Khattak), Philippines (Shiela May Galangue, Dr Ramon Devera), and Nepal (Srijana Pathak, Radhika Ghimire, Rosani Kadkha) who spent countless hours collecting and compiling data.
- Adam Biran and Val Curtis from LSHTM Hygiene Centre for support with developing formative research tools.
- Jonathan Gill from Unilever Global Partnerships and Aarti Daryanani and Arathi Unni from the Lifebuoy Global Social Mission for technical support and guidance.

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Handwashing for Ebola Outbreaks:

Comparison of Safety and Efficacy of Soap, Hand Sanitizer, and 0.05% NaDCC, HTH, and NaOCl Chlorine Solutions

Marlene Wolfe, Karin Gallandat, Daniele Lantagne
Tufts University

Tufts University School of Engineering

USAID FROM THE AMERICAN PEOPLE

Applied Research on Disinfection to Prevent Ebola Transmission
Tufts University, with the University of Brighton and Brigham and Women's Hospital

BACKGROUND

Handwashing in Ebola outbreaks

- Ebola is **highly infectious**
- **Frequent handwashing** recommended in ETUs
- Significant **person to person** transmission in West Africa
- Recommendations extended from ETUs to **communities**

BACKGROUND

What is recommended for handwashing?

Ebola Virus Disease: Key quest
concerning water, sanitation, a
WHO, 2014

- Soap and w
  hand sanitiz

- Chlorine onl
  other option

owledge
Point

Point Q&A Forum

nders
-source
ers about
ashing

d-washing stations, what is best for the
pochorite, is there a difference?
country: Sierra Leone
water treatment

BACKGROUND

Handwashing Methods

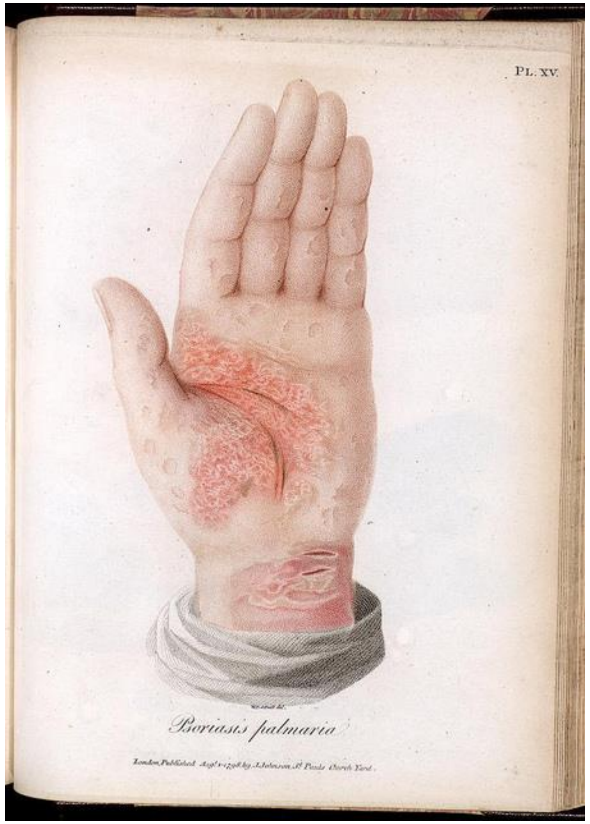
Handwashing Method	Benefits	Drawbacks
Soap and Water	Widely available, acceptable	Does not inactivate organisms, requires water
Alcohol-Based Hand Sanitizer	Simple, portable	Not widely acceptable or available, expensive
0.05% NaDCC (pH=6)	Easy to ship (powdered), Long shelf-life, Does not clog pipes	*Smell*
0.05% HTH (pH=11)	Easy to ship (powdered), Long shelf-life	Explosive, Clogs pipes
0.05% NaOCl (pH=11)	Can be locally produced, Does not clog pipes	Shorter shelf-life, Difficult to ship
0.05% Generated NaOCl (pH=9-11)	Can be produced on-site, Does not clog pipes	Shorter shelf-life, Difficult to ship , QC / Manufacturing

0.05% Chlorine

Concerns about chlorine use

Safety

Chlorine might be harsh on skin



Scaly lesions on the palm of the hand by Thomas Fisher Rare Book Library, UofT licensed under CC BY 2.0

Efficacy

Skin may exert too much chlorine demand

Lifesaver by Julien Harneis licensed under CC BY-SA 2.0

BACKGROUND

What do we know about **safety**?

- **Dermatitis** can result from handwashing
- Chlorine: **case reports**, high exposure
- **Individuals** may have responses that deviate from the average

BACKGROUND

What do we know about **efficacy**?

Efficacy of chlorine solutions used for hand hygiene and gloves disinfection in Ebola settings: a systematic review

J Hopman[1*], Z Kubilay[2], T Allen[3], H Edrees[2], D Pittet[4], B Allegranzi[2]

From 3rd International Conference on Prevention and Infection Control (ICPIC 2015)
Geneva, Switzerland. 16-19 June 2015

Nurse at redemption hospital washes her hands by World Bank Photo Collection

- Evidence is **limited**
- No studies address handwashing for **Ebola and chlorine**
- No studies evaluating persistence of organisms in **rinse water**

PURPOSE

Two Studies

Study #1: Safety

Which handwashing methods are **gentlest on skin**?

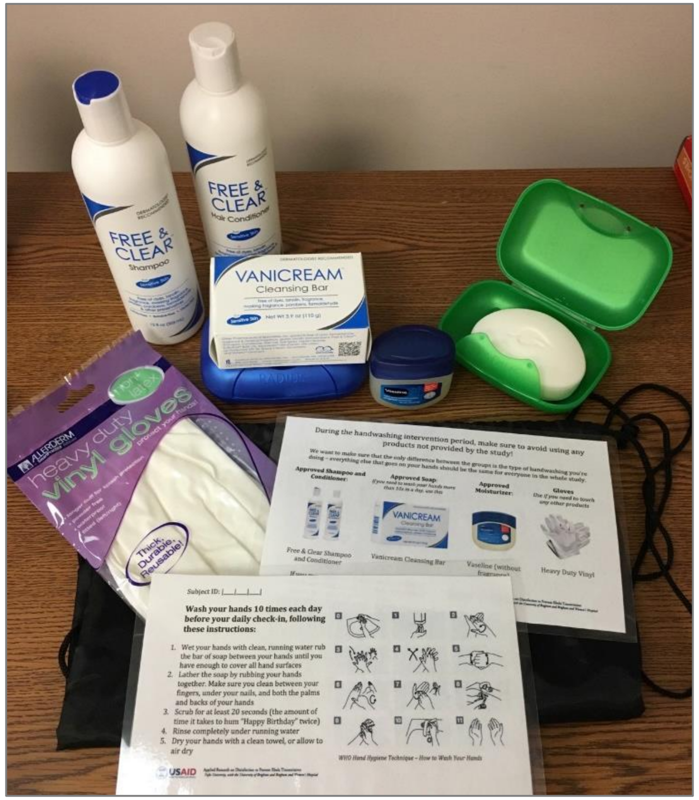
Study #2: Efficacy

Which handwashing methods are **most efficacious** at removing model organisms from hands and avoiding introduction of organisms into the environment?

STUDY #1

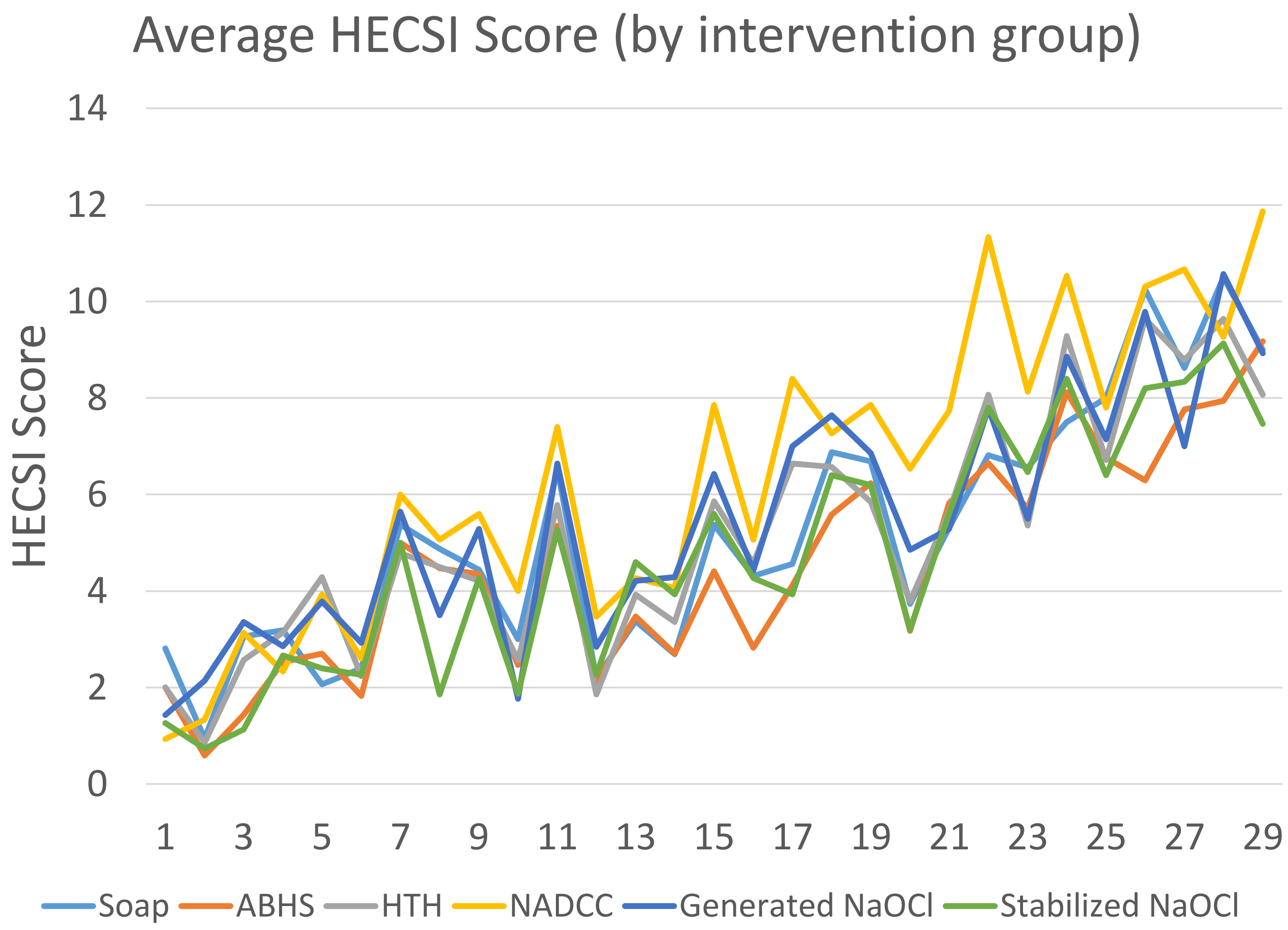
Safety: Methods

- 108 subjects, **randomized** to one of six methods
- Hands washed **10x daily** for **28 days**
- Examined for **irritation** outcomes daily (HECSI)
- **Hypoallergenic** products to control exposures



STUDY #2

Safety: Results



- Overall **statistically significant** increase in irritation
- Increased irritation is not **clinically significant**
- "**Transmission risk**" score also calculated
- Clinical **dermatitis** in four subjects at endline

STUDY #1

Safety: Discussion

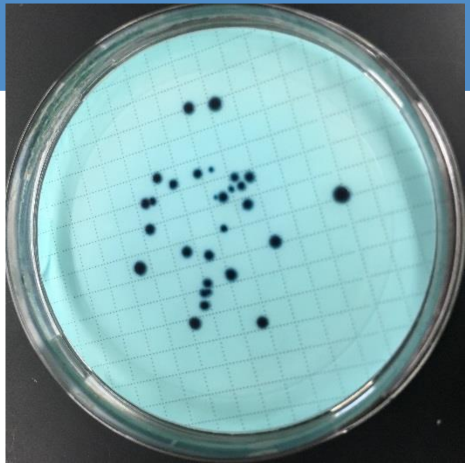
- Results **challenge** the concern that chlorine is more harmful to skin
- Unexpectedly, higher pH better for skin
- No **clinically significant** differences
- Limitations: weather, PPE use, more frequent handwashing

Responders should use the most readily available and acceptable materials

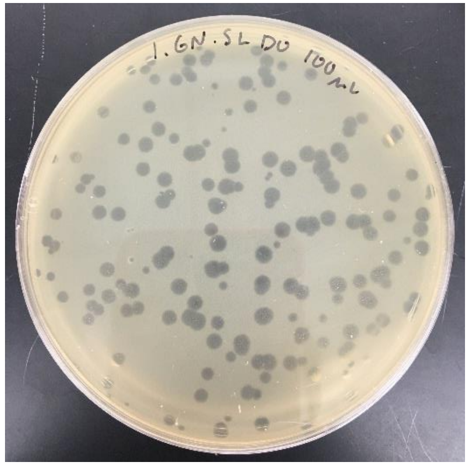
STUDY #2

Efficacy: Methods

- Ebola is a **highly infectious**, BSL-4 agent
- Human studies are not feasible
- Phi6 bacteriophage as a **non-pathogenic, BSL-1 surrogate** for Ebola
- Non-pathogenic *E. coli* as a **bacterial comparison**



E. Coli colonies on m-ColiBlue24 media



Phi6 plaques in soft agar with *Pseudomonas syringae* host

STUDY #2

Efficacy: Methods

18 Volunteers, 4 conditions over 4 days

Organism

Soil Load

E. coli without soil load	Phi6 without soil load
E. coli with soil load	Phi6 with soil load

5. Decontaminate

1. Skin pH Test

2. Spike Hands

E. coli or Phi6
~10^8 CFU/mL

3. Select Protocol

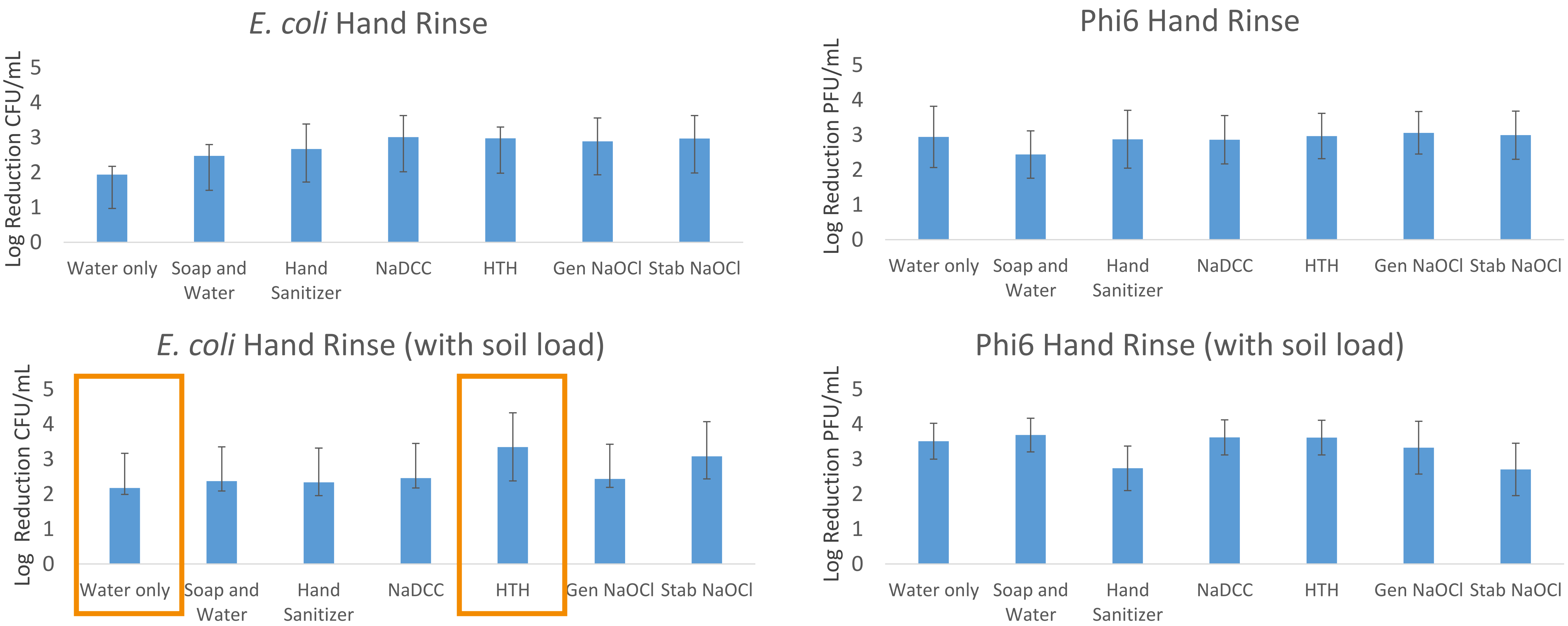
cleansing wash followed by random order

Control A *No washing*	**Control B** *Water only*
Soap and Water	**ABHS**
0.05% HTH	**0.05% NaDCC**
0.05% NaOCl (gen)	**0.05% NaOCl (st)**

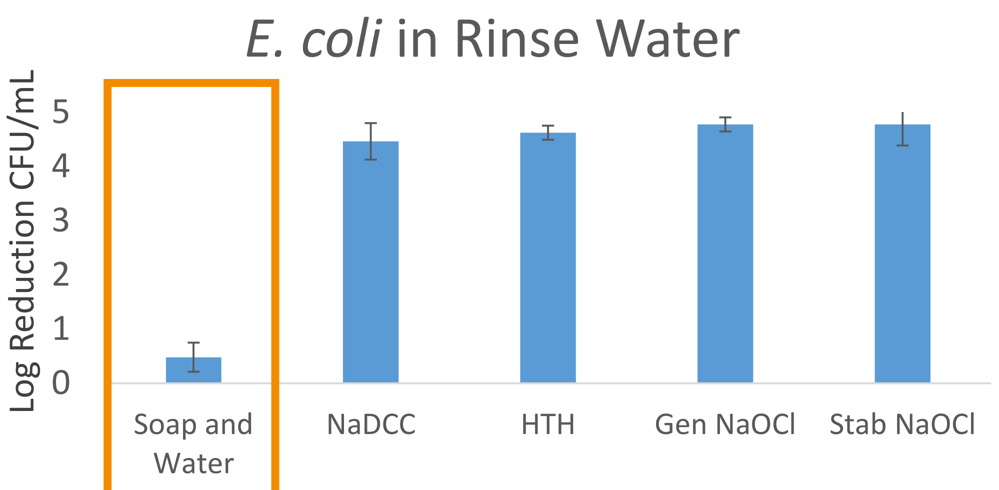
4. Rinse Hands

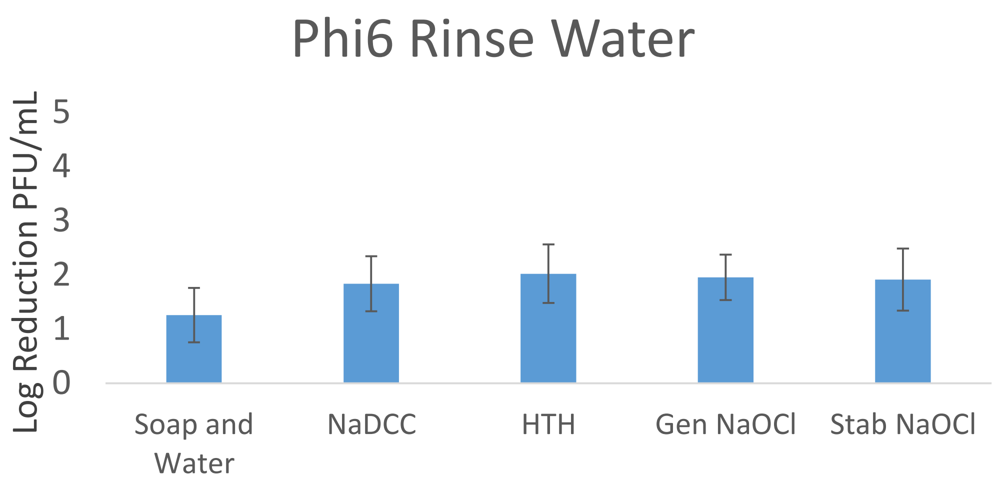
STUDY #2

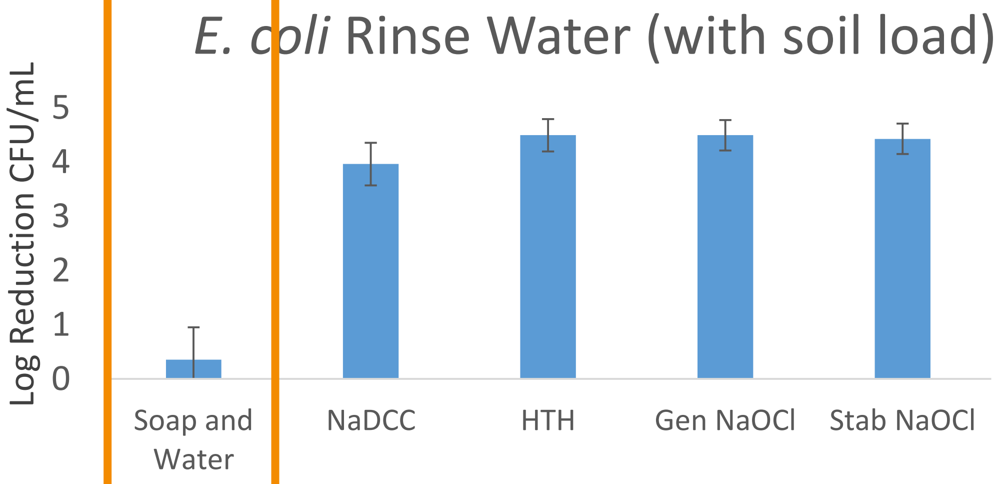
Efficacy: Hand Washing Results

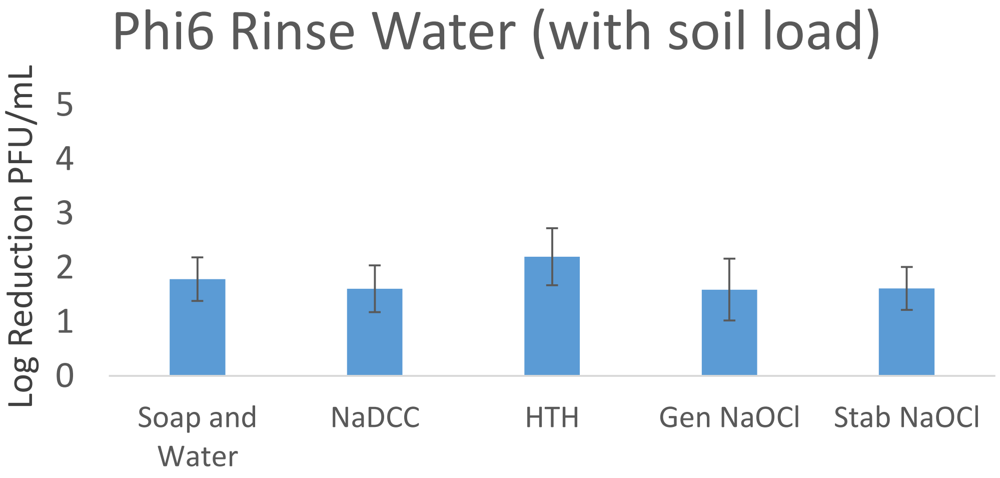


Efficacy: Rinse Water Results



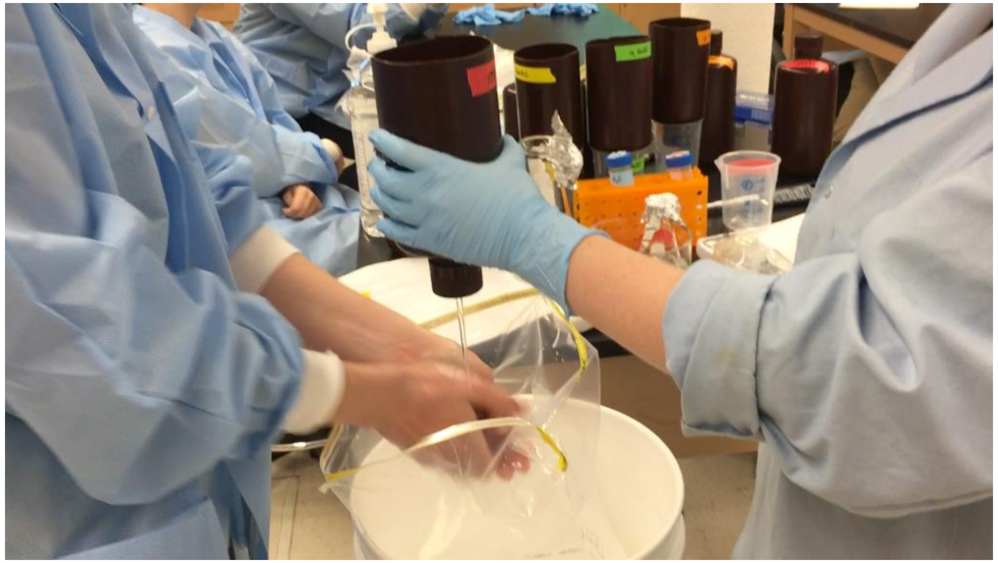






STUDY #2

Efficacy: Hand Rinse Results



- For **handwashing**, chlorine performed similarly or better than other methods for *E. coli* and Phi6,
- For **rinse water**, chlorine resulted in significantly less introduction of *E. coli* into the environment
- **Friction** may have a greater role with Phi6

Responders should use the most readily available and acceptable materials

CONCLUSION

All handwashing methods are equal

- No clinically significant differences in **safety**
- Chlorine not significantly less **efficacious**
- Chlorine may avoid introduction into the environment

Responders should use the most readily available and acceptable materials

Thank you!

Study Team:
Pamela Scheinman
Anne Marie Desmarais
Kyle Daniels
Brittany Mitro
Emma Wells

Qais Iqbal, Kyle Monohan, Marisa Zellmer, Shannon Ball

All of our study volunteers

Free & Clear for donation of hygiene products
Medentech for donation of Klorsept

Irritation - Descriptive and Compliance Data by Intervention Group

	Soap (n=16)	ABHS (n=17)	HTH (n=14)	NaDCC (n=15)	NaOCl (gen) (n=14)	NaOCl (stab) (n=15)	Total (n=91)	Chi square* P-Value
Race – Black	6% (1)	6% (1)	0% (0)	0% (0)	7% (1)	7% (1)	4% (4)	0.98
Race – White	44% (7)	65% (11)	57% (8)	80% (12)	64% (9)	33% (5)	57% (52)	0.13
Race – Asian Descent	31% (5)	24% (4)	29% (4)	7% (1)	14% (2)	40% (6)	24% (22)	0.31
Race - Multiple	19% (3)	6% (1)	14% (2)	13% (2)	7% (1)	13% (2)	12% (11)	0.90
Race - Unknown	0% (0)	0% (0)	0% (0)	0% (0)	7% (1)	7% (1)	2% (2)	0.41
Gender (% Male)	50% (8)	29% (5)	36% (5)	47% (7)	57% (8)	33% (5)	42% (38)	0.60
Atopic Disposition	56% (9)	47% (8)	38% (5)	67% (10)	43% (6)	47% (7)	50% (45)	0.63
Compliance (# handwashes/day)	8.8	9.2	8.9	9.2	9.3	9.2	9.1	0.90

Irritation - Multivariate Linear Regression Analysis of HECSI Outcomes

Variable	Soap as Reference			ABHS as Reference		
	β	95% CI		β	95% CI	
Days of Handwashing	0.26***	0.24	0.28	0.26***	0.24	0.28
Treatment Type						
Soap	--	--	--	0.61*	0.10	1.12
ABHS	-0.61*	-1.12	-0.10	--	--	--
HTH	-0.12	-0.66	0.41	0.48	-0.04	1.01
NaDCC	1.29***	0.77	1.81	1.90***	1.38	2.41
NaOCl (generated by electrochlorinator)	0.06	-0.47	0.59	0.67*	0.14	1.20
NaOCl (from stabilized stock solution)	-0.46	-0.98	0.06	0.15	-0.36	0.66
Gender	0.82***	0.50	1.14	0.82***	0.50	1.14
Atopic Disposition	-1.09***	-1.40	-0.77	-1.09***	-1.40	-0.77
Average Daily Humidity	-0.05***	-0.06	-0.04	-0.05***	-0.06	-0.04

Variables	Soap as Reference			ABHS as Reference		
	Odds Ratio	95% Conf. Interval		Odds Ratio	95% Conf. Interval	
Days of Handwashing	1.02***	1.01	1.03	1.02***	1.01	1.03
Soap				1.55**	1.13	2.12
ABHS	0.65**	0.47	0.88			
HTH	0.57***	0.41	0.80	0.89	0.63	1.25
NaDCC	0.85	0.62	1.16	1.32	0.95	1.83
NaOCl (generated by electrochlorinator)	0.89	0.66	1.22	1.39	1.00	1.92
NaOCl (from stabilized stock solution)	0.68*	0.50	0.94	1.06	0.76	1.47
Gender	2.72***	2.23	3.33	2.72***	2.23	3.33
Atopic Disposition	0.56***	0.46	0.68	0.56***	0.46	0.68
Vaseline Use	0.89*	0.80	0.98	0.89*	0.80	0.98
Average Daily Humidity	1.00	0.99	1.00	1.00	0.99	1.00

Rapidly deployable handwashing interventions in complex emergencies: Results from a trial in a displaced persons camp in the Democratic Republic of the Congo

Victoria Trinies, Mimi Kambere, Lauren S. Blum, John Kanani, Manenji Mangundu, Jelena V. Allen, Foyeke Tolani, Marion O'Reilly, Robert Dreibelbis, Thomas Handzel, Susan Cookson, Pavani K. Ram

7th Emergency Environmental Health Forum

Kathmandu, Nepal

Background

- 27% of <5 mortality in complex emergencies due to respiratory infections and diarrhea[1]
- Mortality rates highest in the acute phase of emergencies
  - Resources stretched
  - Need for rapidly deployable interventions
- Promotion of handwashing with soap reduces respiratory infections 16-21%[2-4] and diarrhea 23-47%[3,5]

How to increase HW practices in acute emergency settings?

Study goal and context

- Goal: Evaluate the efficacy of three novel, rapidly-deployable interventions for improving rates of handwashing with soap in a camp setting

- Location: Kishusha IDP camp, Rubaya, DRC
    - Residents arrived 2-3 years prior to the study
    - Frequent hygiene promotion
    - Provision of soapy water discontinued 1 year prior to start of study – replaced with promotion of ash

Nudges

Triggering

Handy Wash Tap

Research Questions

- What is the impact of the intervention on rates of handwashing with soap at critical events compared to the control group?

Critical events:

- After leaving the latrine
- At the household
  - after household fecal contact events
  - before food contact events
  - after respiratory contact events

Methodology

- 4 clusters of 4 communal latrine blocks each were selected
  - 3 intervention clusters + 1 control cluster
  - 50 households with children <5 enrolled per cluster
  - Soapy water provided at all 16 latrine blocks during the follow-up period

Baseline
- Survey with female head of household
- Household hw observations (1 hr)
- Latrine hw observation (2-4 hrs)

Follow-up 1
- Household hw observations (1.5 hrs)
- Latrine hw observation (5-10 hrs)

Follow-up 2
- Household hw observations (1.5 hrs)
- Latrine hw observation (5-10 hrs)

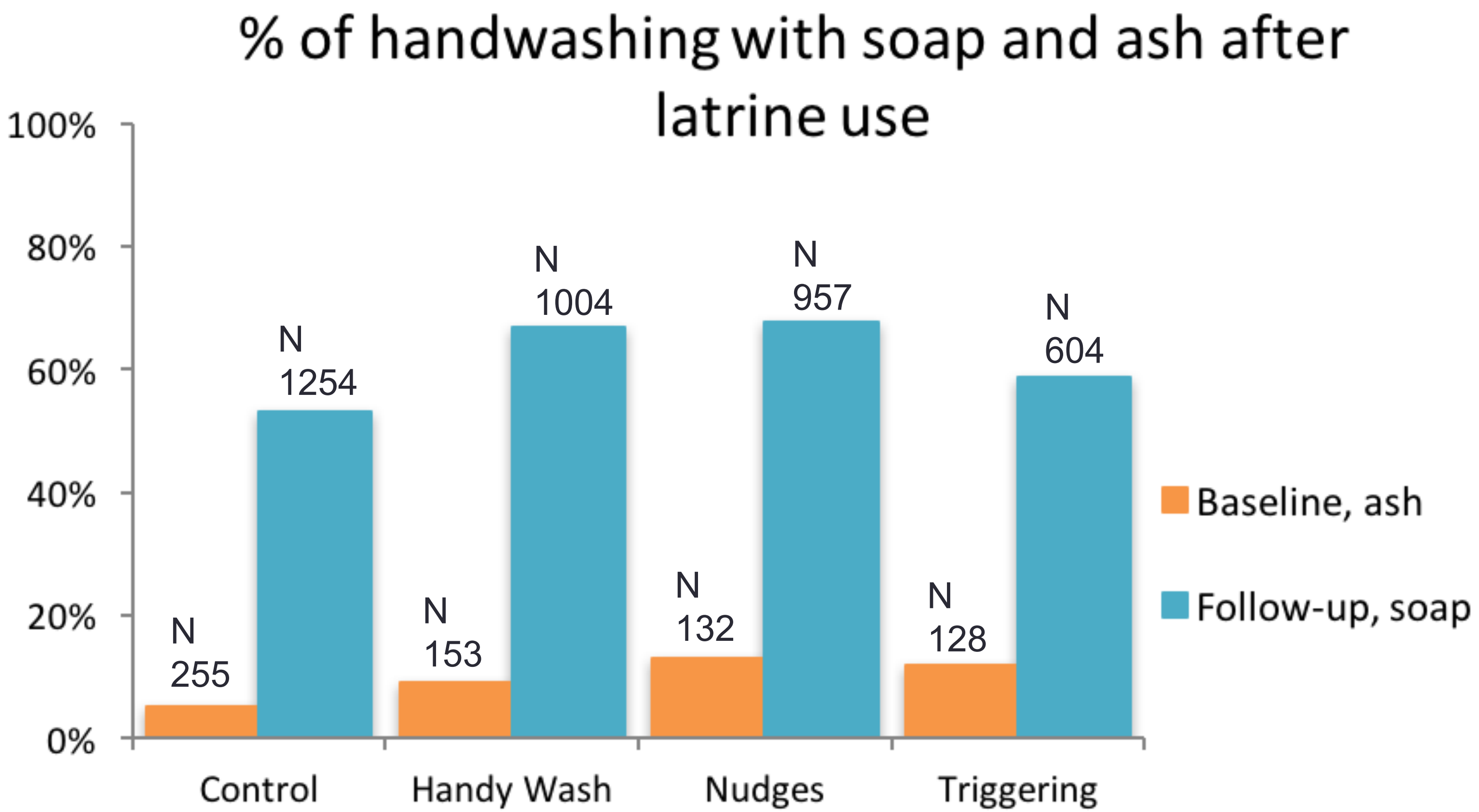
Week 1-2 | Week 3 | Week 4 | Week 5 | Week 6 | Week 7

Intervention deployment (incl. soapy water at latrines)

Summary of Intervention Groups

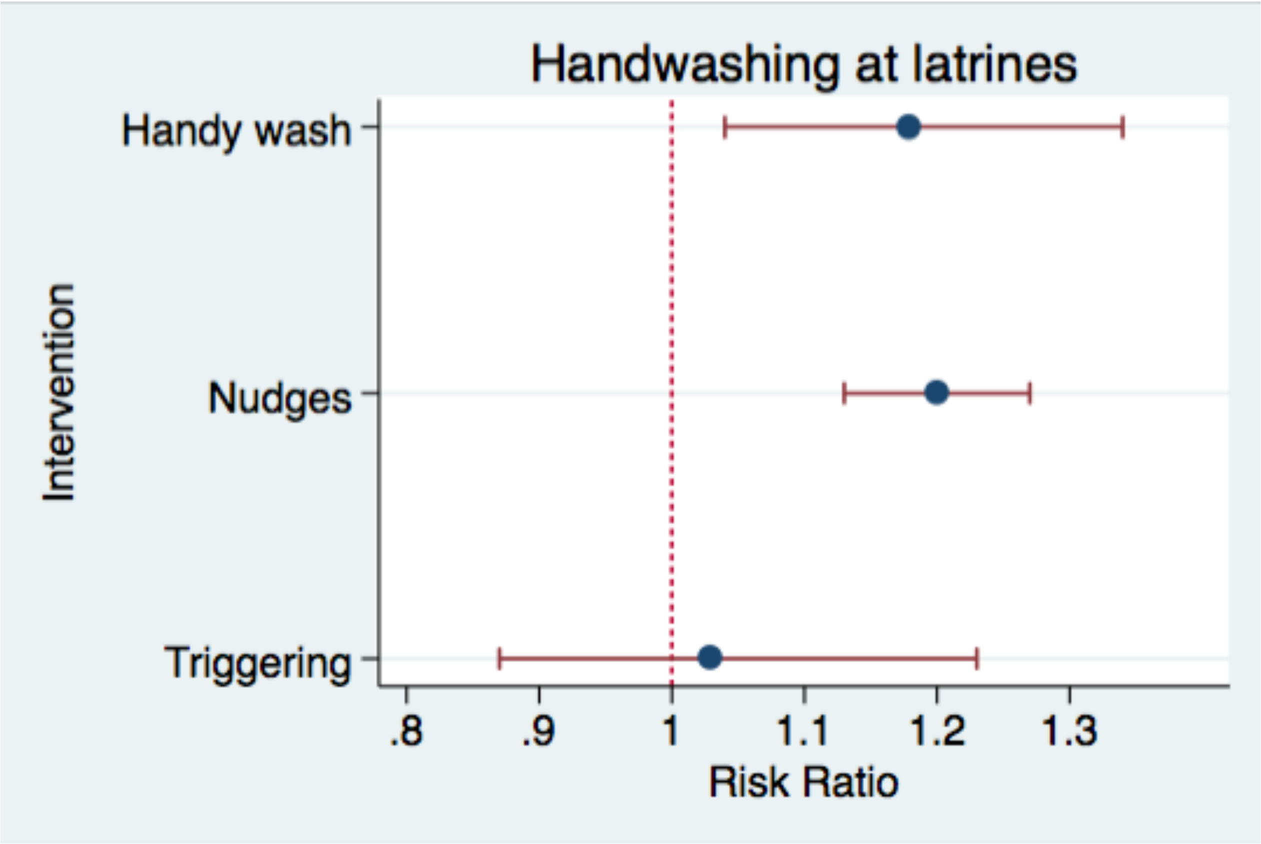
Group	Latrines	Households
A	Handytap+soapy water	Handytap + soapy water
B	Nudges+ soapy water	None
C	Trigger + soapy water	None
Control	Soapy water	None

Results: Handwashing at Latrines



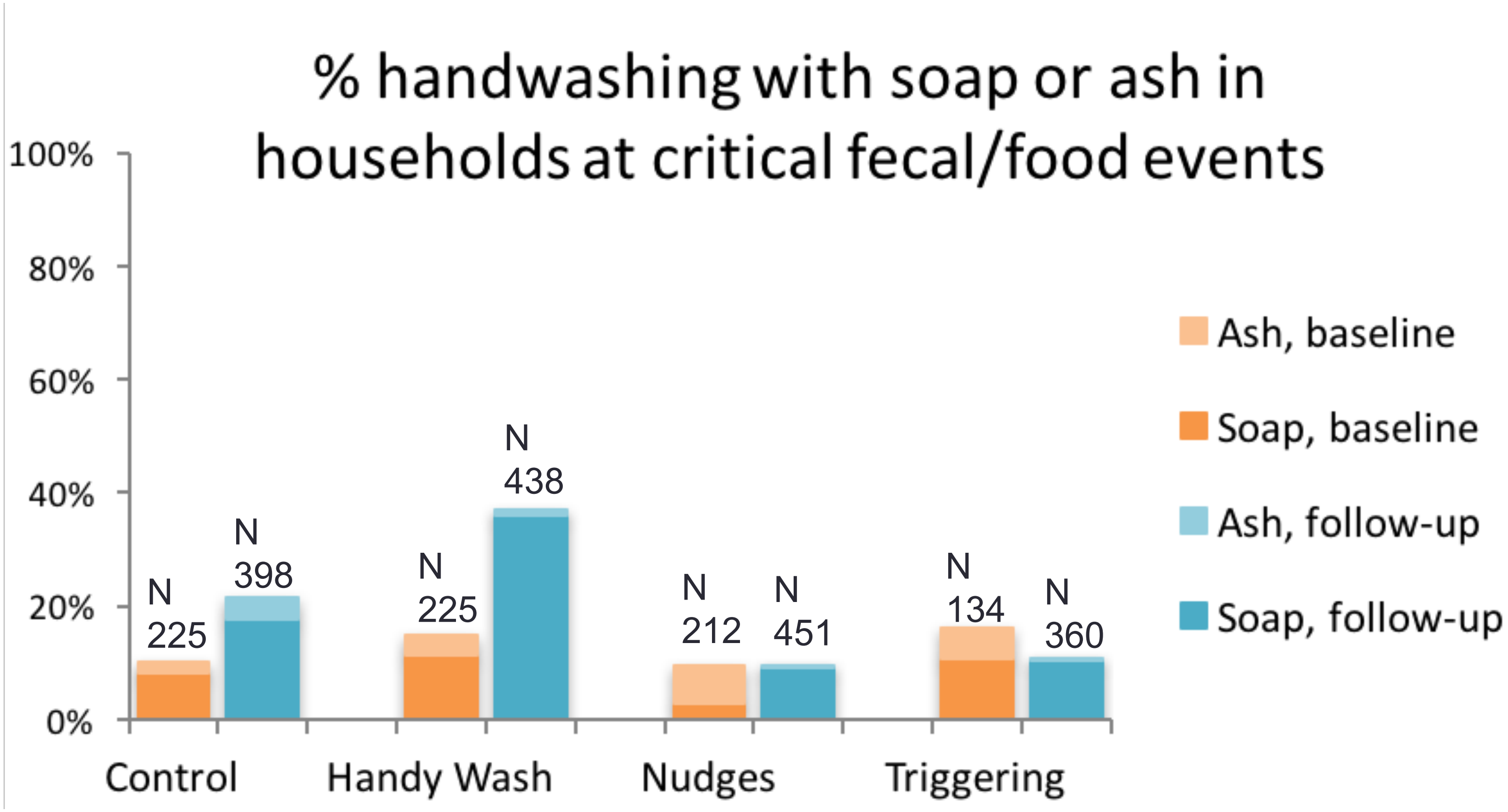
- Baseline: Handwashing rate at latrines in triggering arm statistically higher than control arm, other arms comparable
- Follow-up: Overall increase in handwashing at latrines (soap compared to ash)

Impact of interventions on handwashing with soap after latrine use



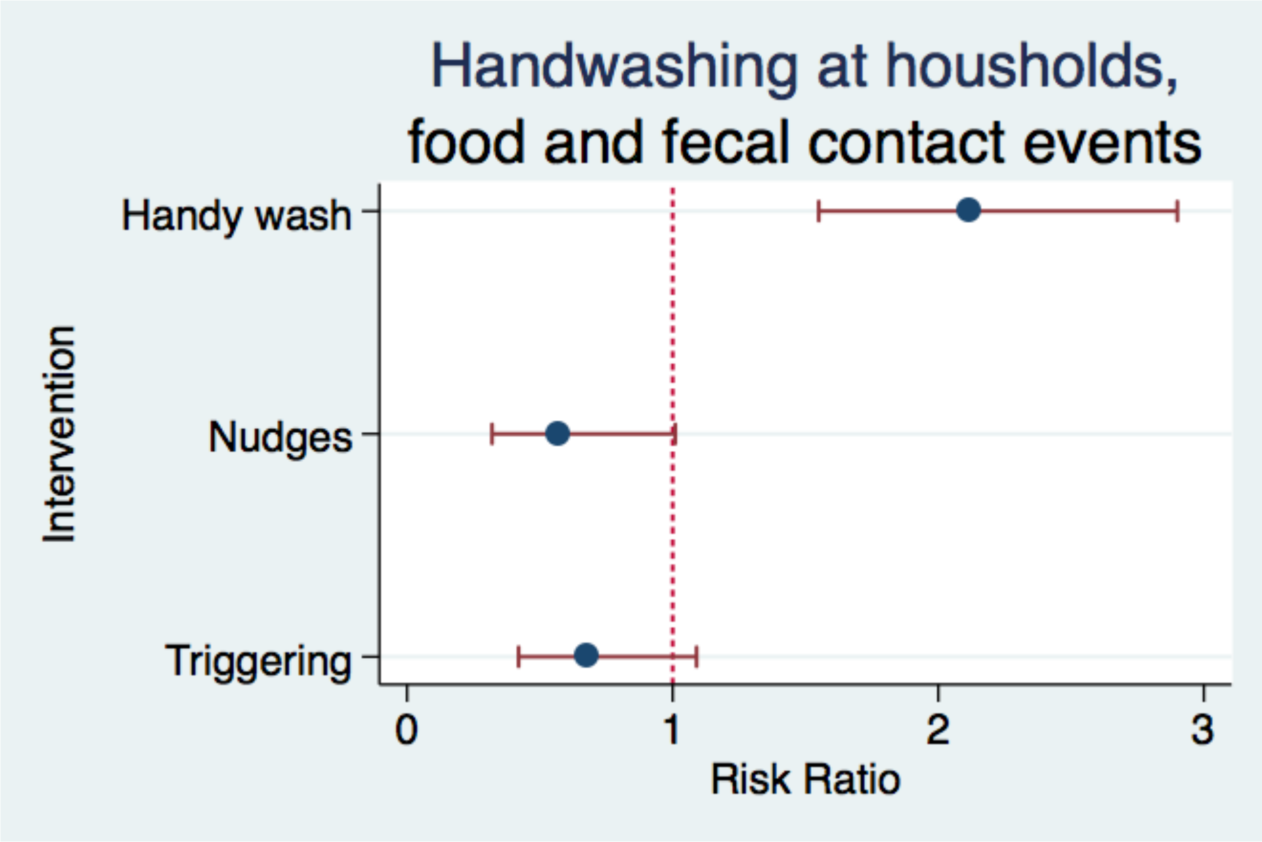
- 18% greater likelihood in Handy wash arm
- 20% greater likelihood of handwashing in Nudges arm
- No effect in Triggering arm

Results: Households



- Respiratory events omitted (high number of events, low hw rates)
- Baseline: Handwashing rates comparable across arms
- Follow-up: Increase in household handwashing in control and handy wash arms

Impact of interventions on handwashing with soap at household fecal and food contact events



- 2x likelihood of handwashing in Handy wash arm compared to controls arm
- Non-significantly lower likelihood of handwashing among Nudges and Triggering arms

Summary of Key Results

- Addition of soapy water increased HW after latrine use in all groups
- Adding nudges at latrines or adding the handy tap at latrines increased this further
- Addition of triggering did not affect HW practices at the latrine
- Use of triggering or nudges at the latrine did not have any spillover effect on handwashing practices at the household level. A negative effect was seen against the control group as HW practices unexpectedly increased in the control group.
- Providing a handytap and soap at the HH level produced increases in HW at the household level

Conclusions and Recommendations

- Handwashing rates increase when soap is available—there is need for sustained provision of soap at latrines (and households) to allow for safe handwashing practice.
- Low uptake of ash + additional qualitative findings suggests ash is not a viable alternative to soap in this context.
  - Not considered effective, not highly valued, does not make the hands feel good or clean
- Longer follow-up period needed to assess sustainability of observed behavior change.
- Interventions should be replicated in in acute emergency setting too assess viability without prior hygiene promotion.

Acknowledgements

OXFAM

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

University at Buffalo
The State University of New York

Special thanks to the research team and the incredible families of Kishusha

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Additional resources

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Urine-Diverting Dry Toilet in Emergency Settings

Mohammad Ali, Public Health Engineer Coordinator, Oxfam in Bangladesh
Email: ali@oxfam.org.uk

What we know

In Bangladesh the most common disaster is flooding

- In many areas due to high water table and/or frequent flooding it is not possible to dig pit latrines.
- Flooding of existing pits or insufficiently raised latrine is an enormous public health risk
- When latrines are destroyed people revert to open defeaction
- Frequent desludging of latrines is a time consuming messy business

Comparative study of 3 Flood resistant & response toilet options used in Bangladesh

9 sites – 3 Organizations, Oxfam, JADE (Japan Association of Drainage and Environment) & Practical Action Bangladesh

1. Emergency mobile urine diversion toilet
2. Raised permanent urine-diverting dry toilet (UDDT)
3. Floating Latrines
4. Traditional Pit Latrine

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Portable Emergency UDDT



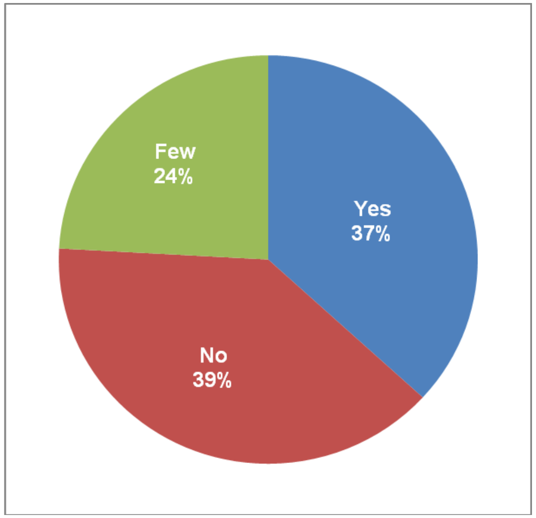


UDDT as resilient option

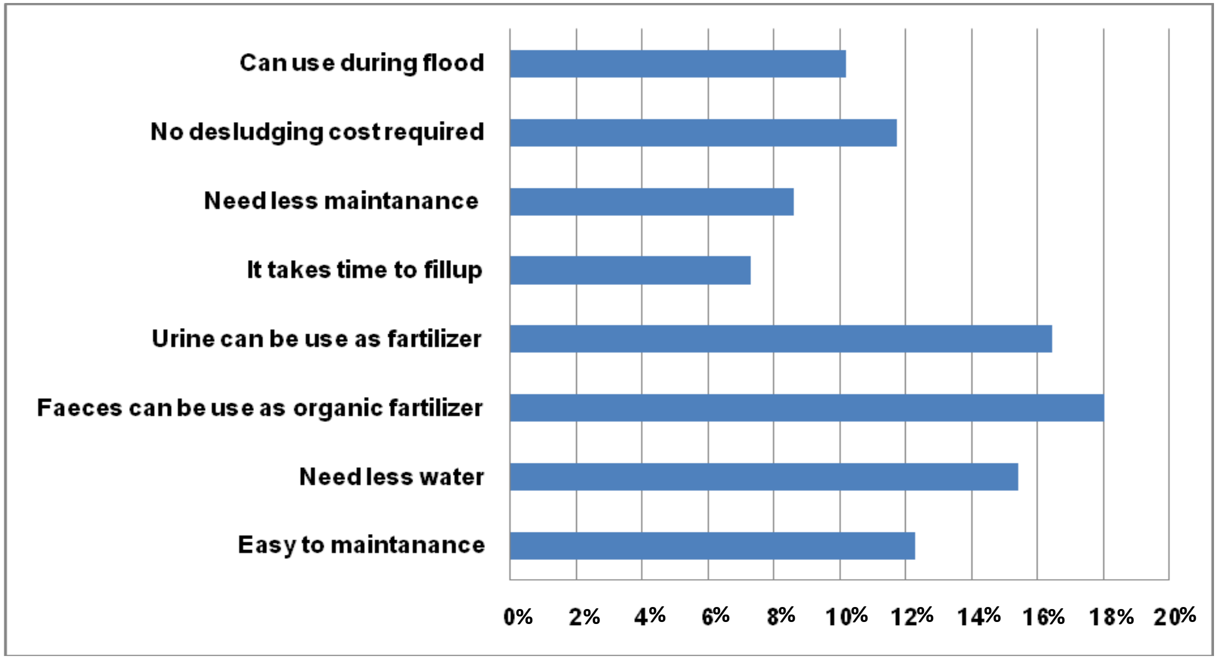
Emergency Floating Toilet

OXFAM

Study findings UDDT



Cultural barriers



User comments

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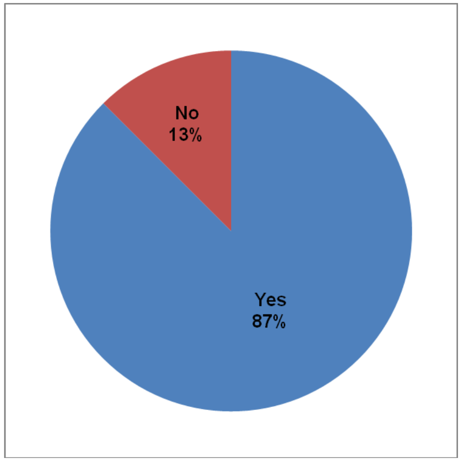
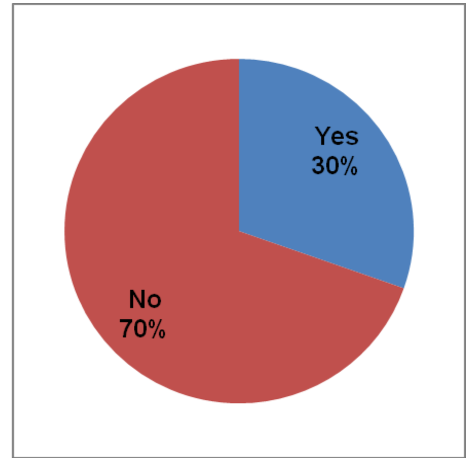
Environmental and health aspect

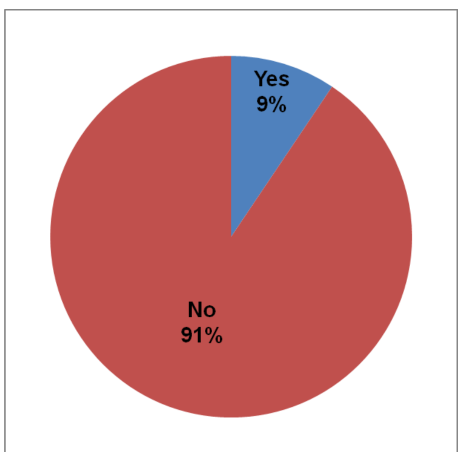


UDDT

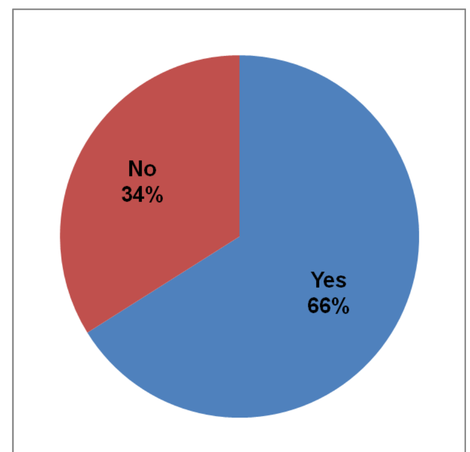


Traditional Pit Toilet

Remain functional during disaster



UDDT



Traditional Pit Toilet

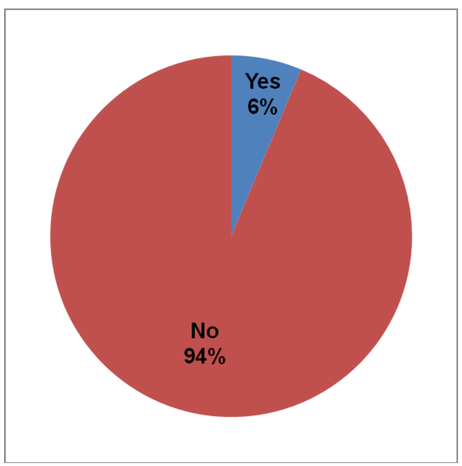
Inundated during flood

OXFAM

Surrounding water contamination

Grade	No. Coli form count	Risk	Frequency	Percentage
A	0	No risk, WHO guideline value, no action required	34	34
B	01 – 10	Low risk, need action and follow-up	42	42
C	11 - <50	Intermediate risk, highly polluted, immediate action needed	22	22
D	>50	High risk, gross/highly polluted and not acceptable, suspend the source	3	3

Source: *Oxfam*



User comments

Surface and subsurface water pollute by UDDT

OXFAM

Table 4.14: Comparison of presence bacteria, parasitic protozoa, helminths in the different faeces sample of different organization			
Pathogen	**Symptoms**		
Bacteria		Oxfam (one sample)	JADE (four sample)
Aeromonas spp	Enteritis		
Campylobacter jejuni/coli	Diarrhoea, cramping, abdominal pain, fever, nausea, joint pain, Guillain-Barré syndrome		
Escherichia coli (EIEC, EPEC, ETEC, EHEC)	Enteritis		Absent (three months observation)
Plesiomonas shigelloides	Enteritis		
Salmonella typhi/paratyphi	Fever - headache, malaise, anorexia, slow pulse, enlarged spleen, cough		
Salmonella spp.	Diarrhoea, fever, abdominal cramps	Absent / 10 g	Absent (three months observation)
Shigella spp.	Dysentery (bloody diarrhoea), vomiting, cramps, fever	Absent / 10 g	Absent (three months observation)
Vibrio cholera	Cholera - watery diarrhoea, lethal if severe and untreated	Absent / 10 g	Absent (three months observation)
Yersinia spp.	Fever, abdominal pain, diarrhoea, joint pains, rash		
Clostridium perfringens		Absent / g	

Pathogen	Symptoms		
Bacteria		Oxfam (one sample)	JADE (four sample)
Total coliform		43 MPN/g	
Parasitic protozoa			
Cryptosporidium parvum/hominis	Watery diarrhoea, abdominal cramps and pain	0 (Count/gm)	
Cyclospora cayetanensis	Often asymptomatic, diarrhoea, abdominal pain	0 (Count/gm)	
Entamoeba histolytica	Often asymptomatic, dysentery, abdominal discomfort, fever, chills	720 (Count/gm)	3000max 2200min (1st month) 300max 0min(2nd month) 0 max –0min (3rd month)
Giardia intestinalis	Diarrhoea, abdominal cramps, malaise, weight loss	0 (Count/gm)	5300max 3300min (1st month) 300max 100min(2nd month) 0 max –min (3rd month)
Toxocara SPP.			0max 0min (1st month) 0max 0min(2nd month) 0 max 0min (3rd month)
Helminths			
Ascaris lumbricoides	Generally no or few symptoms, wheezing, coughing, fever, enteritis, pulmonary eosinophilia	160 (Count/gm)	700max 300min (1st month) 0max 0min(2nd month) 0 max 0min (3rd month)

Challenges:

Portable Emergency UDDT

•It is unstable in high wind area.
•Salty ground (rust) cause damage to any iron made structure.
•Secondary treatment/ composting

Floating Toilet

•Higher cost than normal latrine
•New technology for users
•Desludging

Permanent UUDT option

•Need more space than traditional latrines
•Need to be careful about not letting water into feces chamber
•Poor families are unable to invest such an amount of initial cost for the latrine
•Construction is more complicated than pit latrine
•In some cases, the user feels uneasy using this latrine rather than ring slab latrine

OXFAM

Any Question ?

An Environmental and Acceptability Evaluation of Urine-Diversion Dry Toilets (UDDT)

Hiloweyn Refugee Camp

Dollo Ado, Ethiopia

May 2014 - Dec 2016

Overview

- Hiloweyn/UDDT Program Background
- Environmental Evaluation
  - Methods, Key Results
- Acceptability Evaluation
  - Methods, Key Results
- Conclusions

Hiloweyn Camp

- One of five refugee camps in Dollo Ado
- Established after major refugee influx in 2011
- Official pop'n (2016): 45,000 persons
  - New arrivals still being settled
  - Origin: Somalia (rural)
- Located in area of rocky soil, bedrock and localized flood risk
  - Pit latrines infeasible

UDDT Program

Year	UDDT quantity/type	Beneficiaries [Implementer]
2012	90 single-family units	140 HHs [Oxfam]
2013 (early)	50 single-family units	
2013 (late) - 2014 (early)	635 two-family units – Phase I and 2	1,270 HHs [Oxfam]
2014 (late)	130 two-family units – Phase 3	260 HHs [NRC]
2015 (mid/late)	65 two-family units – Phase 4	130 HHs [NRC]
TOTAL:	**970 UDDTs**	**1,800 HHs**

Operational Research Questions

- When could the UDDT waste be safely handled and emptied?
  - Environmental Evaluation

- What was the level of adoption among users?
  - Acceptability Evaluation

Proposed UDDT Evaluation

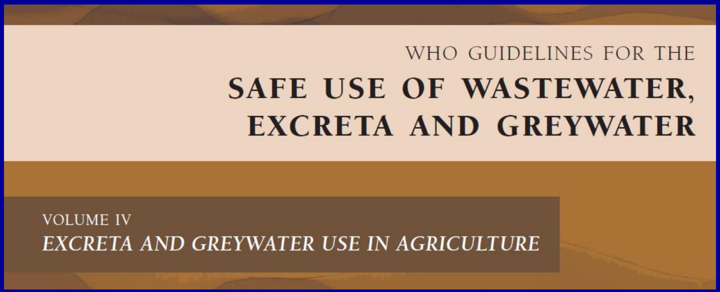
- **Partnership with UNHCR, Oxfam/NRC and CDC**
- **Time period :** 2.5 years (May 2014 – Dec 2016)
- **Funding:** Grant to CDC Foundation from the *Research for health in humanitarian crises (R2HC)* programme via ELRHA, Wellcome Trust and DFID

Environmental Evaluation

Specific Objectives

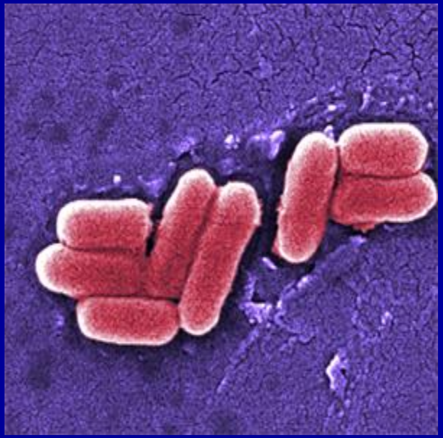
1) Conduct longitudinal 'seeded' study to document key physical factors (+time) influencing the performance of the UDDTs for microbial inactivation
   → With known quantities of *Ascaris suum ova*

2) Compare conditions to WHO guidelines (2006) for safe use of excreta for agricultural use
   - <1000 *E. coli* / g total solids
   - <1 viable helminth egg / g total solids



Parameters of Interest

- **Microbial inactivation:**
  - ○ ***E. coli*: common in feces**
  - ○ ***Ascaris suum* ova: highly resistant to environmental stress**



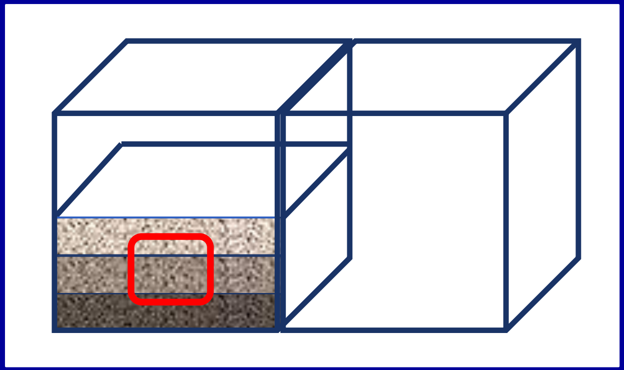
- **Physical characterization:**
  - ○ **Moisture content (i.e., total solids)**
  - ○ **pH**
  - ○ **Temperature**

○ **Storage time:**
  - ○ **0, 6, 9, 12-months of storage**

Methods

- 4 pairs of "Tea bags"[1] (20 µm mesh) were prepared for each of <u>20 shared-family UDDTs</u>:
    - Bag A: Waste + *Ascaris* ova
    - Bag B: Waste only
- One of each bag type tested immediately (Baseline)

- Three of each bag type were embedded into the center of each UDDT
- At 6, 9, and 12 months, one of each bag type was removed and tested for key parameters
- Temperature of waste was measured at 3 locations during each sampling event



1. Jenson, 2009

Results

Physical characterization of UDDT waste in shared UDDTs over time (n=20)

Treatment Time	Average Moisture Content	Average pH	Average Temperature		
			Top	Middle	Bottom
Baseline	9%	9.0	32°C	33°C	32°C
6 months	8%	9.1	36°C	36°C	36°C
9 months	4%	9.1	34°C	34°C	35°C
12 months	3%	9.1	32°C	32°C	32°C

Results

Microbial inactivation in shared UDDTs over time

Treatment Time	No. (%) UDDTs with <1000 *E.coli* / g total solids	Log_{10} Reduction of Viable *Ascaris* (%)*
Baseline	6 (30%)	-
6 months	14 (74%)	>2.8 (>99.8%)
9 months	16 (89%)	>2.7 (>99.8%)
12 months	19 (95%)	>2.8 (>99.8%)

*Log reduction may actually be much higher. Due to the extreme decomposition of Ascaris eggs over time, we were unable to achieve our method detection limit in order to calculate an absolute log reduction value (Detection limit of 16 viable eggs per gram feces)

Conclusions

- Initial moisture content was low (9%) and decreased over time
- Average pH was moderately alkaline
  - Elevated pH has been shown to reduce time required for microbial inactivation
  - We are currently conducting lab studies to assess the effects of increased pH on *Ascaris* viability over time
- By 12 months, majority (~95%) samples met the WHO Guideline of <1000 *E. coli* / g total solids
- By 6 months, there was a >2.8 $\log_{10}$ (>99.8%) reduction in viable *Ascaris* ova
  - These log reduction values might be higher

Acceptability Evaluation

Specific Objectives

1) Determine if UDDTS are correctly and consistently used and by whom (reported and observational)
   a. Determine if adoption/use changes over time

2) Document the overall condition of the UDDTs wrt usability
   a. Look at key structural and cleanliness indicators

3) Compare level of satisfaction of single-family and shared-family UDDTs to other forms of sanitation available (i.e. pit latrines)
   a. Determine factors contributing to level of satisfaction

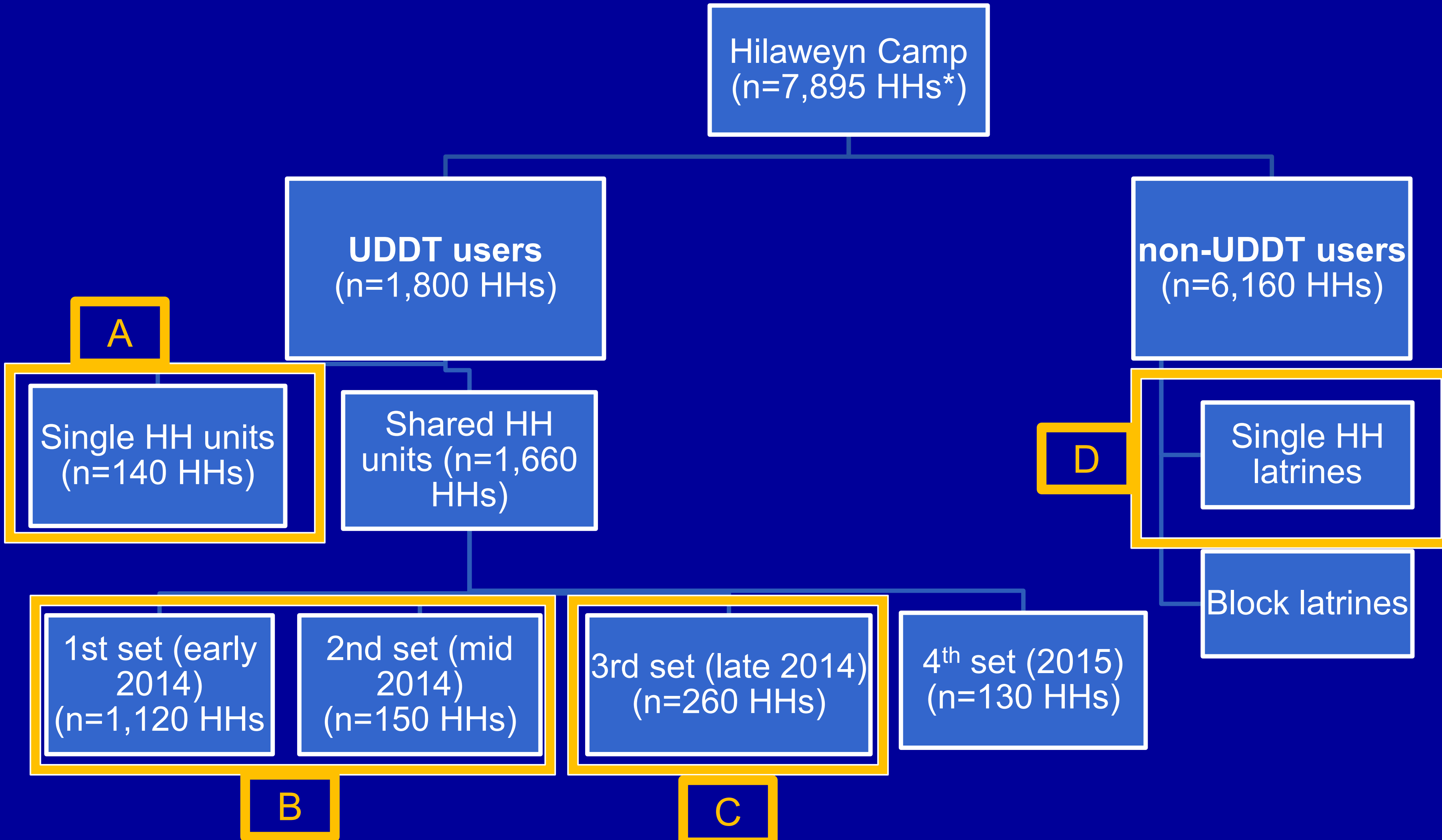
Methods

- Baseline Survey: April 2015
  - User household interviews, UDDT observations

- Monitoring Visits: May 2015-May 2016
  - UDDT observations (NRC UDDTs)

- Endline Survey: October 2016
  - User household interviews, UDDT observations

Survey Sampling Frame



*official estimates

Survey Methods

- Sample Size: 420HHs for each survey
  - 105HHs from each of 4 comparison groups (A-D)
    - Detectable difference between the proportion for key indicator(s) among comparison groups [e.g. satisfaction, perceptions of reuse]
    - The limit of statistical significance (alpha) is 0.05 (95% confidence interval)
    - Power (1 - beta) 0.8
    - Anticipated response rate of 90%.
- Simple random sampling from each group list (A-D)
- UDDT observations from all UDDT users

KEY RESULTS

Expected (lists) to Actual (reported) Practices

- 94% (baseline) and 90% (endline) of expected UDDT users were using UDDT
  - Rest had switched to latrine as primary sanitation
- 89% (baseline) and 72% (endline) of expected latrine users from list were using latrines
  - Rest had switched to UDDTs

UDDT Users

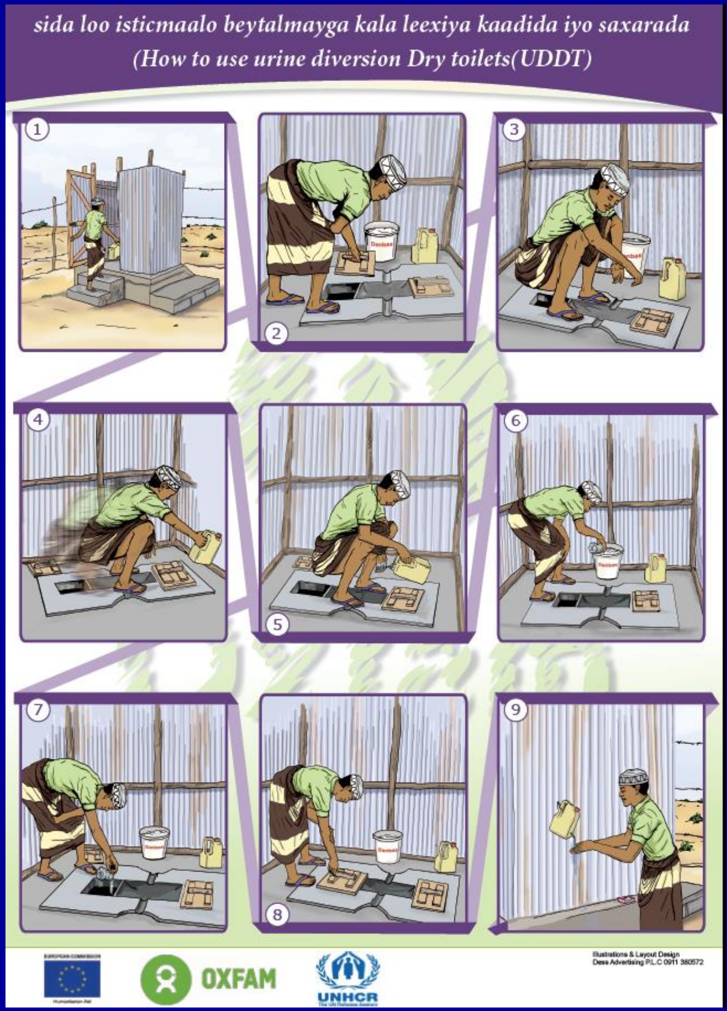
Variable	Percent	
UDDT USERS	April 2015 (n=285; 71.8%)	October 2016 (n=303; 73.2%)
Share UDDT with another family	68.1	51.8
Reported length of time of use		
3-5 years	13.0	**34.7**
1-2 years	**49.1**	**59.4**
6-11 months	**21.1**	2.0
3-5 months	14.0	1.3
<3 months	2.8	2.0

Consistent and correct use

Variable	Percent		p
	April 2015 (n=285)	October 2016 (n=303)	
Reported to use in past 24 hours	98.2	96.7	0.235
Reported consistent use (every day)	88.8	93.4	0.048
Reported all family members use UDDT	34.7	25.4	0.012
Report to add ash after every use	85.3	97.0	<0.0001
Ash bucket present UDDT (observed)	97.9	91.1	0.0003
Ash in the bucket (observed)	81.4	67.0	<0.0001

UDDT Condition

Variable	April 2015 (n=285)	October 2016 (n=303)	p
Cleanliness issues			
presence of flies	28.1	17.8	0.0031
presence of odor	26.3	16.8	0.0051
presence of feces on squat pan	30.5	38.6	0.075
Infrastructure issues			
cracks in masonry	19.65	9.24	0.0003
door broken	22.1	12.5	0.0021
Correct use issues			
foreign objects/clog in urine pipe	22.8	10.2	0.0003
foreign objects in either vault	8.77	19.5	0.0002
wet waste in active vault	41.4	26.7	0.0002



Satisfaction with Sanitation Type

Reported Satisfaction	Percent	
	April 2015	**October 2016**
Single-family Latrine users	**(n=107)**	**(n=108)**
Primary Latrine Users	66.4	88.9
UDDT users	**(n=285)**	**(n=303)**
All UDDT Users	62.8	97.4
Single family UDDT users	76.4	96.6
Shared family UDDT users (older, Oxfam)	64.4	100.0
Shared family UDDT users (newer, NRC)	48.9	97.3

Factors associated with Satisfaction – Univariate (ALL)

Variable	contrast	p
Age of respondent		0.3909
Ability to read (0=no vs 1 yes)	0 vs 1	0.8095
Received formal education (0=no vs 1 yes)	0 vs 1	<.0001
Has a child < 5 years in the home (1=yes vs 0=no)	1 vs 0	0.0040
Time in Hiloweyn camp		<.0001
HH size		0.5457
Previous sanitation type		
1= no sanitation system/field	1 v 3	<.0001
2= pit latrine	2 v 3	0.0015
3= pour flush toilet		
Current sanitation type		
latrine vs uddt	1 vs 0	0.2377
Shares current sanitation (1=yes vs 0=no)	1 vs 0	0.0011

Factors associated with Satisfaction-Multivariate Model (ALL)

Variable	Odds Ratio	p
Has education (ref) vs none	2.057	0.0083
Previous sanitation type		
1= no sanitation system/field	2.050	0.0031
2= pit latrine	2.532	0.0147
3= pour flush toilet (ref)		
Years in the camp (Increase in satisfaction per year)	1.893	<.0001
Shared yes (ref) vs no	1.729	0.0047

Factors associated with Satisfaction – Univariate (UDDT)

Variable	contrast	p
Age of respondent		0.4321
Ability to read (0=no vs 1 yes)	0 vs 1	0.6042
Received formal education (0=no vs 1 yes)	0 vs 1	0.0003
Has a child < 5 years in the home (1=yes vs 0=no)	1 vs 0	0.0558
Time in Hiloweyn camp		<.0001
HH size		0.4649
Previous sanitation type		
1= no sanitation system/field	1 v 3	<.0001
2= pit latrine	2 v 3	0.0005
3= pour flush toilet		
Shares UDDT (1=yes vs 0=no)	1 vs 0	<.0001
Length of time using UDDT		<.0001
Clean Index		<.0001

Factors associated with Satisfaction- Multivariate Model (UDDT)

Variable	Odds Ratio	p
Previous sanitation type		
1= no sanitation system/field	2.325	0.0063
2= pit latrine	3.407	0.0312
3= pour flush toilet (ref)		
Years in the camp (Increase in satisfaction per year)	2.329	<.0001
Time of use of UDDT (increase in satisfaction per year)	1.825	0.0008
Clean Index (decrease in satisfaction with increase in 'dirtiness')	0.493	<.0001

Acceptability Conclusions

- Reported consistent and correct use high
  - Even after 2+ years of use (endline average)
- Some people unable to use UDDTs
- UDDT users not more (or less) satisfied than latrine users
- Length of time of use and cleanliness impacts acceptability among UDDT users
  - Impact of lack of cleanliness on satisfaction more notable among newer users

Implications for UDDT use in emergencies

Acceptability :

- More appropriate for protracted/stable emergency situation (time of use a driving factor in adoption/acceptability)
- If feasible, single-family units could lead to higher adoption/acceptability
  - More important in early phase
- Ensuring cleanliness of units could lead to higher adoption/acceptability
  - In part, relates to correct use

Implications for UDDT use in emergencies

Performance:

- UDDTs perform well in dry, arid, hot environments like Hiloweyn
  - Dessication major driver
- Increased pH should be explored to reduce treatment time (in less favorable conditions)
  - Addition of lime during UDDT usage, or after UDDTs are closed, may increase treatment efficacy

THANK YOU

Discussion Session

- Panel Discussion Topics

  1) key challenges/lessons learned on adoption? (From Dollo Ado)

  2) what to do when safety of stored waste cannot be ensured/determined? (Best practices)

- Future directions for UDDTs in emergencies
  - Camp and non-camp settings

ADDITIONAL PICTURES


S3 B30 C6
L#7
29/11/2013

Borehole diagnosis and rehabilitation as an alternative to new borehole drilling

The Médecins Sans Frontières approach in rural Niger

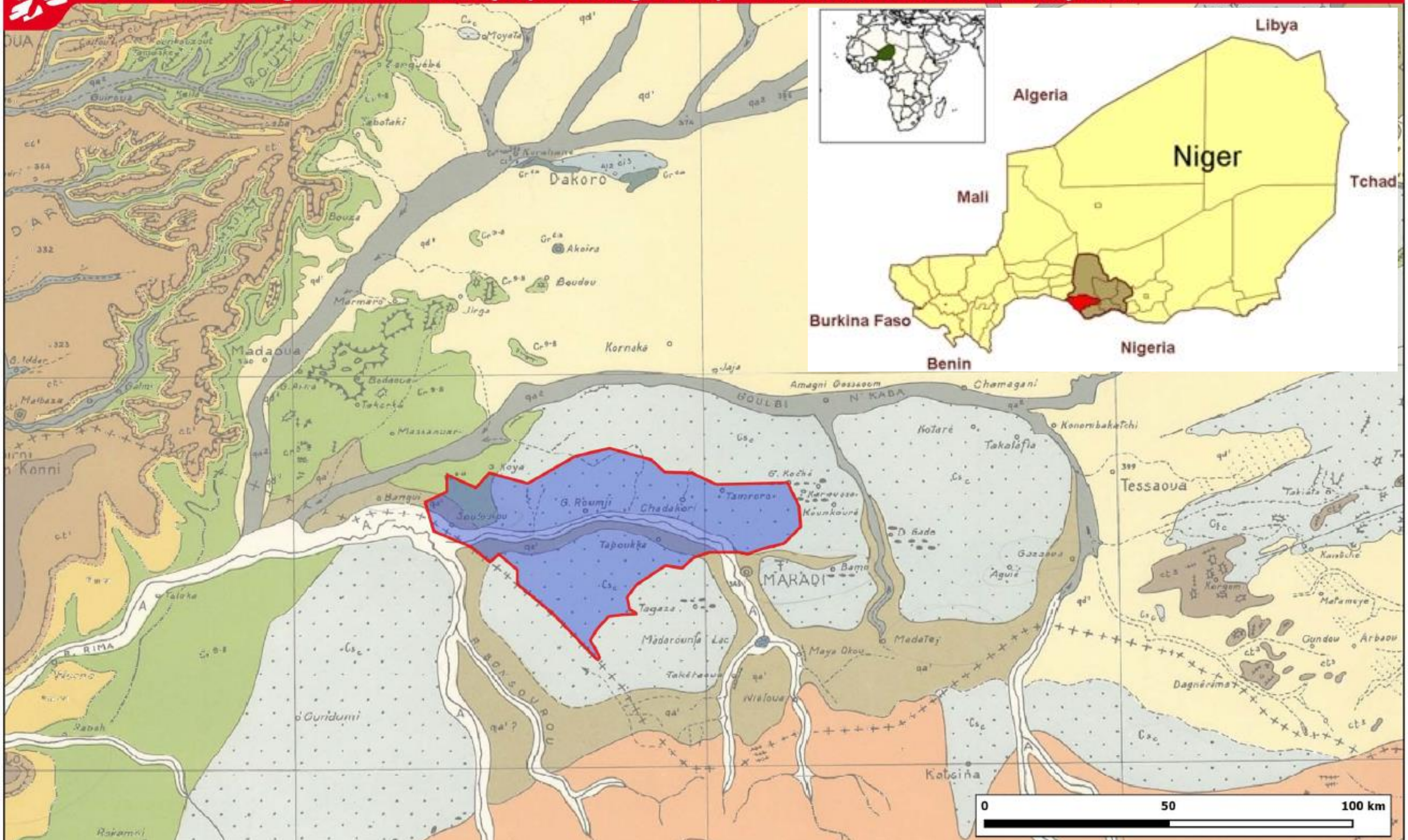
Presented by Mamadou ZONGO
Water, Hygiene & Sanitation Unit, MSF

Sustainable water availability is under pressure, in particular in developing countries

When **boreholes fail**, a common approach is to drill a new one – sometimes efficient but expensive.

$\Rightarrow$ **REFRESH**

NIGER - Maradi Region, Guidan Roumdji Dpt - Geological map of Lullimeden Pond Covert Study Area



Diagnosis Tools

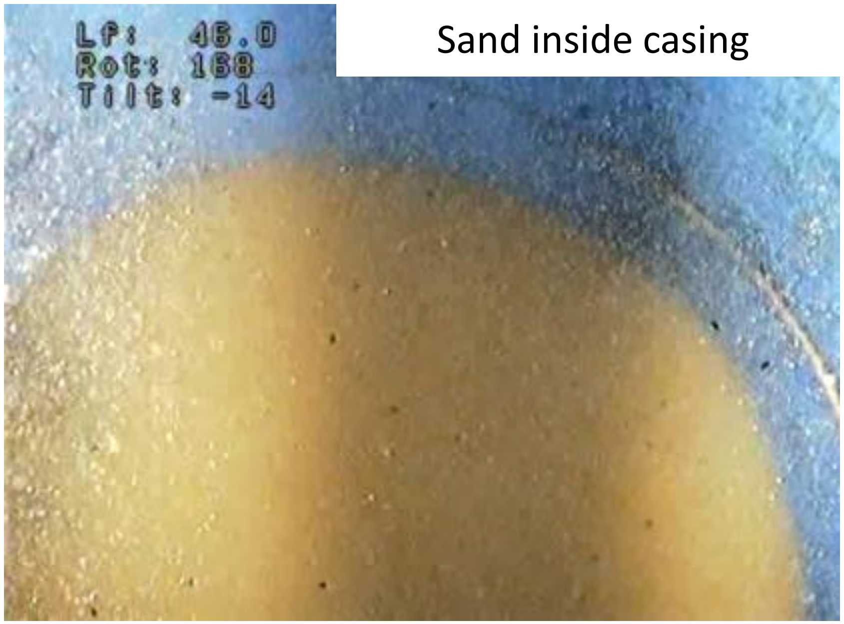
Sampling

Pumping test


XAHS

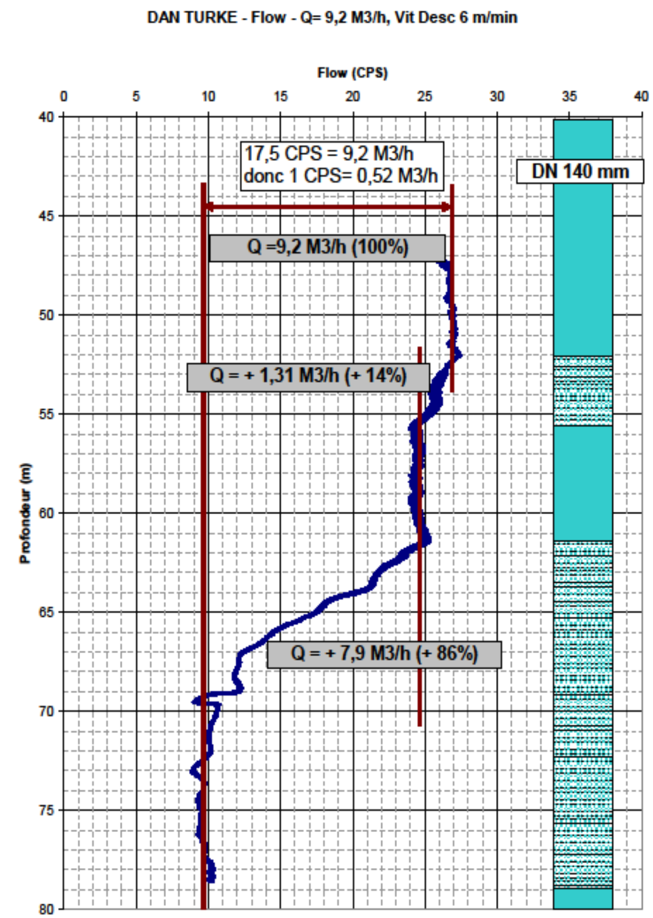
Information generated

Visual:



Sand inside casing

Physical:



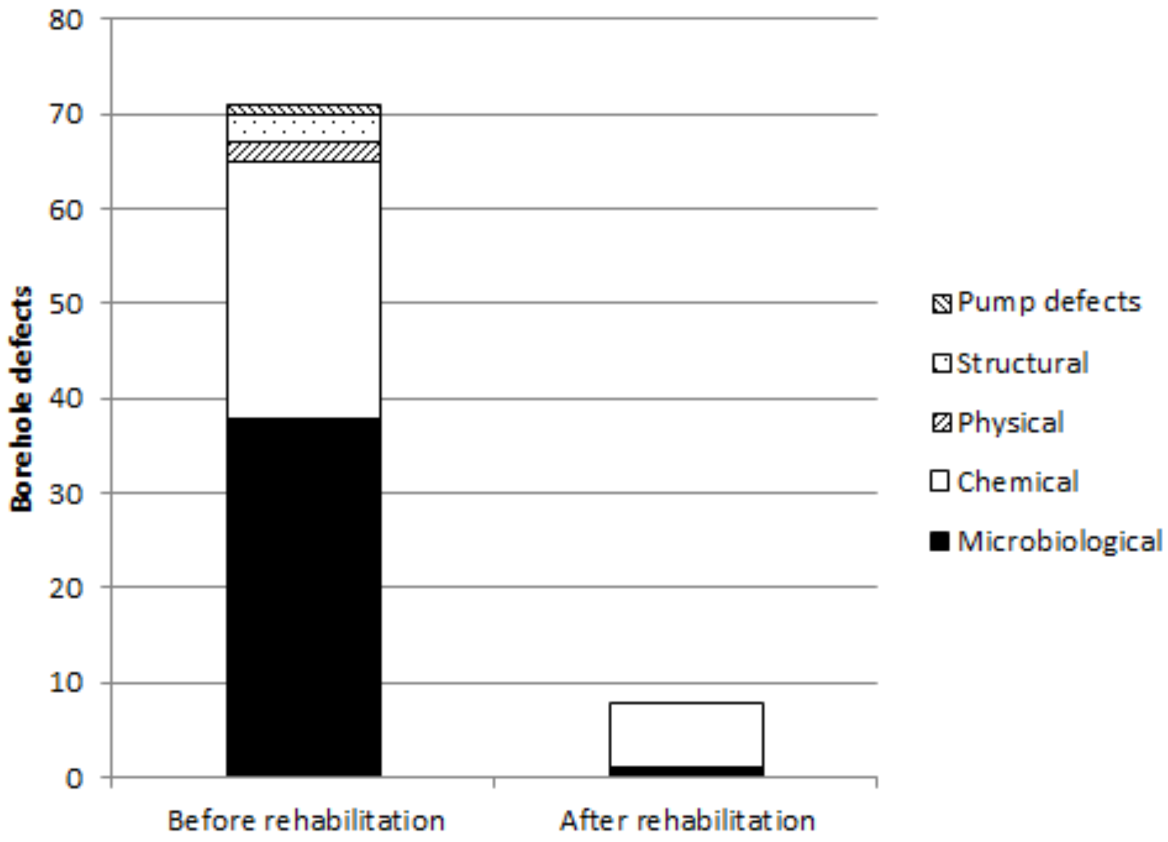
Microbiological/chemical:

Quantification of:

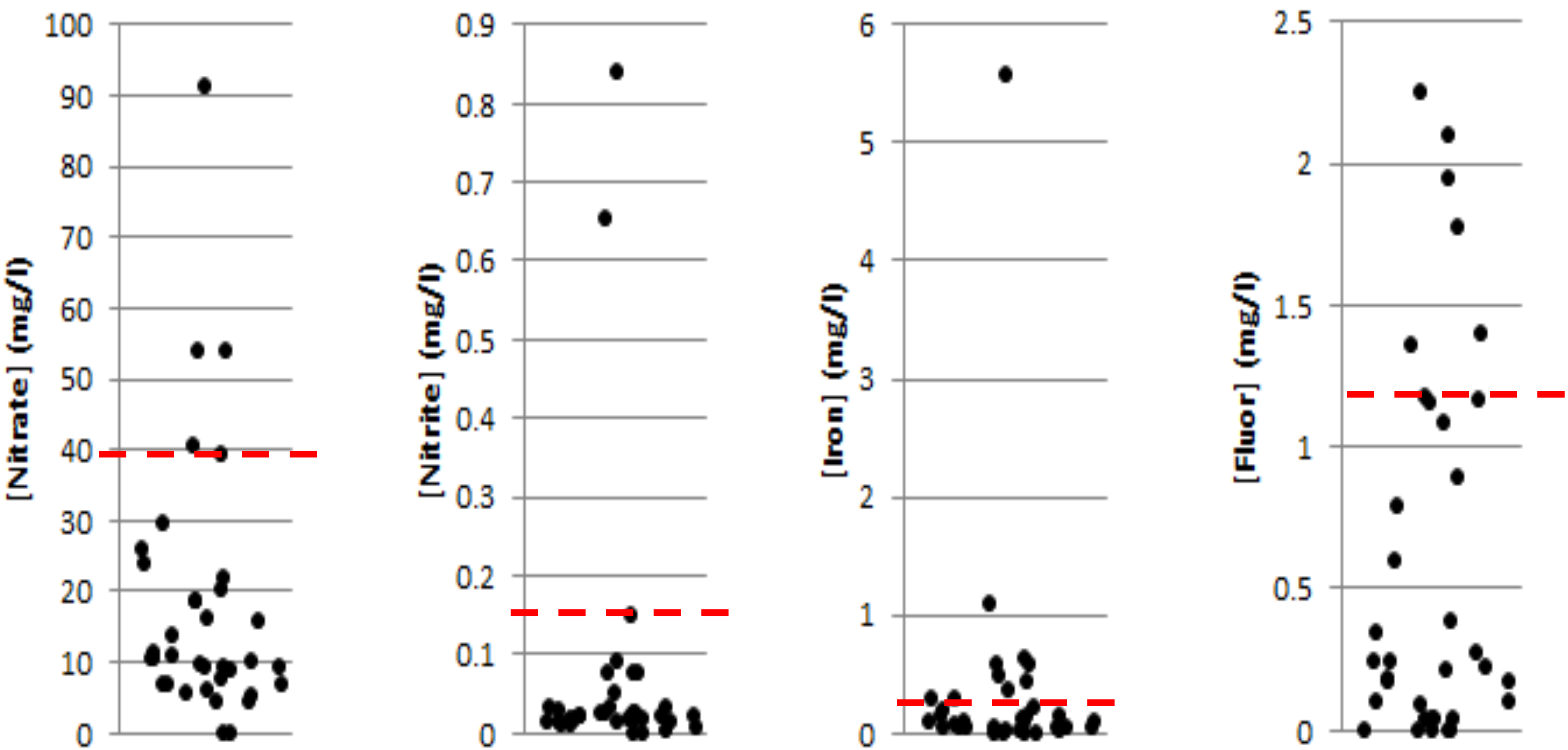
- **Bacteriological contamination** (fecal coliform, total coliform, worms, pseudomonas, …)
- **Chemical parameters** (Iron, Fluoride, Nitrate, etc.)

Findings and Rehabilitation

Out of the 50 diagnosed boreholes, 34 were in need of significant rehabilitation; 31 (91%) were finally rehabilitated:



Example of chemical parameters



Findings

stones in casing

Broken casing

Roots inside casing

Deposit inside casing

Rehabilitation

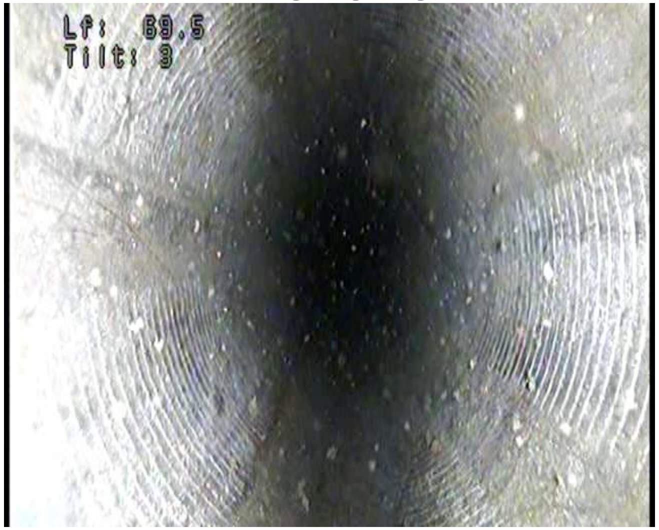
Chemical treatment

Scrubbing

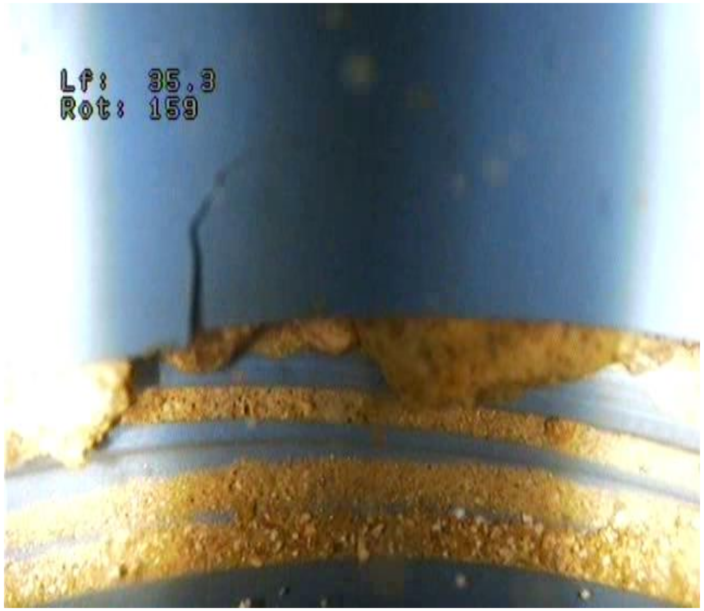
Rinsing & Flushing

Rehabilitation

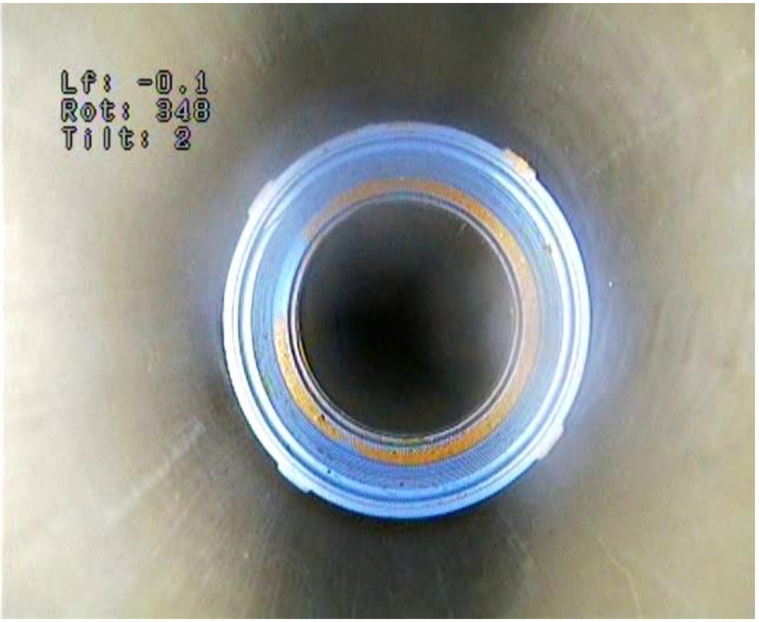
Before *After*



Before

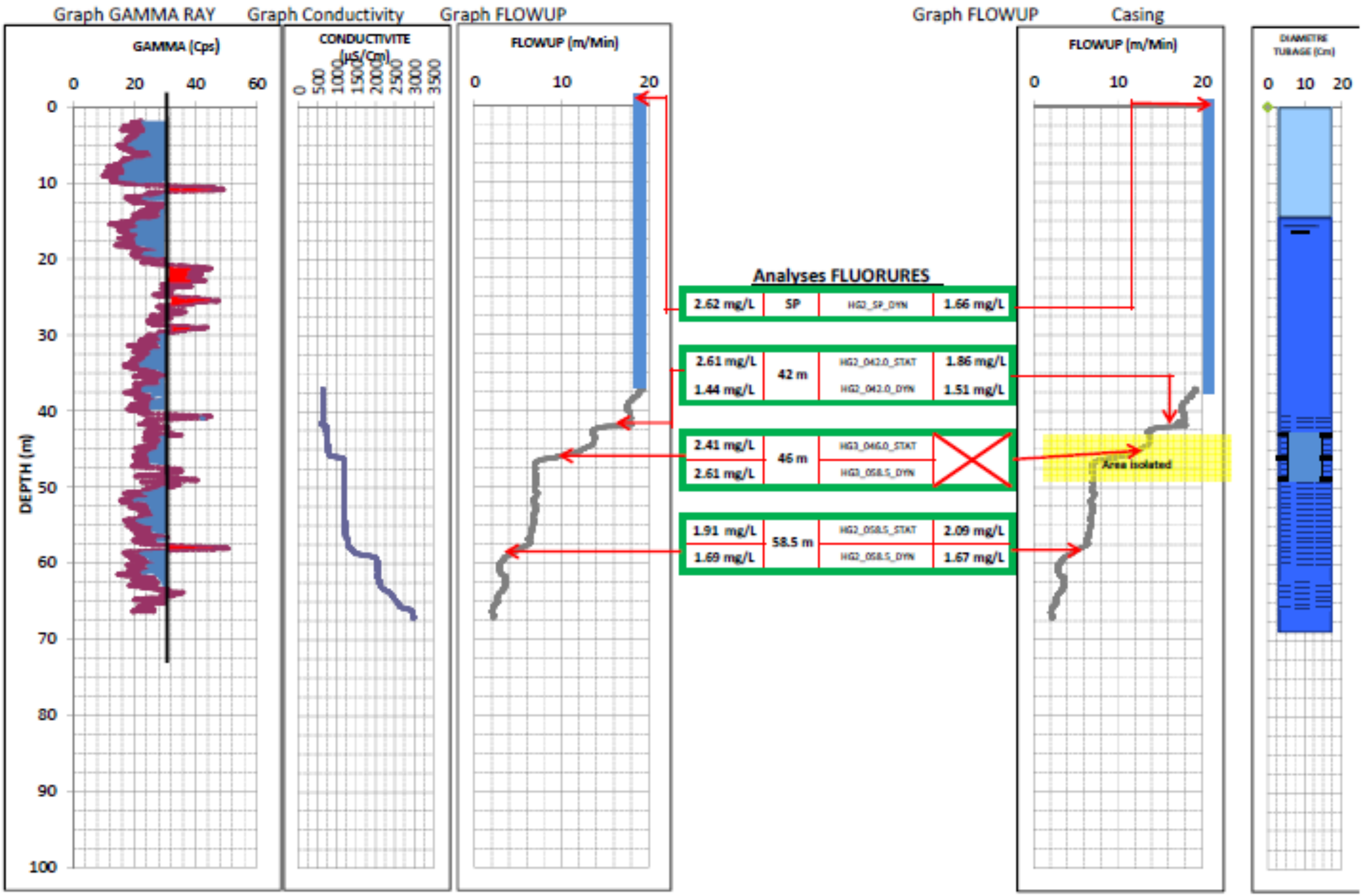


After



Case of fluoride

REDUCTION [FLUORIDE] OUT OF PUMPING AFTER PLUGGING WATER INLET: CASE OF HANNOU GA ZANE F2_IRH PEM 466877



Technique of this rehabilitation

Patching system to block the layer with high concentrations of fluoride

Estimation of the average cost of borehole diagnosis

N°	Item	Estimation ($ US)
1	Fuel and mobilization	500
2	Amortization of equipment	400
3	Human resource	200
4	Physical and bacteriological analysis	300
	Total	**1400**

The rehabilitation depends on diagnosis and context. The average cost is around 3000 usd.

Strengths

- **Rehabilitation rather than new drilling**: more cost-effective/sustainable
- **Allows diagnosis of hydrogeological context**: e.g. of fluoride in Maradi, with layer and distribution identified, allowing guidance for new boreholes
- Now also exists as **emergency camera kit** (hand carried 23 kg) for use in emergencies


40 m

Perspectives

- ***Ongoing***: borehole diagnosis and rehabilitation to prevent cholera and typhoid in districts of Harare, Zimbabwe
- ***In development***: full investigation and drilling kit
- ***Publication*** finalised and to be submitted to PLoS One
- Explore WASH sector interest in an external service provider as technical interface to ***share expertise with other NGO*** (www.interface-eau.com)

ACKNOWLEDGEMENTS REFRESH PROJECT

(alphabetic order)

Jean-Yves Nuttinck[1],

Mamadou Zongo[1-] presenter

Guy Faure[2],

Huggins Madondo[1],

Rafael Van den Bergh[1],

Peter Maes[1]

MSF Operational Centre Brussels (1)

Idées-Eaux, St Lupicin, France (2)

Emergency Bulk Chlorination in Cholera-affected areas in Dar es Salaam and Morogoro, Tanzania

Anu Rajasingham, Colleen Hardy, Thomas Handzel

Emergency Response and Recovery Branch

EEHF Forum

November 24, 2016

Background

- **Tanzania cholera outbreak detected in August 2015**
  - *Affected 22/25 mainland regions and Zanzibar*
  - *Specific wards in urban areas with high attack rates*

  - **22,791 cases** *and* **351 deaths** *(***CFR 1.5%***)*
    - *Dar es Salaam: > 5,000 cases (23% of cases)*
    - *Morogoro: 2,900 cases (>12 % of cases)*

Water Supplies/Sources

- **Municipal water utilities-in house pipe connections**
  - *~10% –Dar es Salaam*
  - *~20%- Morogoro*

- **Private water vendors (1,000-15,000 L plastic storage tanks)**
  - *Water source: water trucks, boreholes, piped from water utilities*
  - *Sell to community members in 20 L increments*

Chlorination Challenges

- *Inconsistent residual chlorine levels in piped system*
- *Low FRC levels detected in Vendor tanks and bowsers*
- *FRC Spot testing during peak outbreak:*
  - *Bowsers/water tankers: 47% (9/19) samples 0.0 mg/L*
  - *Piped network: 64% (21/33) samples 0.0 mg/L*
  - *Vendor tanks: 88.0% (234/266) samples 0.0 mg/L*

WASH Response

- **National Cholera Taskforce: Ministry of Health, Ministry of Water, WHO, UNICEF, CDC, TRCS**

1) *Advocacy to increase chlorine of municipal water utilities to recommended cholera outbreak levels*
2) *Strengthen water quality monitoring of the municipal distribution systems*
3) *Distribution of water purification tablets to households in cholera hotspots*
4) *Decommission and/or closure of shallow wells*
5) *On-going WASH social mobilization activities*

No steps taken to address the insufficient levels of chlorination in bulk drinking water supplies

Bulk Chlorination Project Objective

- *Improve community-level chlorination among water vendors in targeted cholera affected areas*
  - *Dar es Salaam 15 highly affected wards*
  - *Morogoro 8 highly affected wards*
  - *Zanzibar 2 highly affected shehias*

Aquatabs

- **8.68 g Sodium dichloroisocyanurate (NaDCC) tablets**
  - *Provides 5,000 mg of available chlorine*
- **Dosage:**
  - *Aimed at 1.0 to 1.5 mg/l*
    - *Due to low levels of chlorine in piped system did not want to overdose tanks*
  - *Pilot testing results indicated 0.7-1.0 mg/l after 30 minutes of storage*
- **Instructions:**
  - *Leave tablet for 30 minutes before drinking*

Implementation Activities and Timeline

Pilot
Feb-Mar '16

- *Piloted tablet distribution with 25 Vendors*

Mapping
Apr-May '16

- *Mapped vendors*
- *Enrolled and trained*

Tablet Distribution
May-Jun '16

- *Distributed initial supply of chlorine tablets*

Routine Monitoring
May-Sept '16

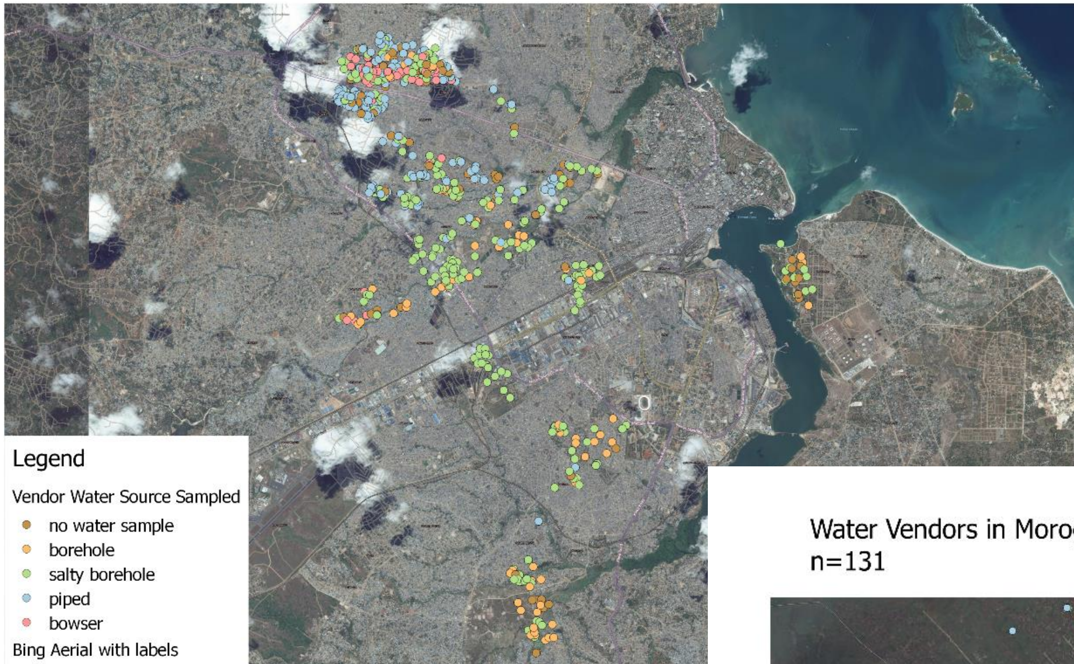
- *FRC testing & tab distribution*
- *On-going review-corrective actions*

Evaluation
22 Sept-15 Oct '16

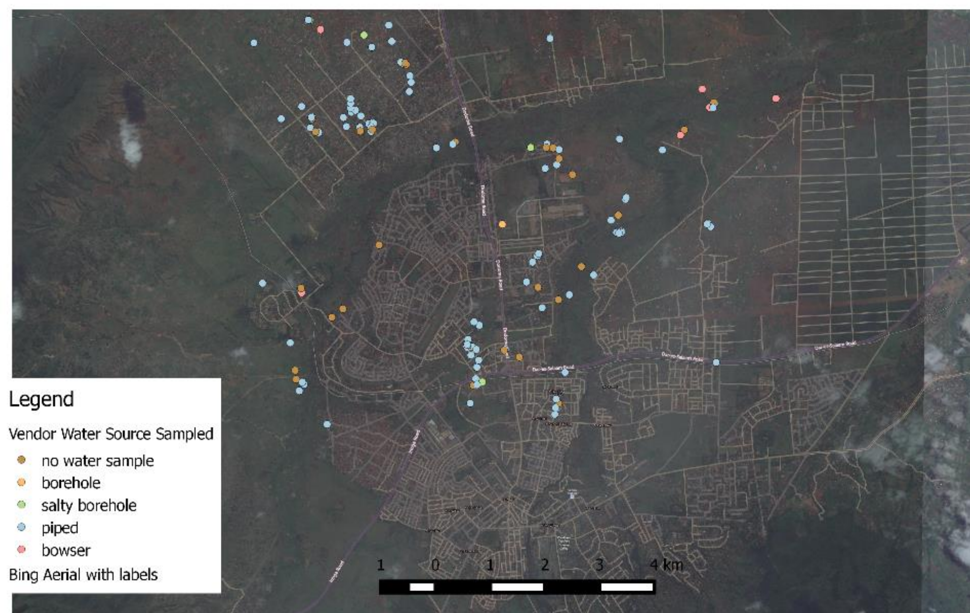
Evaluation Methods

- **Vendor Survey** *(Dar es Salaam and Morogoro)*
  - *Sampling frame: Census-All mapped vendors (897) + any new vendors*
    - *Brief interview with all vendors visited + spot test*
    - *Longer interview with every other vendor visited + spot test*
- **11 Focus Group Discussions**
  - *Compliant vendors, non-compliant vendors, water customers, ward environmental health officers*

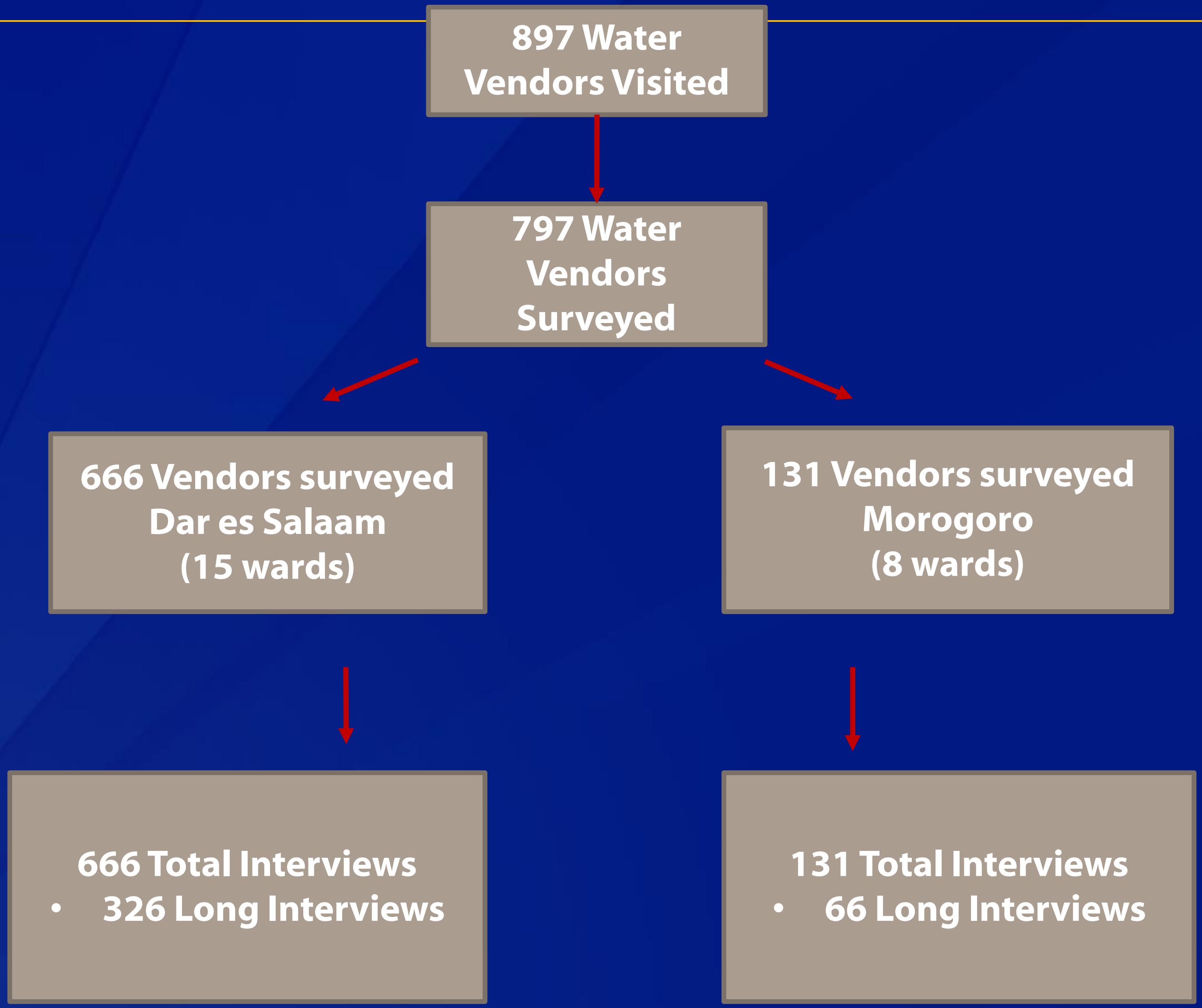
Water Vendors in Dar es Salaam, by water source
n=666



Water Vendors in Morogoro by Water Source Sampled
n=131



Results


897 Water Vendors Visited
797 Water Vendors Surveyed
666 Vendors surveyed Dar es Salaam (15 wards)
131 Vendors surveyed Morogoro (8 wards)
666 Total Interviews
• 326 Long Interviews
131 Total Interviews
• 66 Long Interviews

Water Vendor Tanks
Morogoro and Dar es Salaam

Tank Variables	**Tank Tested (n=698)**
Median Tank Volume	*5000L* *Range (750-50,000)*
Sold as Drinking Water	*76.2% (532)*
Water Source	*38.4% Salty boreholes (268)* *36.7% Piped (256)* *12.5% Borehole (87)* *11.9% Bowser (83)*
Elevated Tank	*51.2% (367)*

Chlorine Residuals Vendor Survey

- *67.7% reported treating*
- *Mean storage time since treatment: 2.5 days*

Free Chlorine Residual (FRC)	Frequency N=493*	% (n/N)
0 mg/L	*88*	*17.8 %*
0.1-0.5 mg/L	*320*	*64.9 %*
>0.5-2.0 mg/L	*80*	*16.2 %*
> 2.0 mg/L	*5*	*1.0 %*

Univariate Associations

Factors associated with increased odds of detecting FRC ≥ 0.2 mg/l

Variable	Odds Ratio	Confidence Interval	P-value
Bowser Water	*1.86*	*1.11 - 3.12*	*0.02*
Piped Water	*1.83*	*1.29 - 2.59*	*<0.001*
Water sold as drinking water	*2.76*	*1.78 - 4.39*	*<0.001*
Vendor reported treating water	*4.75*	*2.97 - 7.85*	*<0.001*
Vendor received training	*5.51*	*1.68 - 28.68*	*0.002*
Received tablets ≥3 times	*1.79*	*1.24 - 2.58*	*0.002*
Received ≥3 monitoring visits	*1.97*	*1.13 - 3.50*	*0.01*

Univariate Associations

- *Factors associated with decreased odds of detecting FRC ≥ 0.2 mg/L*

Variable	Odds Ratio	Confidence Interval	P-value
Elevated Tank	*0.65*	*0.46 - 0.91*	*0.01*
Tank in Sunlight	*0.49*	*0.24 - 0.99*	*0.04*
Borehole Water	*0.56*	*0.32 - 0.96*	*0.03*
Salty Borehole Water	*0.56*	*0.39 - 0.80*	*0.001*
Treated >24 hours ago	*0.33*	*0.20 - 0.52*	*<0.001*

Conclusions

- *High and consistent use of NaDCC tablets*
  - *2/3 of vendors reporting treating their water*
  - *82% of tanks tested positive for FRC*
- *Elevated tanks- barrier to treatment*
- *Lengthy storage times resulted in lower FRC levels*
- *Ward Health Officers engagement increased compliance*
- *Novel community level approach to bulk secondary chlorination*

Next Steps

- **Social Marketing**
  - *Social mobilization activities targeting vendors and community promoting NaDCC tablets use and importance of drinking treated water*
  - *Establish distribution points/market place sales*
  - *Implement cost recovery*

- **Program Expansion**
  - *New wards in current implementation districts*
  - *New wards in new districts*
  - *Institutional settings.*
    - *Healthcare facilities*
    - *Schools*

Acknowledgements

- *Regional, District, and Ward environmental health officers in Morogoro and Dar es Salaam*
- *MOHCDGEC of Tanzania*
- *Stanislaus Kamwaga, UNICEF Tanzania*
- *Kiwe Sebunya, UNICEF Tanzania*
- *Rachel Eidex, CDC Tanzania*
- *Peter Mmbuji, CDC Tanzania*
- *UNICEF Tanzania*
- *CDC Tanzania*

For more information please contact Centers for Disease Control and Prevention

1600 Clifton Road NE, Atlanta, GA 30333
Telephone, 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348
E-mail: cdcinfo@cdc.gov   Web: www.cdc.gov

Optional Slides

Chlorine Residuals Vendor Survey

- *67.7% reported treatment*
  - *FCR Range: (0 mg/L – 3.4 mg/L)*

- *Storage time since treatment: 2.5 days*

Free Chlorine Residual (FCR)	Frequency N=493*	% (n/N)
0 mg/L	*88*	*17.9 %*
0.1-0.5 mg/L	*185*	*37.6 %*
0.2-0.5 mg/L	*133*	*27.0 %*
>0.5 mg/L	*84*	*17.0 %*

Vendor Acceptability

Liked about Tabs n=392		**Disliked about Tabs** n=392	
Makes Water Safe	*80.4%*	*Do Not Dislike*	*45.7%*
Ease of Use	*16.3%*	*Smell of Water*	*29.1%*
Tablets Work Well	*15.8%*	*Taste of Water*	*11.0%*
Taste of Water	*12.2%*	*Elevated Tanks-Difficult Tx*	*6.1%*
No cost	*7.7%*	*Difficulty of Adding Tabs*	*5.4%*
Did not like	*0.3%*	*Difficulty Getting More Tabs*	*5.4%*

Limitations -Implementation

- **Vendor loss:** *after program initiation, some vendors moved or stopped selling water from tanks*

- **Range in ward health officer vendor coverage**
  - *Responsible for monitoring anywhere between 12-152 vendors*

- **Emergency intervention**
  - *Targeted vendors*
  - *No customer focus to increase demand and awareness.*
  - *Customer education was not prioritized*
  - *No social mobilization activities*

Overview

- Background
- Methods
- Results
- Conclusions
- Next steps

Vendor Survey

- **Sales: 81.2% - reported selling water in the last week**
  - *65.9% sold from 1 tank*
  - *24.7% sold from 2 tanks*
  - *9.6% sold from 3 or more tanks*
- **Reasons for joining the Chlorine tablet program:**
  - *58.3% wanted to sell safe water*
  - *57.1% to prevent disease*
  - *27.2% asked to attend an orientation*
  - *7.0% thought it was mandatory*

Team and Roles

- **MOHCDGEC:** *Selected districts and wards, identified environmental health officers as water quality monitors and overall direction*

- **UNICEF:** *Purchased and distributed NaDCC tablets, trained ward officers, and project management*

- **CDC Division of Global Health Protection:** *Developed assessment and monitoring tools, led initial training and provided final evaluation guidance*

How do we monitor the effectiveness and appropriateness of innovative approaches in humanitarian WASH?

A case study from Rakhine State, Myanmar

Tom Wildman
Senior WASH Advisor for Asia
Oxfam GB

Melissa Opryszko
Global WASH Advisor
USAID/OFDA

OXFAM


Ceramic Water Filter
မိသားစုတိုင်း
ကျန်းမာဖို့
မြေရေစစ်အိုး
ကို သုံးကြစို့
Aye Thant အေးသန့်

By the Numbers…

Month	>10 FCU	>50 FCU	>100 FCU
Aug '14	73%	60%	55%
Sept '14	76%	56%	43%
Oct '14	56%	41%	21%
Nov '14	50%	39%	20%

Source: DFID consortium water quality monitoring report

OFDA & New Approaches

"Must follow "best-practices" to ensure that emergency activities are rapid, effective, meet objectives, and address critical public health risks associated with poor environmental health conditions." *-OFDA Grant Guidelines*

- **Review existing evidence base**
- **Provide justification for new approach**
- **M & E to build evidence of effectiveness**

OXFAM

Rationale for Evaluation

- **Surface water + open defecation + rains = High risk to displaced population**
- **Poor access in Rakhine**
- **Evidence of effectiveness lacking**
  - FGDs found people liked getting the filters
  - Previous studies found problems: post-contamination, low flow rates, breakage

OXFAM

Effectiveness within Households

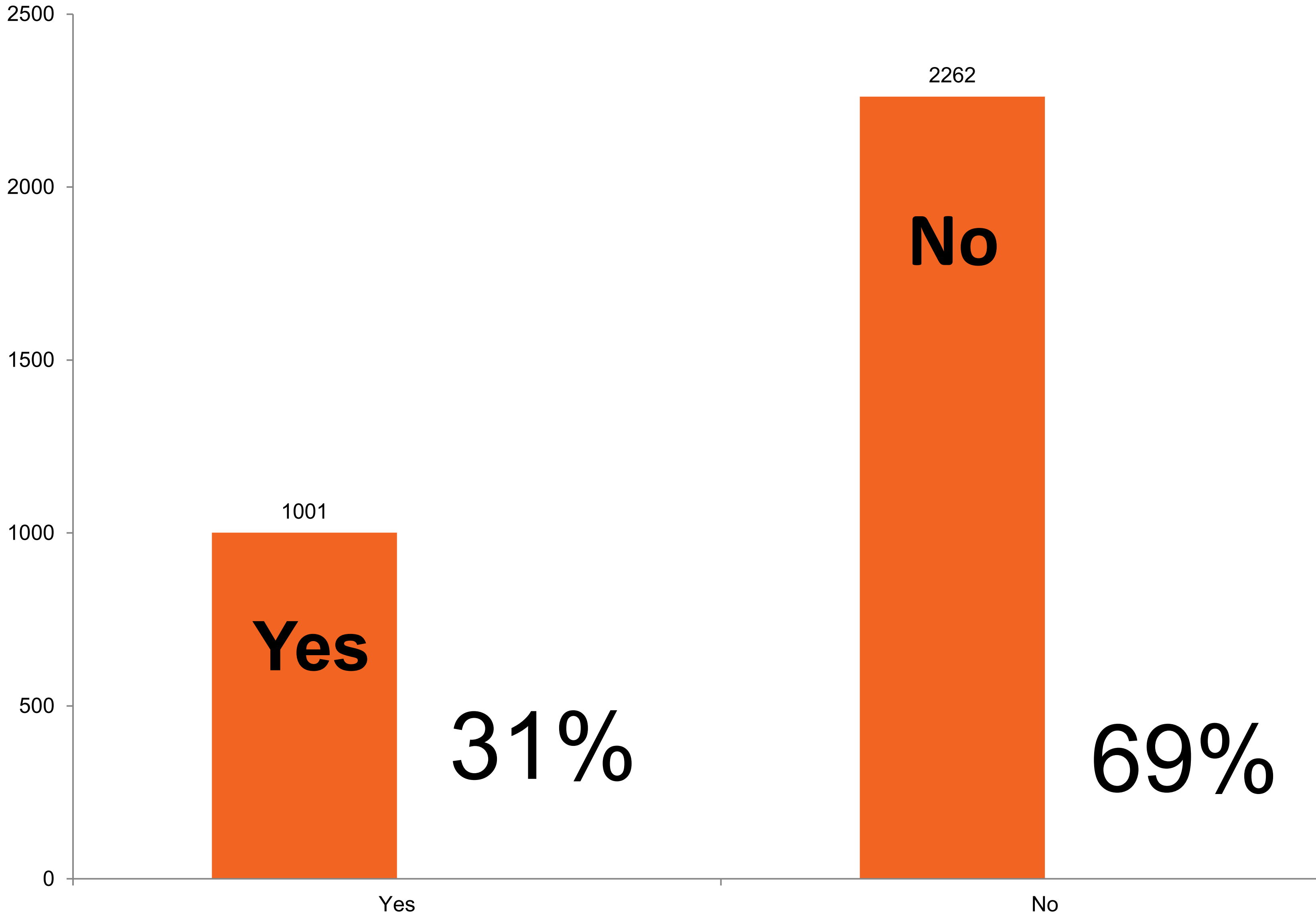
- **Lifespan of technology**
  - 62% using CWF
  - Filters last 13 months on average
- **Effect on water quality**
  - 31% improved
  - 28% decreased quality *after* filtering
- **Choosing appropriate evaluation population**
  - Study: 90% of households using boreholes and conducted in dry season
  - Water quantity (l/p/d) important but not included

OXFAM

Month	>10 FCU	>50 FCU	>100 FCU
Aug 2014	**73%**	**60%**	**55%**
Sept 2014	**76%**	**56%**	**43%**
Oct 2014	**56%**	**41%**	**21%**
Nov 2014	**50%**	**39%**	**20%**
Dec 2014	**43%**	**25%**	**20%**
Jan 2015	**49%**	**22%**	**15%**
Feb 2015	**42%**	**19%**	**11%**
March 2015	**36%**	**22%**	**15%**
April 2015	**67%**	**46%**	**36%**
May 2015	**58%**	**40%**	**33%**
June 2015	**54%**	**42%**	**31%**
July 2015	**60%**	**41%**	**29%**
Aug 2015	**69%**	**39%**	**26%**
Sept 2015	**60%**	**40%**	**30%**
Oct 2015	**56%**	**38%**	**28%**

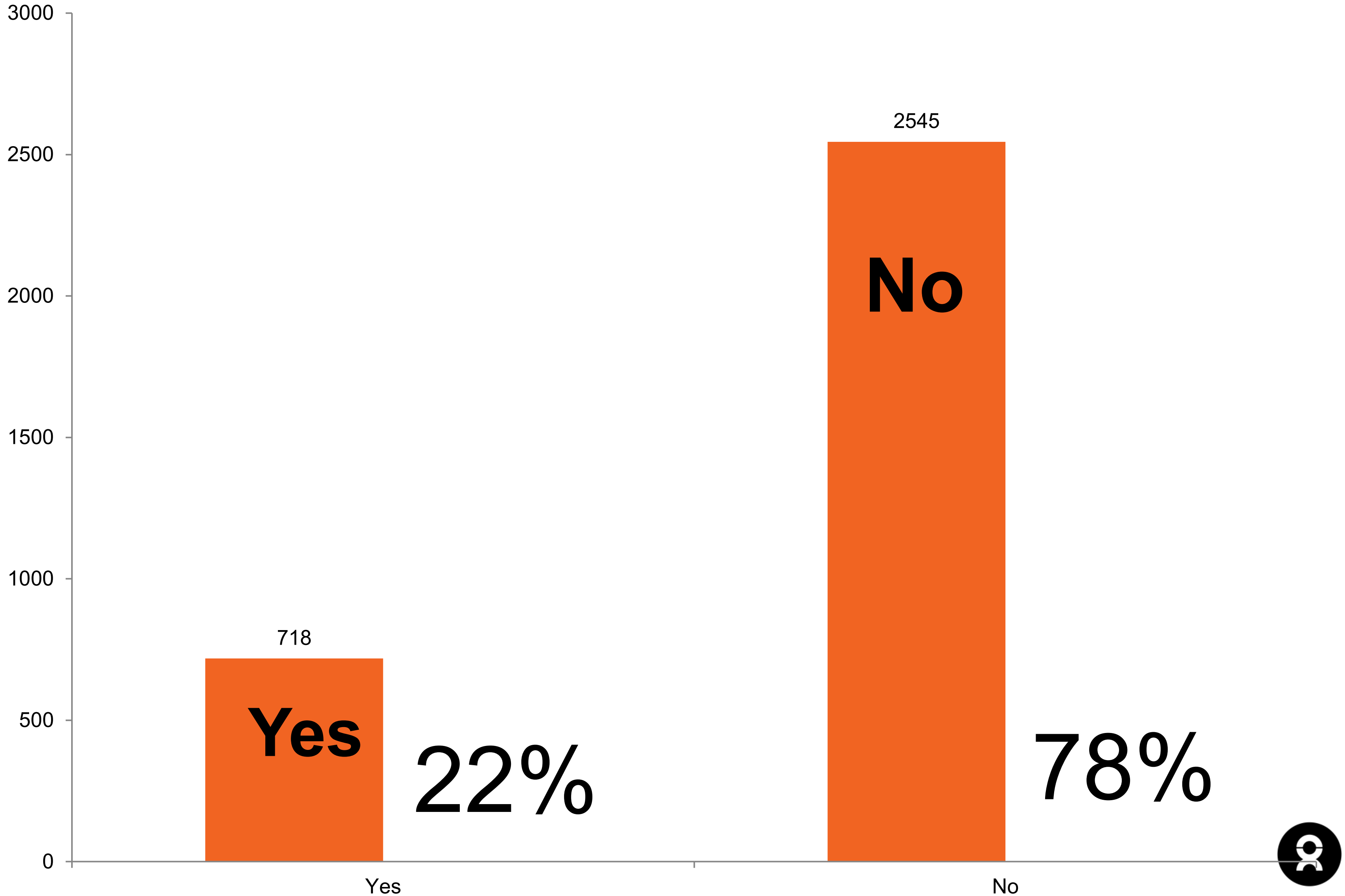
OXFAM

Is the CFW present in HH?



OXFAM

Is the HH using the CWF?



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Training

Evolving process

Must be constantly monitored & adapted

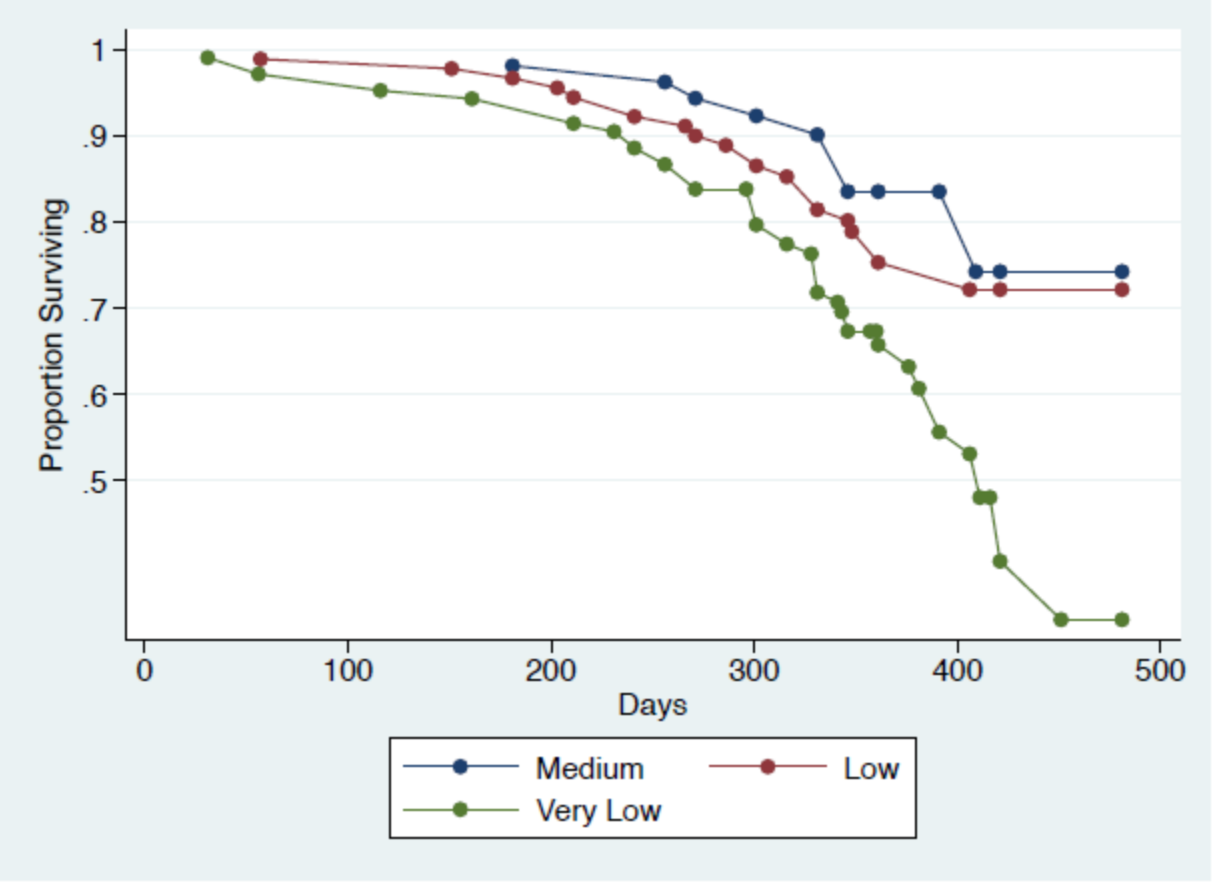


Figure 12 – Proportion of CWFs remaining in use over time since distribution by highest completed education level in the household

Sustainability

- High breakage rates – how to replace?
- Time frame of response?

OXFAM

Recommendations for M&E of New Approaches

- Standardized M&E
- HH level M&E….FGDs alone are insufficient
- 95% confidence level & random sampling
- Qualitative + Quantitative

- Contingency plans…what now?

OXFAM

From Data to Decision -

Monitoring Water Supply

From Data to Decision - Introduction

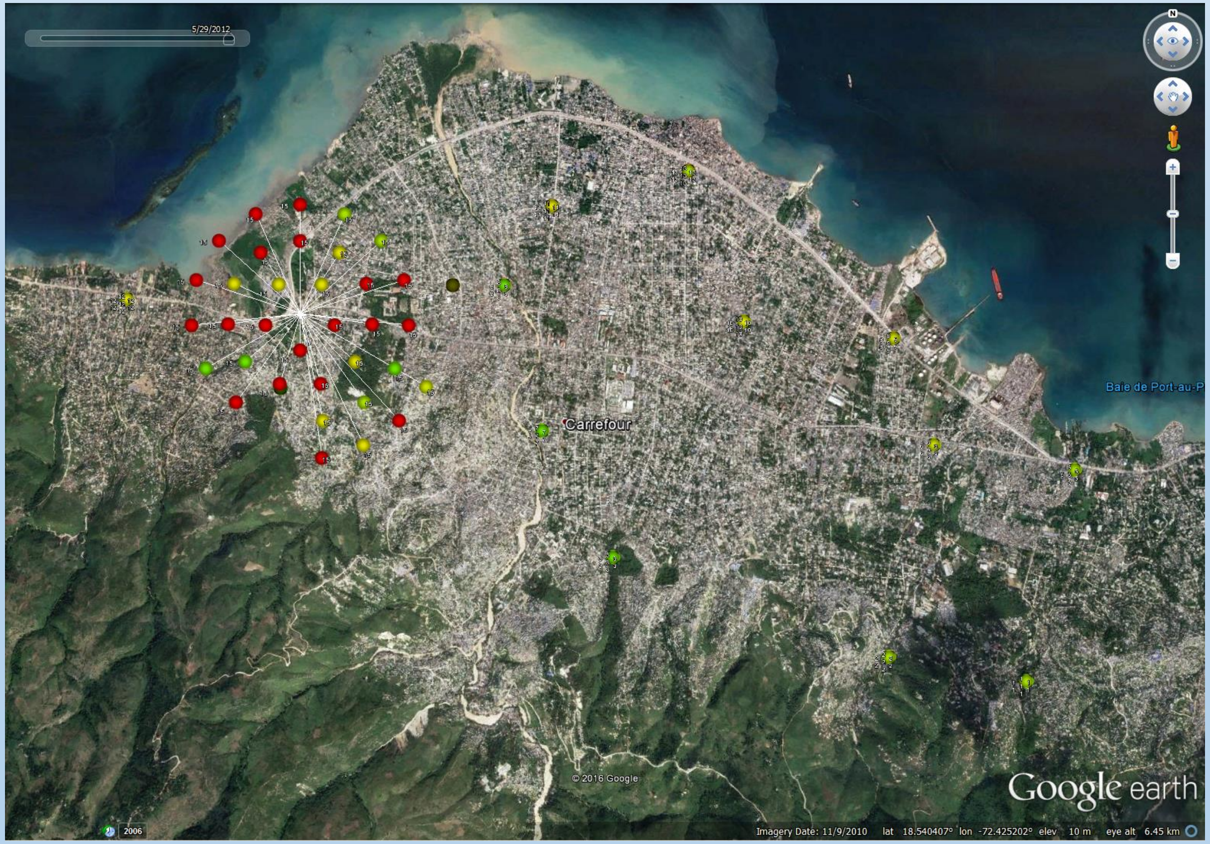
Monitoring of Free Residual Chlorine (FRC) in emergency and other interventions is often our best proxy indicator for the micro-biological quality of water.

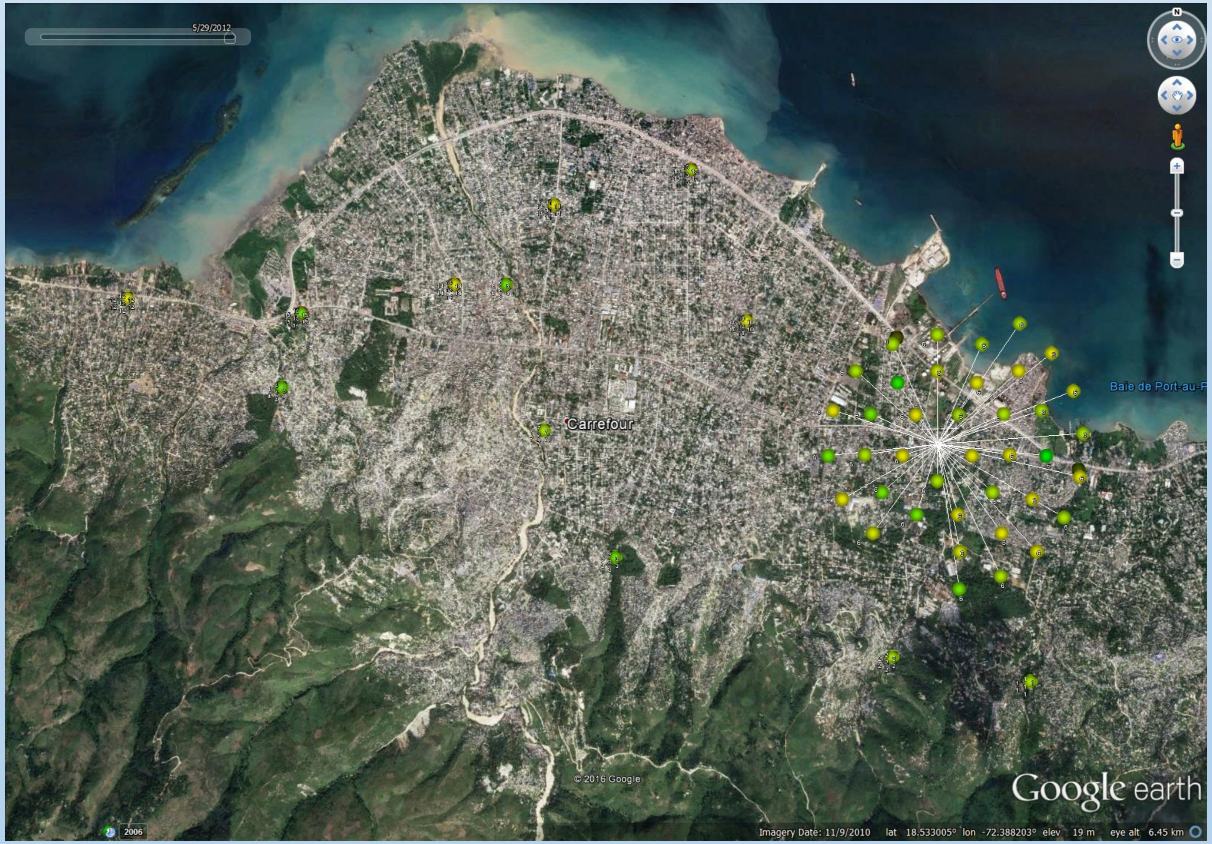
MSF, as with many other organisations, routinely measures FRC in the field during interventions and particularly during outbreak interventions and when intervening with displaced populations.

In the past (and still in many locations) measurements were made using a PoolTester, results noted down on a form and then transcribed later to a data sheet.

It has taken some time to try and resolve some of the problems inherent to this approach and finally see a way to get to a position of better decision making.

Haiti Cholera Outbreak – 2010 onwards





Manual FRC measurements entered in spreadsheet. Tool developed by Google (JoeKit) which could better represent this data – easy manipulation including creation of animated time-series .kmz files for opening with Google Earth.

From Data to Decision – EEHF Presentation, Matt Arnold, MSF. November 2016.

Haiti Cholera Outbreak – 2010 onwards

Figure 1: The chlorine dispenser.

Source: MSF-OCA, 2013.

UPTAKE OF CHLORINE DISPENSERS IN CARREFOUR,

PORT AU PRINCE, HAITI,

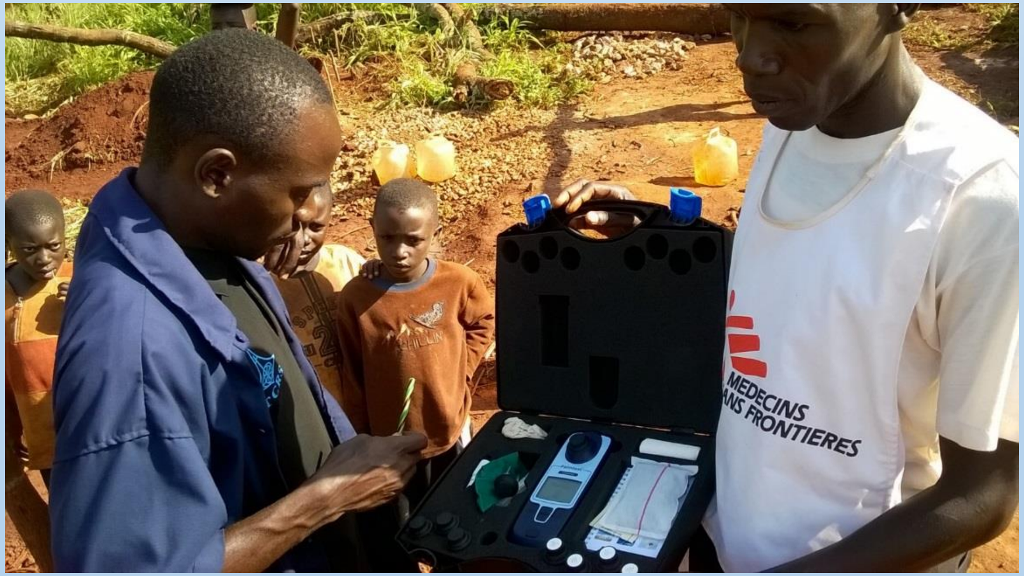
OCTOBER-DECEMBER 2013

MEDECINS SANS FRONTIERES
DOCTORS WITHOUT BORDERS

Report by:

Konstantinos Koutentakis, European Programme for Intervention Epidemiology Training (EPIET) and National Centre for Epidemiology, Instituto de Salud Publica Carlos III, Spain
Enold Thelemaque, Outreach Supervisor, MSF-OCA, Port Au Prince, Haiti
Daniel Collot, Water and Sanitation Supervisor, MSF-OCA, Port-au-Prince, Haiti
Lindsay Bryson, Medical Coordinator, MSF-OCA, Port-au-Prince, Haiti
Judy-Fay Ferron, Water Sanitation expert, MSF-OCA, Port-au-Prince, Haiti
Biserka Pop-Stefanija, WatSan Advisor, MSF-OCA, Amsterdam, The Netherlands
Jean-Francois Fesselet, WatSan Unit Coordinator, MSF-OCA, Amsterdam, The Netherlands
Annick Lenglet, Epidemiology Advisor, MSF-OCA, Amsterdam, The Netherlands

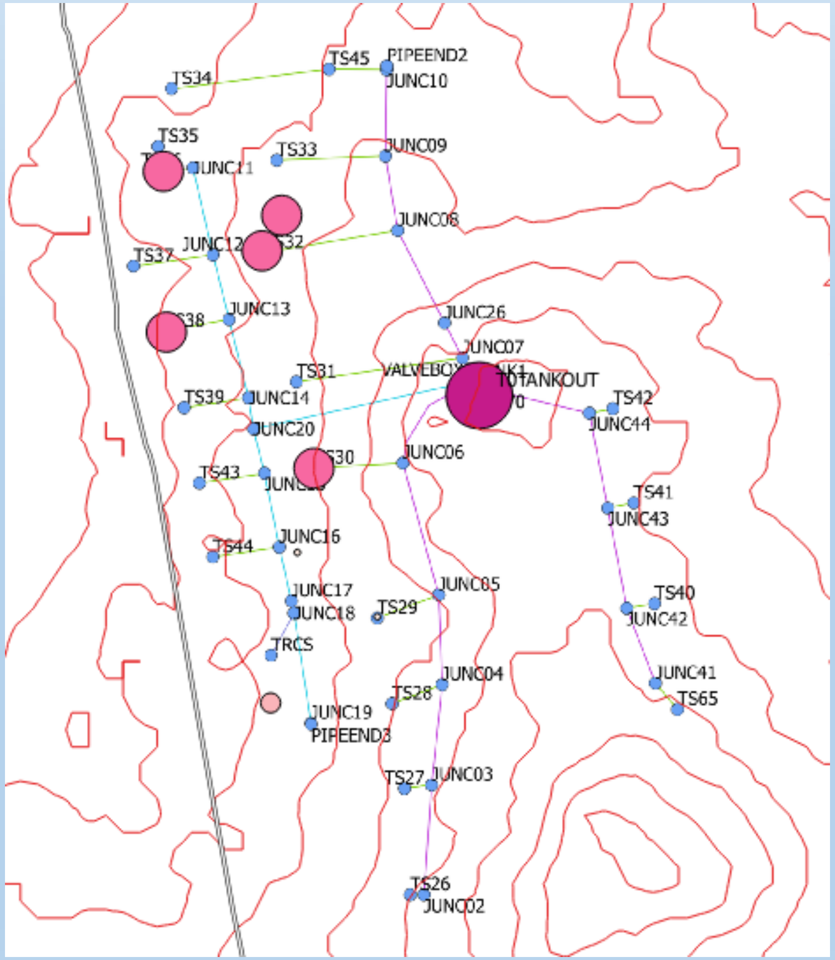
Mtendeli Refugee Camp - Tanzania

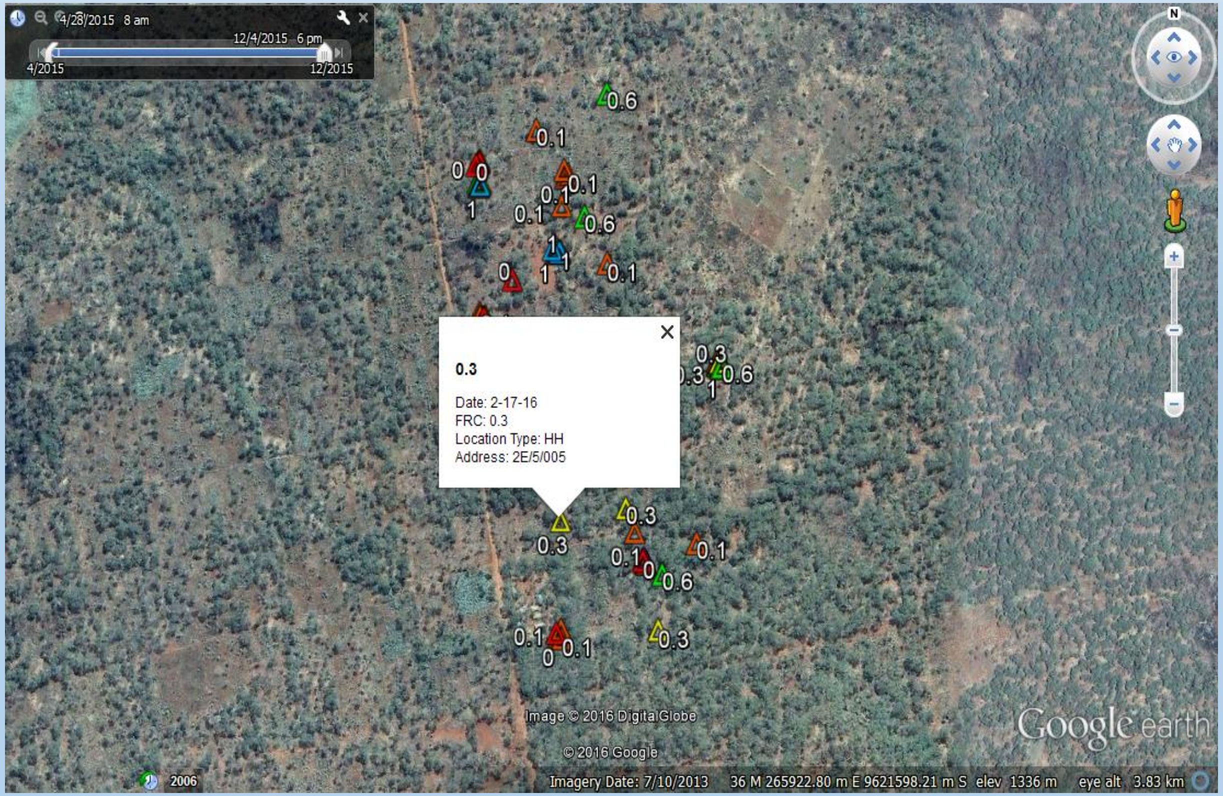


Over 3,000 manual measurements at tap stand and HH level using an Open Data Kit

FRC, turbidity and observational records helped to ensure correct chlorination of water supply and reporting to UNHCR.

Mtendeli Data Collection – Data Output





Sever output in .csv file and manual manipulation to create maps or carry out analysis.

From Data to Decision – EEHF Presentation, Matt Arnold, MSF. November 2016.

Mtendeli Data Collection – Operational Decisions

From the borehole……………………………….to the doser……………………….to the tap stand.

Mtendeli Data Collection – FRC Study

Table 1 | Probability that household water safety was achieved for different tapstand FRC target ranges at Mtendeli.

	~18 hours post-distribution			~24 hours post-distribution		
Tapstand FRC	**Pass**	**Fail**	**Pass Probability**	**Pass**	**Fail**	**Pass Probability**
0.2 - 0.5 mg/L	13	3	**81**	2	3	**40**
0.6 - 0.8 mg/L	15	6	**71**	22	9	**71**
0.8 - 1.0 mg/L	17	1	**94**	5	0	**100**

Data was also used as preliminary evaluation of the water treatment prior to conducting the latest round of the ongoing FRC study, presented previously at the EEHF by Syed Imran Ali.

The Future – Digital Measurement and Data Logging

WHY – WHAT ARE THE PROBLEMS WITH THE WAY THINGS ARE DONE AT THE MOMENT?

- Subjective aspect of using colorimetric devices is often problematic
- Manual data entry often leads to errors
- Carrying a testing device, a GPS and a data entry form complicates field work
- Integration of measurement, data management and mapping ensures data can be used rather than just end up on paper

The Future – Digital Measurement, Data Logging and Display

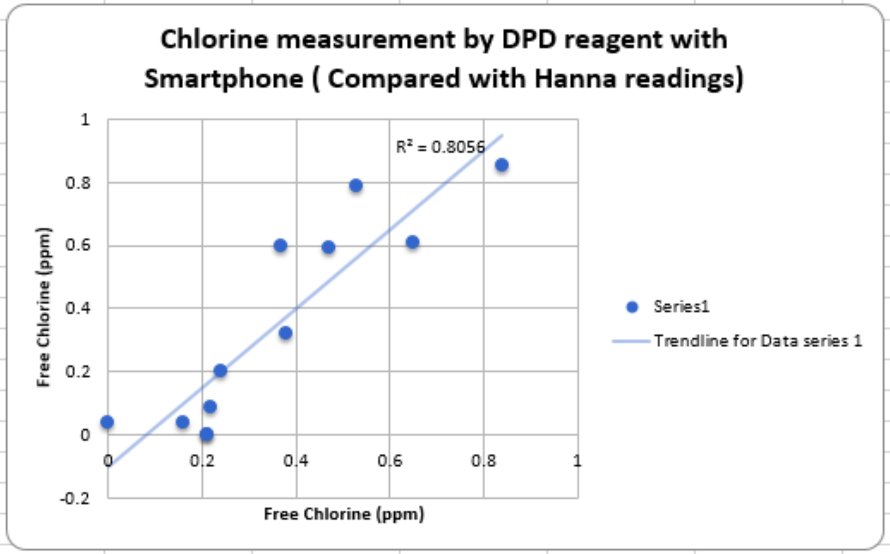
WITH WHAT?

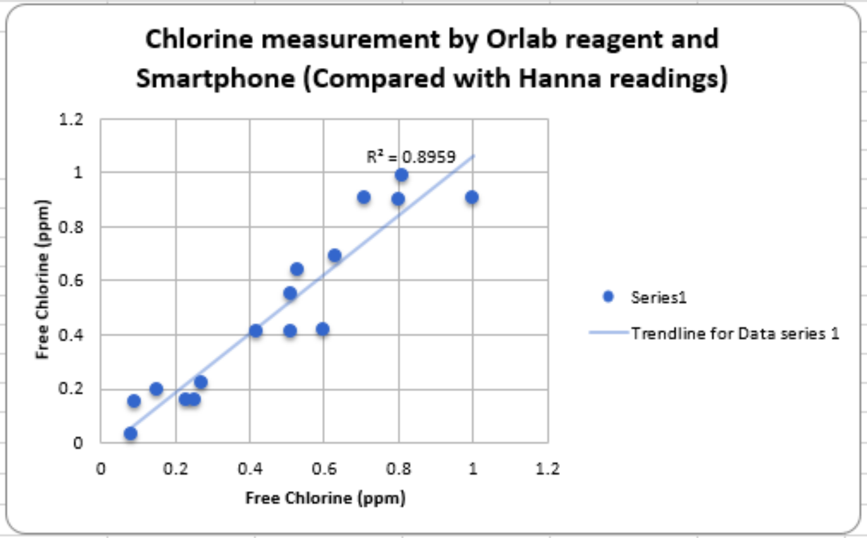
AKVO Caddisfly hardware and software offers the possibility to integrate all aspects of data measurement, management and mapping.

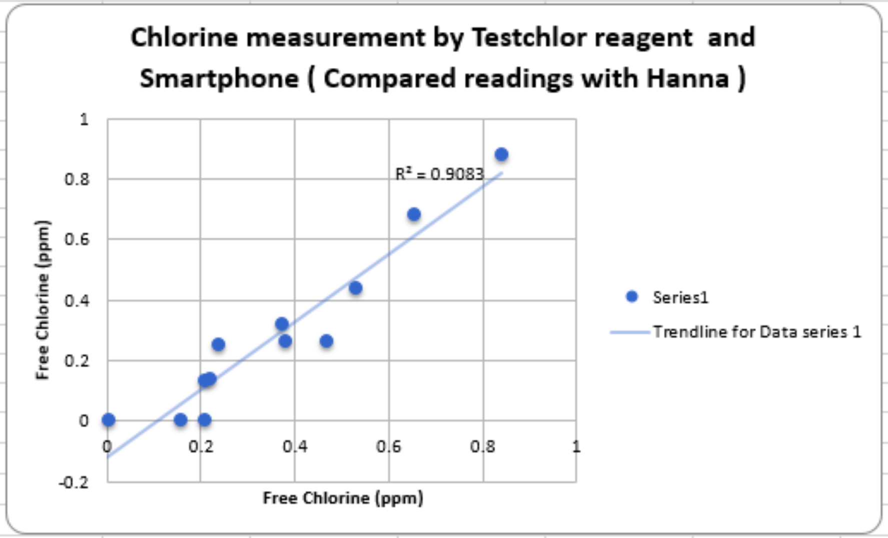
This will lead to more effective use of data in the field………………

Testing Reagent Options

Reagent	Range of free chlorine measurement (ppm)	Availabilty	Advantages	Disadvantages	R^2
DPD reagent (Supplied by Doctors without borders) :	0-3	Tablet form	Easy to use and transport.Available in Market	Forming slight turbidity when mixed with chlorine standards	0.806
TestChlor reagent :	0-1 ppm	Liquid	Easy to use.Available in Market	Limited range of measurement	0.908
Orlab reagent:	0-3 ppm	Powder in small packets	Easy to use and transport and gave accurate readings.Available in Market		0.896

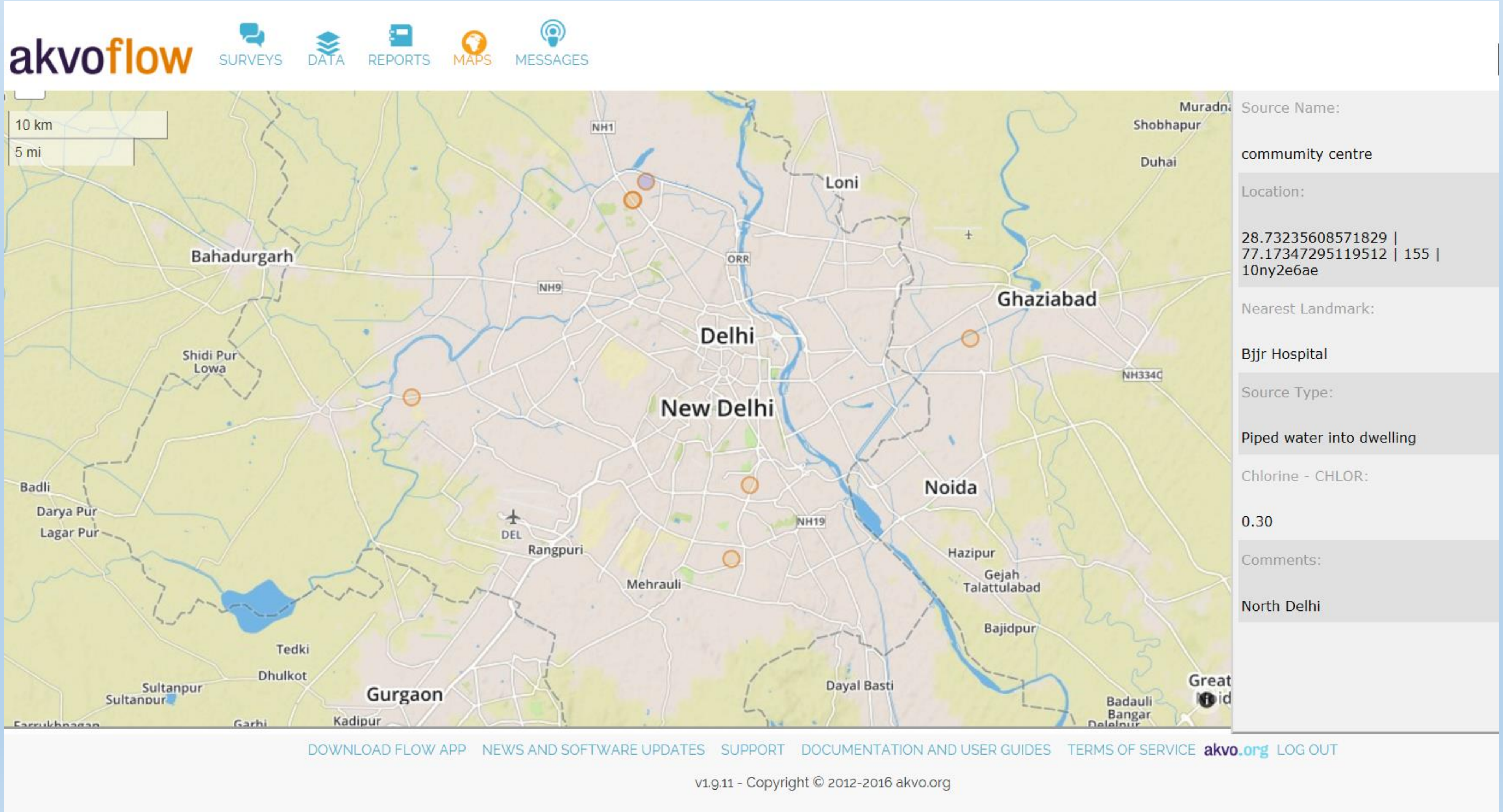






From Data to Decision – EEHF Presentation, Matt Arnold, MSF. November 2016.

Sample/Pilot Data – Delhi



From Data to Decision – Conclusions and Questions

Tufts UNIVERSITY | School of Engineering

Efficacy assessment of surface disinfection in Ebola outbreaks

K. Gallandat, M. Wolfe and D. Lantagne

Department of Civil and Environmental Engineering,
Tufts University, Medford, MA, USA

USAID FROM THE AMERICAN PEOPLE

Applied Research on Disinfection to Prevent Ebola Transmission
Tufts University, with the University of Brighton and Brigham and Women's Hospital

2014 Ebola outbreak

Largest outbreak to date:

>28,000 cases >11,000 deaths

Ebola is transmitted through contact with:

- An infected individual ➡ Disinfection of hands
- His/her bodily fluids ➡ Disinfection of vomit/excreta
- Contaminated surfaces ➡ Disinfection of surfaces

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Disinfection recommendations

Target	Action	Disinfectant	Exp. time	Source
Hospital, ETU	Pre-clean surface	0.5% chlorine	10 min.	WHO, 2015
Household	Cover spills	0.5% chlorine	15 min.	CDC, 2014
Hospital	Pre-clean surface	"Chemical disinfectant for non-enveloped viruses"	Not specified	CDC, 2014
ETU	Do nothing	0.5% chlorine	15 min.	MSF, 2008

Objectives

1. Compare the efficacy of 4 commonly available chlorine solutions for the disinfection of 3 surfaces types.

2. Evaluate how recommended practices (pre-cleaning and covering) affect surface disinfection efficacy.

3. Determine how presence of a soil load mimicking human liquid waste affects surface disinfection efficacy.

Testing matrix

Test organisms	×	Soil load	×	Surfaces	×	Rec.	×	Chlorine
E. coli		With		Stainless steel		**A** Do nothing		**G** Generated NaOCl
Phi6		Without		Nitrile		**B** Wipe		**S** Stabilized NaOCl
				Heavy duty tarp		**C** Cover the spill		**H** HTH
						D Wipe and cover		**N** NaDCC

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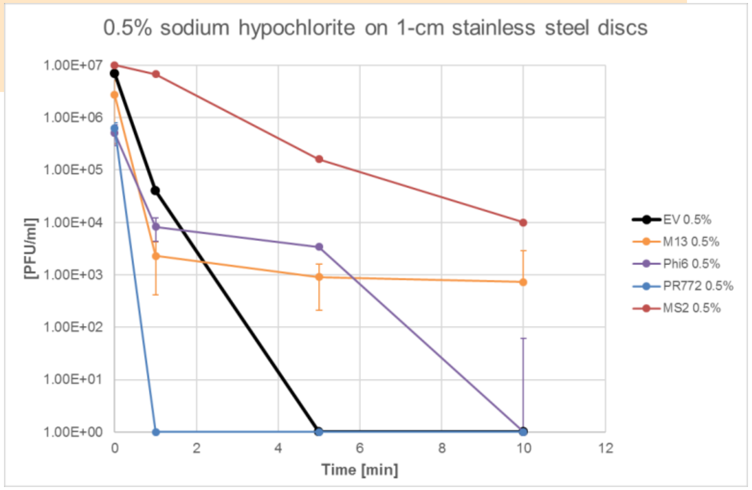
Test organisms

E. coli (ATCC 25592)

=> Membrane filtration

Phi6 (HER #102) propagated in *P. syringae* (HER #1102)

=> Plaque assay



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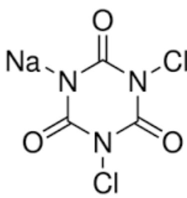
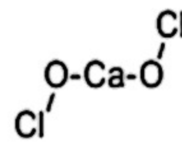
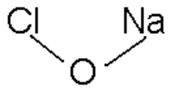
Chlorine types

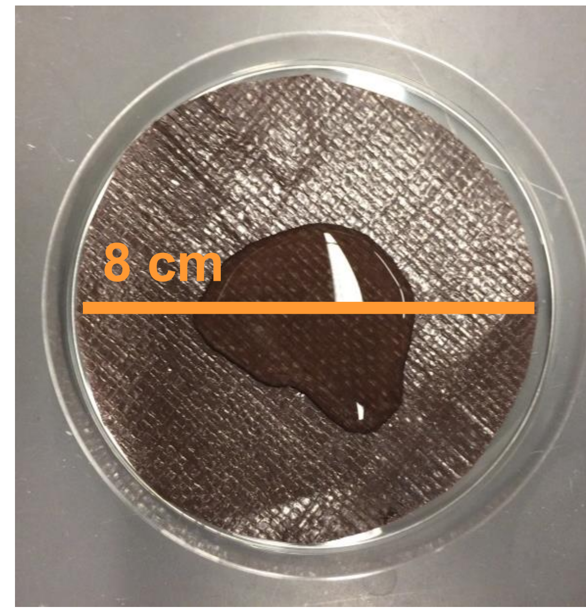
Sodium dichloro-isocyanurate (NaDCC)	pH 6	Granules	Easy to ship Long shelf-life Does not clog pipes	Smell	
High-test hypochlorite (HTH)	pH 11	Granules	Easy to ship Long shelf-life	Explosive Clogs pipes	
Stabilized sodium hypochlorite (NaOCl)	pH 11	Liquid	Can be local Does not clog pipes	Short shelf-life Difficult to ship	
Non-stabilized NaOCl	pH 9-11	Liquid	Can be on-site Does not clog pipes	Short shelf-life Difficult to ship QC?	

Surface types

Nitrile

Stainless steel

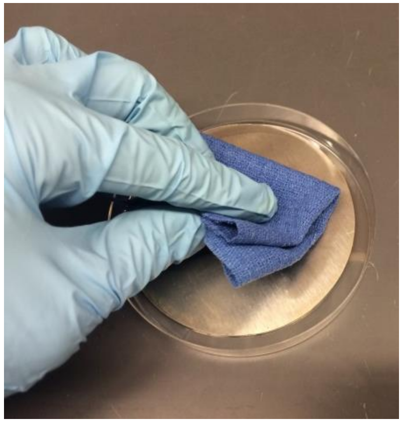
Heavy duty tarp

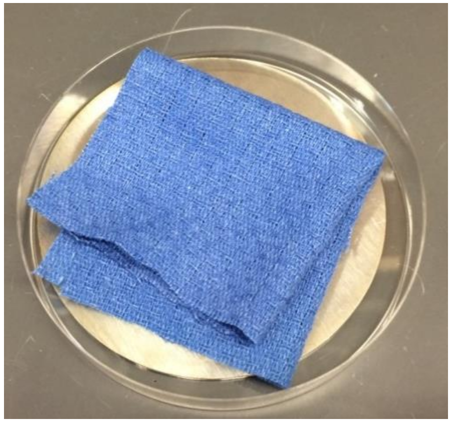


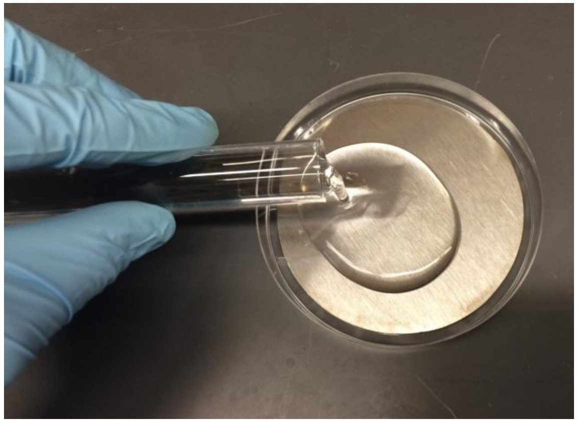
2-ml « spill »

Disinfection practices

Rec.	A	B	C	D
Pre-cleaning	✗	✓	✗	✓
Covering	✗	✗	✓	✓

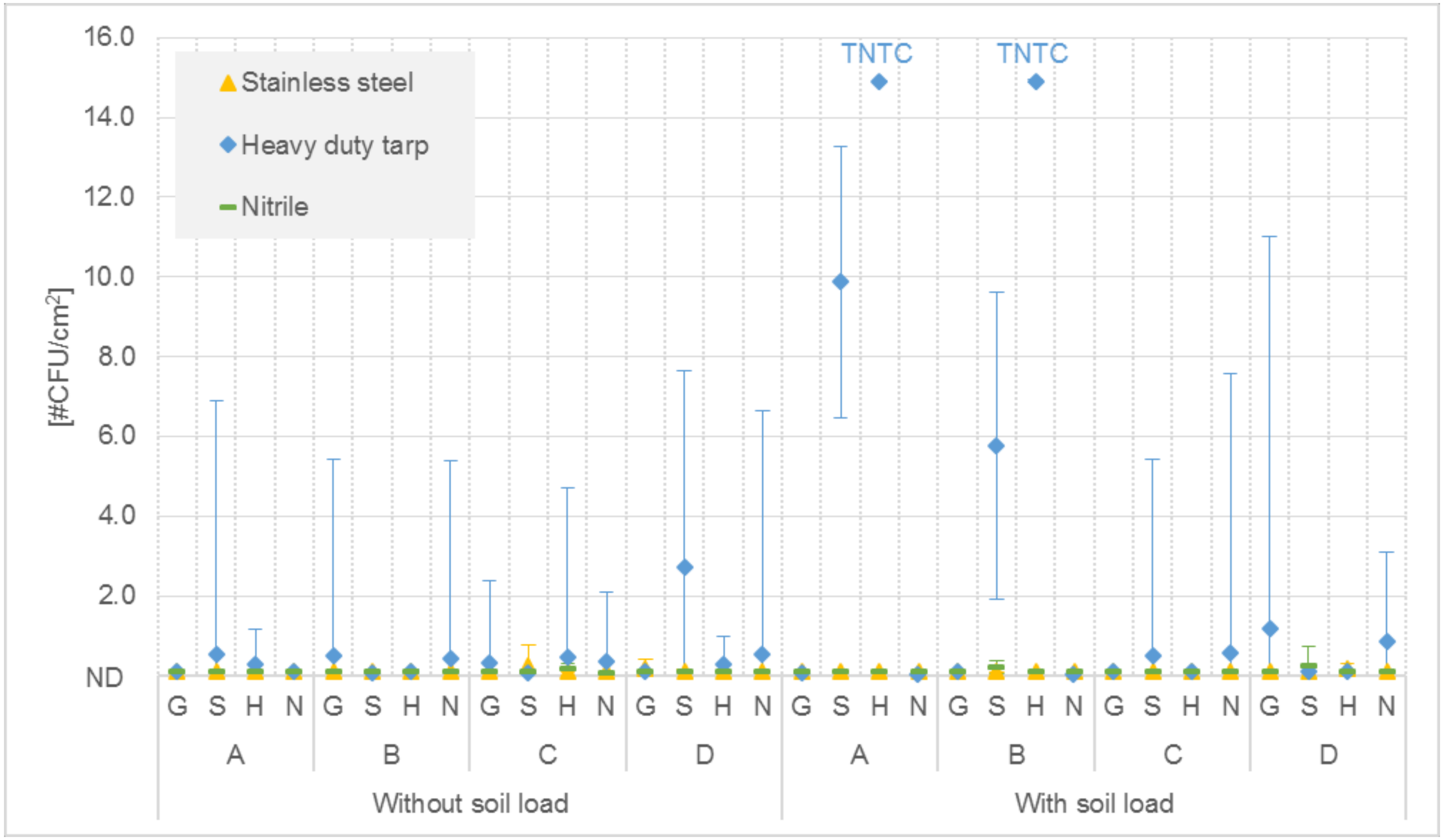






Exposure time: 10 minutes
Neutralization with sodium thiosulfate

E. coli



Recommendations	A	B	C	D		Chlorine types			
Pre-cleaning/wiping	×	✓	×	✓		**G**	Gen. NaOCl	**H**	HTH
Covering	×	×	✓	✓		**S**	Stab. NaOCl	**N**	NaDCC

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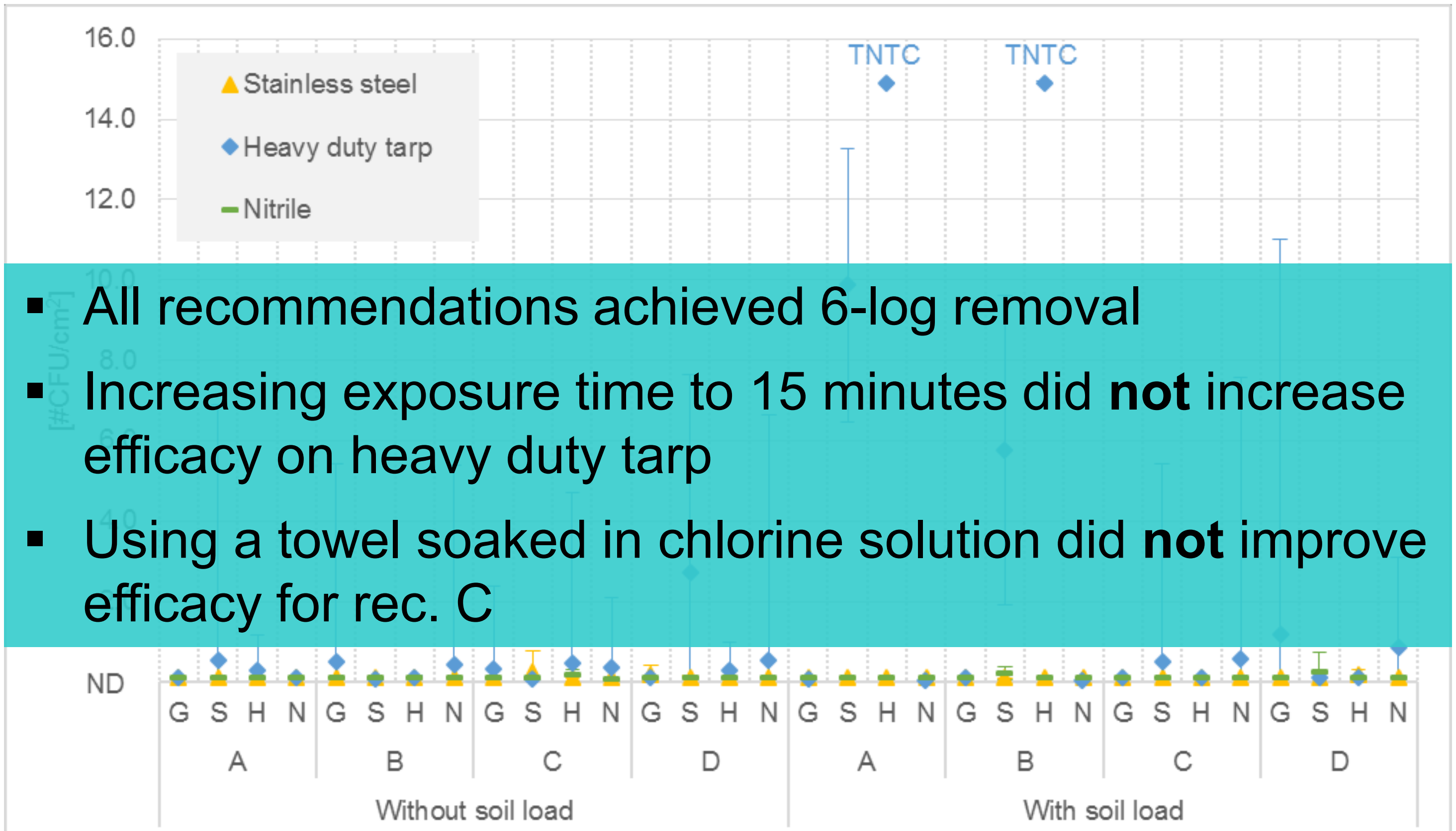
E. coli

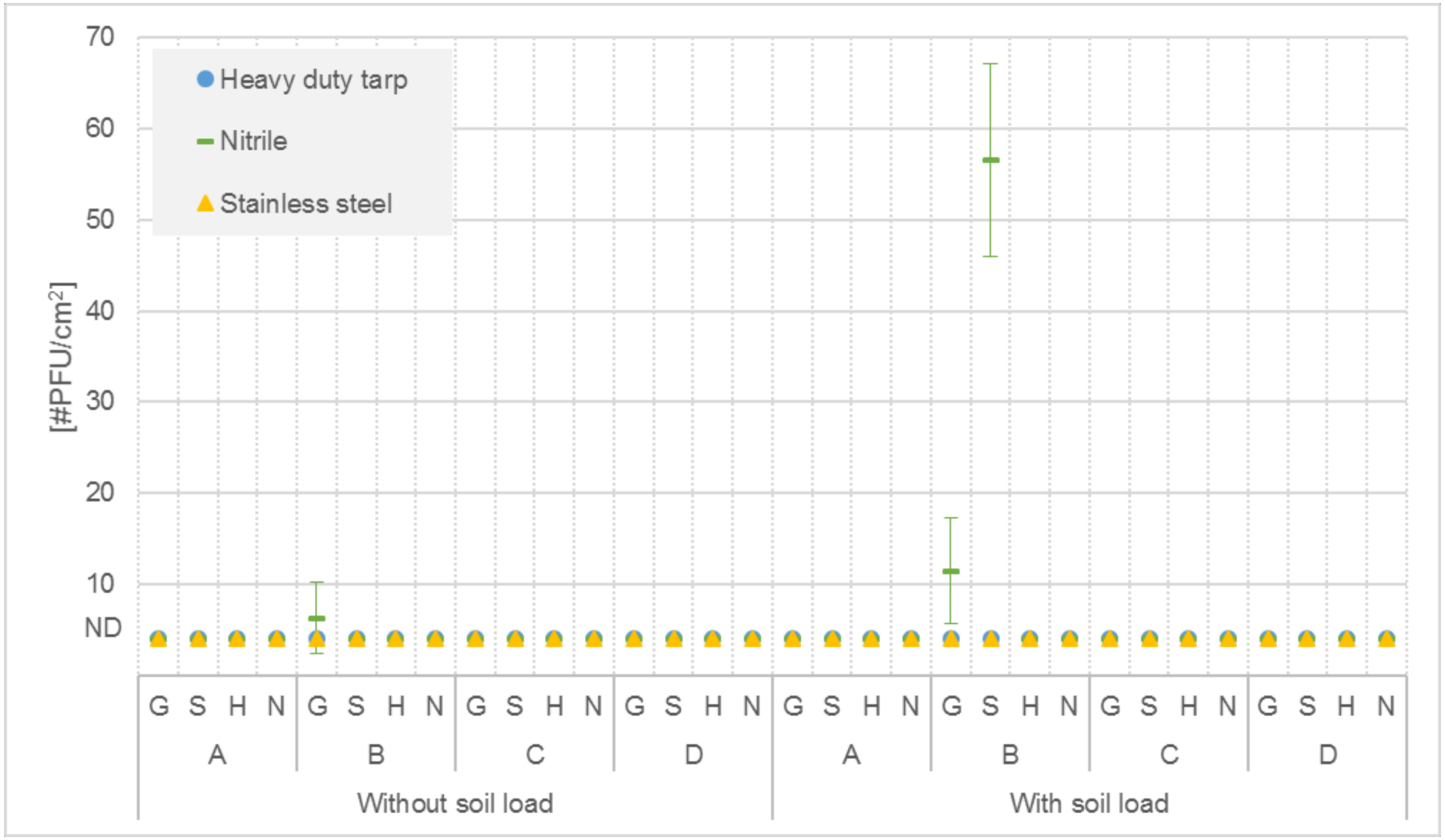


- All recommendations achieved 6-log removal
- Increasing exposure time to 15 minutes did **not** increase efficacy on heavy duty tarp
- Using a towel soaked in chlorine solution did **not** improve efficacy for rec. C

Recommendations	A	B	C	D
Pre-cleaning/wiping	×	✓	×	✓
Covering	×	×	✓	✓

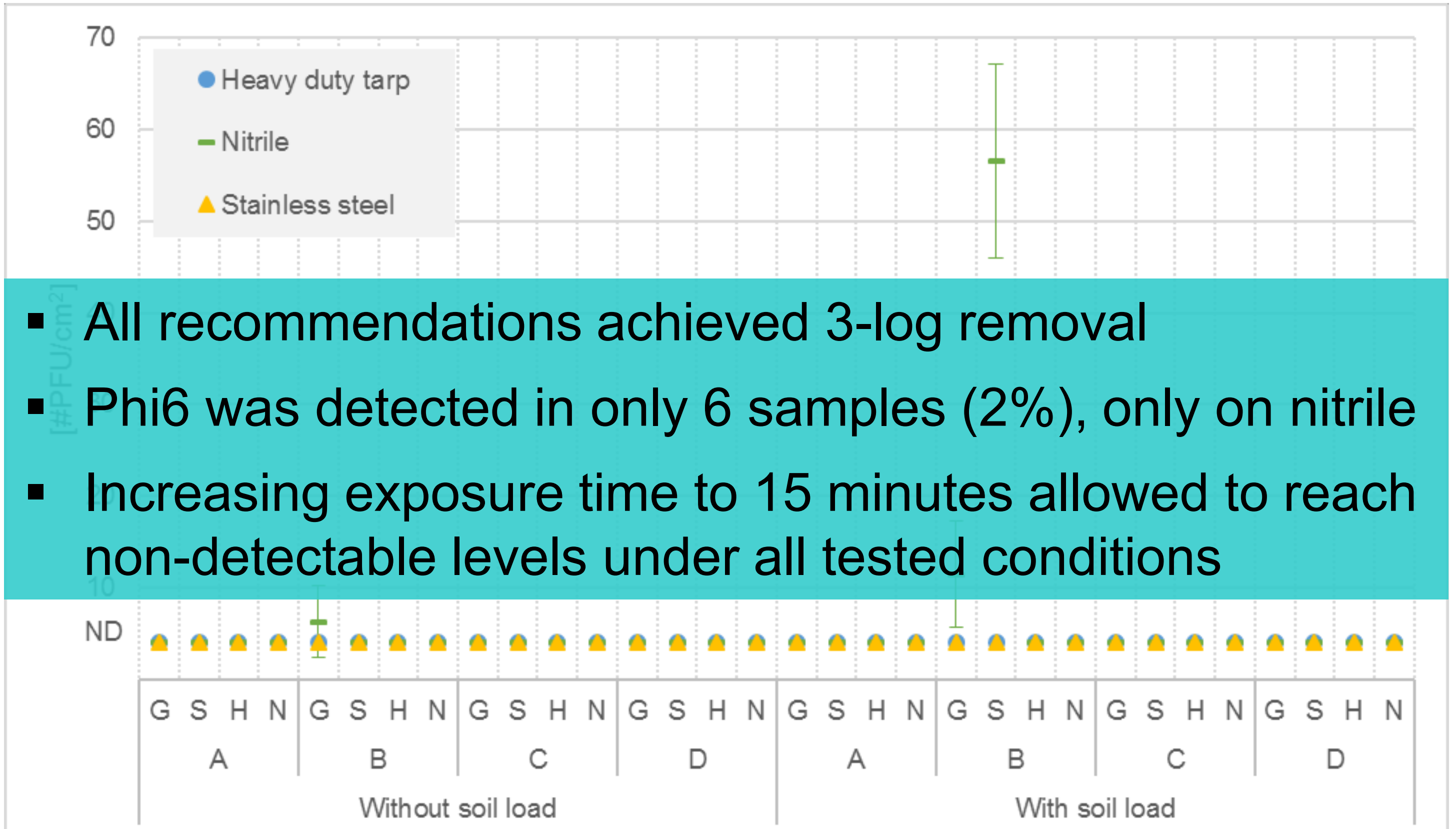
Chlorine types			
G	Gen. NaOCl	**H**	HTH
S	Stab. NaOCl	**N**	NaDCC

Phi6



Recommendations	A	B	C	D		Chlorine types		
Pre-cleaning/wiping	×	✓	×	✓		G Gen. NaOCl	H	HTH
Covering	×	×	✓	✓		S Stab. NaOCl	N	NaDCC

Phi6



- All recommendations achieved 3-log removal
- Phi6 was detected in only 6 samples (2%), only on nitrile
- Increasing exposure time to 15 minutes allowed to reach non-detectable levels under all tested conditions

Recommendations	A	B	C	D
Pre-cleaning/wiping	×	✓	×	✓
Covering	×	×	✓	✓

Chlorine types			
G	Gen. NaOCl	H	HTH
S	Stab. NaOCl	N	NaDCC

Key points

- **Surface type** and **test organism** appeared to be the two most influent parameters for disinfection efficacy.
- **All chlorine types** were equally efficacious.
- **Pre-cleaning** does not improve disinfection efficacy – and should be avoided.
- **Covering** is only desirable if transmission of the disease via splashes is a concern.
- Presence of **soil load** did not affect disinfection efficacy at 0.5% chlorine.

Summary

A 15-minute exposure to 0.5% chlorine – independently of chlorine type, surface type, practices and presence of organic matter – should be an efficacious measure to stop EVD transmission via fomites.

Thank you !

We are happy to take questions.

karin.gallandat@tufts.edu

Applied Research on Disinfection to Prevent Ebola Transmission

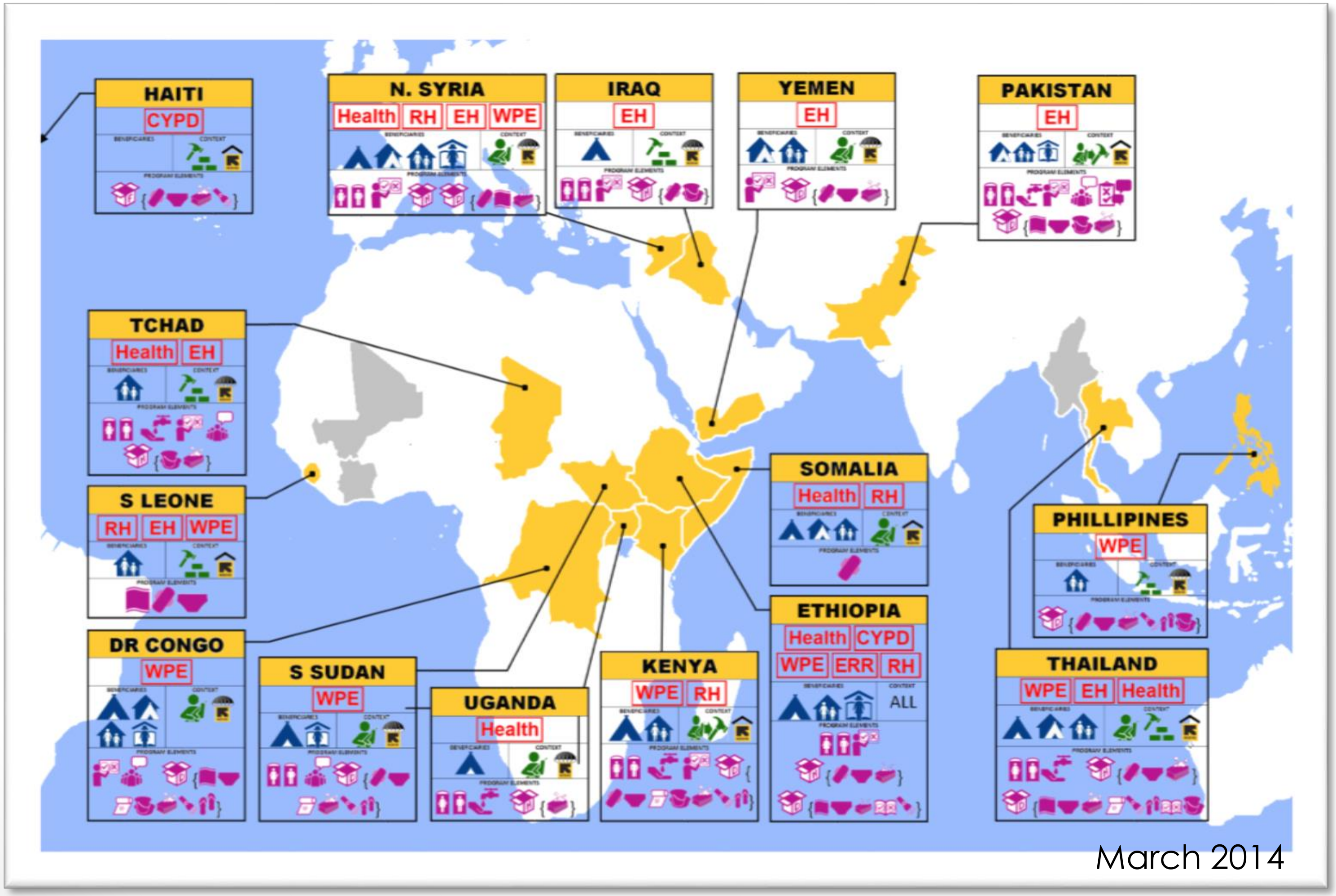
Tufts University, with the University of Brighton and Brigham and Women's Hospital

7th Emergency Environmental Health Forum
Kathmandu, Nepal

Learning from the development of a cross-sectoral toolkit for improving menstrual hygiene management in complex humanitarian emergencies

David Clatworthy, Technical Adviser,
International Rescue Committee

Background



HAITI
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RH EH WPE
SOMALIA
Health RH
PHILLIPINES
WPE
DR CONGO
WPE
S SUDAN
WPE
UGANDA
Health
KENYA
WPE RH
ETHIOPIA
Health CYPD
WPE ERR RH
ALL
THAILAND
WPE EH Health
March 2014

Aims of research

- To contribute to the evidence base around MHM in humanitarian contexts.
- To develop effective cross-sectoral MHM guidance for humanitarian programming to improve MHM outcomes for girls and women.
- To develop evidence-based monitoring measures for MHM in humanitarian response.

Project Phases:

1. **Formative Research**
2. **Toolkit Development**
3. **Piloting**
4. **Dissemination**

Project Phases:

1. **Formative Research**
   - Key Informant Interviews (KII) with cross-sectoral humanitarian responders (N = 28)
   - Desk review of existing documentation
   - Formative assessments in 2 emergency contexts: Myanmar and Lebanon
2. **Toolkit Development**
3. **Piloting**
4. **Dissemination**

Global KII Findings:

Is MHM usually part of initial humanitarian response?

- Often not prioritized in acute phase
- When included from start, is generally provision of MHM supplies (disposable pads)
- Failure to consider disposal and waste management systems when selecting materials.
- Most initial rapid assessments do not include MHM questions

"There is often a flood of materials at the start and no way to deal with disposal. I think that has fallen off the radar." – WASH Adviser

Global KII Findings:

Barriers to MHM programming?

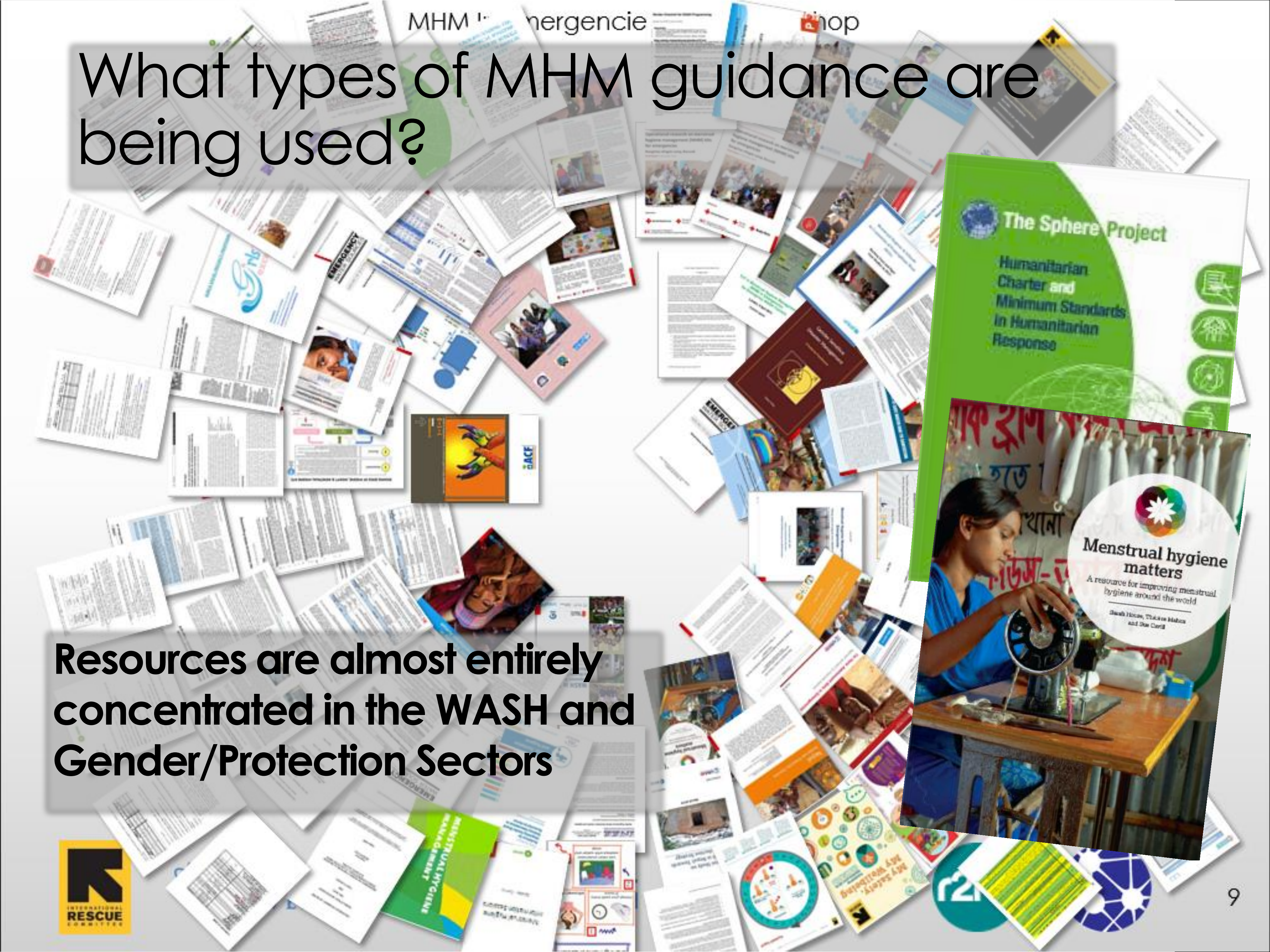
- The gender of program staff (especially senior leadership)
- Not considered as a life-saving intervention
- Discomfort discussing MHM (local program staff and both genders)
- Women & girls often do not demand support for MHM.
- Lack of written guidance or documentation on MHM approaches & experiences

Global KII Findings:
When should an MHM response be introduced?

Acute	Protracted
"If we don't deal with gender [appropriate facilities] from the get go, 50% percent of the population won't use the services we put in." – WASH Advisor ***"There is no excuse or good argument for it not being an immediate priority. It's cheap and it's not too hard to do…. It is often an excuse for any change in the aid sector, that it is not perceived as acute."*** – *Gender Adviser*	***"In the 1st phase you need to plan as if you don't have any external commodities available. In the 2nd phase you can consider the materials you have available but you need to think about the next phase and being able to sustain the commodity delivery."*** – WASH Adviser ***"It is pressing for women but it is not pressing for survival of people. It's not water and it's not sanitation. It's part of sanitation but it's not general health or food or infectious disease or vaccinations."*** – Health Adviser

There is a lack of consensus across organizations and actors about which MHM response components should be introduced when.

What types of MHM guidance are being used?



Resources are almost entirely concentrated in the WASH and Gender/Protection Sectors

Outcomes from Formative Research:

Challenges experienced for girls and women:

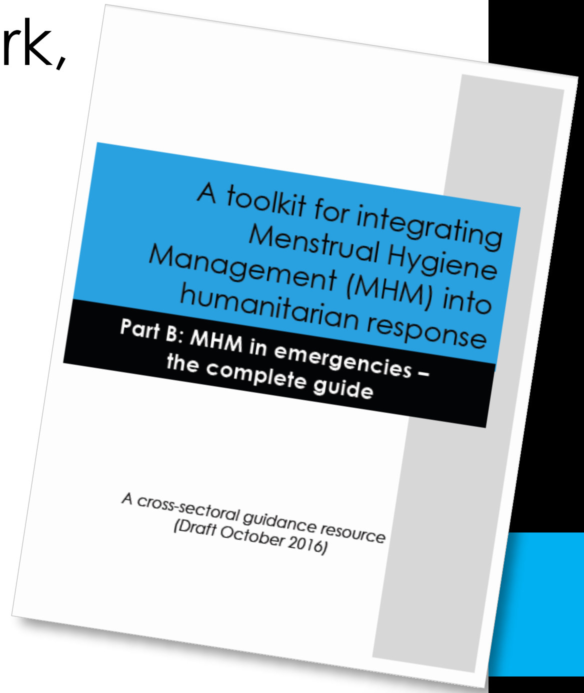
- **Distribution of materials** - frequency, amount, targeting, type
- **Inadequate latrines -** water, lighting, hygiene
- **Privacy and safety** at home and at latrines
- Worry that **men or boys (or anyone)** will see menstrual materials
- Difficulties in **drying cloths/pads**
- Difficulties **purchasing** materials
- **Cultural beliefs** esp around disposal
- **Access to information,** especially girls on menstrual health education

Project Phases:

1. **Formative Research**
2. **Toolkit Development**

- Gather recommendations, draft toolkit
- Multi-sectoral workshop in New York, March 2016
- Toolkit revision

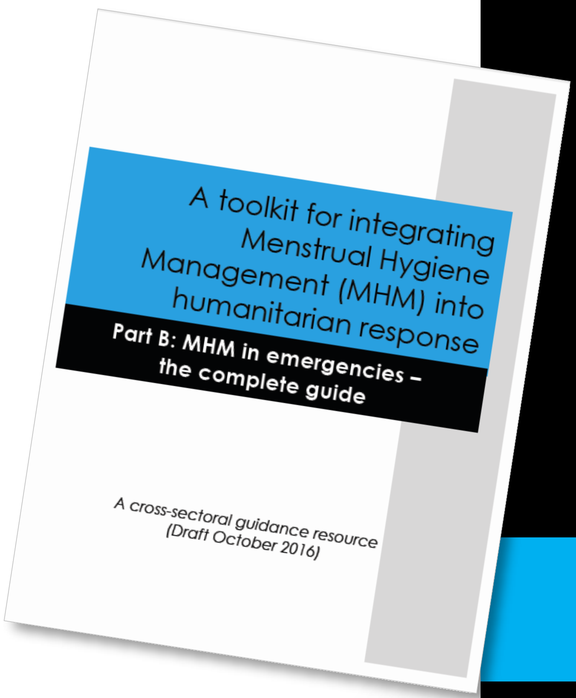
3. **Piloting**
4. **Dissemination**



MHM Toolkit Contents:

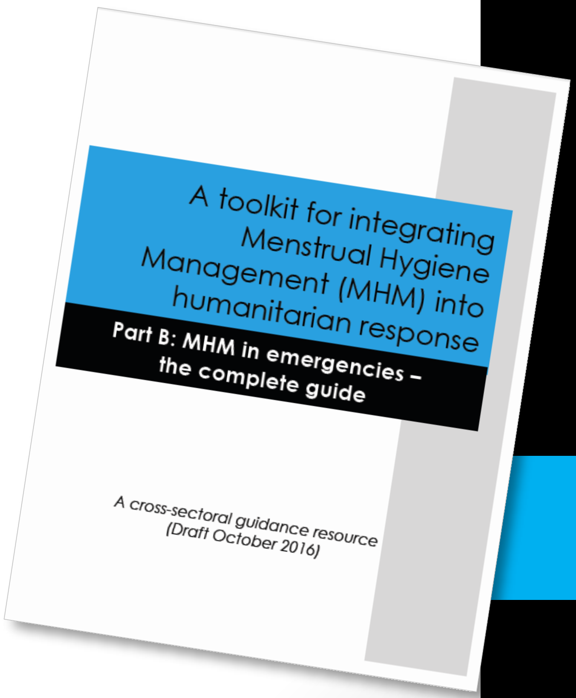
1. Six sectors targeted: WASH, Shelter, NFI, Health, Protection, Education
2. Needs assessment
3. Coordination
4. Staff training
5. Monitoring and Evaluation

Consultation & Coordination



Project Phases:

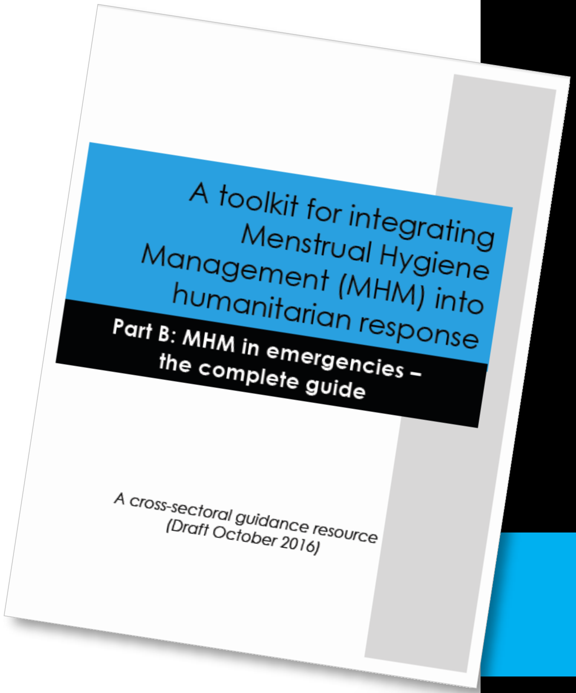
1. **Formative Research**
2. **Toolkit Development**
3. **Piloting**
   - 3 refugee camps and reception centers in Tanzania
   - Assess usefulness of toolkit
   - Gain experience in monitoring
4. **Dissemination**



Project Phases:

1. **Formative Research**
2. **Toolkit Development**
3. **Piloting**
4. **Dissemination**

- Finalize toolkit
- Translation – French, Arabic
- Dissemination & Launch



Beyond Tanzania Pilot

- Seeking additional global cross-sectoral partners and agencies to test and utilize the draft toolkit, and share learning and experiences.
- Looking for additional case studies, best practices and designs on approaches for MHM programming, including:
  - ✓ Supportive WASH facilities
  - ✓ Designs for discreet disposal options
  - ✓ Methods for improving the drying of reusable materials
  - ✓ Innovative approaches in providing MHM health education and hygiene promotion
  - ✓ Distribution methods
  - ✓ Strategies for more effectively targeting adolescent girls.

7th Emergency Environmental Health Forum
Kathmandu, Nepal

Thank you.

David.Clatworthy@rescue.org

Effect of WASH on the ambulatory treatment of Severe Acute Malnutrition

(CMAM with RUTF)

ACF research update from DRC, Pakistan and Chad

EEHF Kathmandu 11-2016

WASH’ Nutrition Research Objectives

Research questions:

- WASH effect the treatment of Severe Acute Malnutrition (relapse, duration, response to treatment)?
- WASH contribution to Acute and Chronic prevention?
- Secondary: WASH effect morbidity indicators?

Finding potentials?

- To validate the HH minimum WASH package of WASH’NUT strategy
- To improve CMAM performance and efficiency (rely on expensive RUTF provision and lengthy treatment)
- To document WASH’ Nutrition in Sub Saharan Africa
- To demonstrate the effect of WASH on Acute undernutrition, in order to influence practitioners, institutions and donors

PUR1 - DRC - 2012-2013

Effects of HHWT on the treatment of SAM

Study location: Popokabaka, Bandundu Province, DRC

Financial support from: P&G

Coordination: ACF, John Hopkins Univ.

<u>Quasi-experimental panel design</u>:

Comparative study with 2 arms (total 207 children):

- control group (children U5 treated for SAM without complication)
- intervention group (same + **P&G PUR Ca Hypochlorite- FeSo4**)

<u>→ Main results:</u>

The average treatment time decreased by 4 days (30.4 to 26.4 days, 13%)

Results not statistically significant, sample size too small

The intervention covers its own costs (Nutrition treatment is around 2 USD/d, treatment is reduced on 4 days, then 8 USD saved = 4 months PUR for the HH).

R2HC - Pakistan - 2015/2016

Effectiveness of Safe Drinking Water in SAM Treatment

Study location: Dadu District, Sindh Province, Pakistan
Financial support: R2HC / ELRHA (DFID, EU, Welcome Trust), P&G
Project management: ACF, John Hopkins Univ.

a) Cluster Randomized Control Trial with 4 arms (sample size = 840 = 4 x 210):

- control group (conventional CMAM program)
- same + **P&G PUR (Ca Hypochlorite disinfectant / FeSo4 flocculent)**
- same + **Aquatabs (NADCC disinfectant)**
- same + **ceramic candle filters**

b) Qualitative inquiry in each arm (in-depth interviews, HH observation).

→ Expected results 12/2016:

- Effectiveness of Household WT in SAM treatment (response, relapse)
- Cost-effectiveness of adding Household WT in SAM treatment (duration)

OUADINUT - Chad - 2015/2016

Effectiveness of adding a Household WASH component to a routine outpatient program (CMAM) for U5 Severe Acute Malnutrition

Study location: Mao and Mondo health districts, Chad

Financial support: NEEP call from Path (DFID), ACF Research Foundation

Coordination: ACF, ASRAD, Antwerp University

Duration field work (data collection): 13 months (April 2015 - April 2016)

<u>Cluster Randomized Control Trial with 2 arms (sample size =1595 children):</u>

- control group: routine ambulatory nutritional program + h promotion (10 Health Centers)
- intervention group: same + **WASH minimum package** (10 Health Centers)

<u>→ Initial Results (not yet published):</u>

… but here is a teasing →

Objectives of the study

To assess the effect of the household WASH kit on:

1 – **WASH Kit adherence**, tested through observational HH study (2 visits 4 weeks – 8 weeks)

2 - **Morbidity outcomes** (occurrence and duration of diarrhea, vomiting, cough, fever) checked & tested weekly at HC

3 – **Nutritional outcomes**: tested at HC

- ✓ Weight-gain and time-to-recovery (response to treatment)
- ✓ Proportion of cured children (response to treatment)
- ✓ Proportion of relapses after successful discharge

Study setting

- **Area of intervention**

✓ Mao and Mondo health districts, Chad

✓ GAM = 15,4%

(15% emergency threshold UNICEF / WHO)

✓ SAM = 2,5%

(2% emergency threshold UNICEF / WHO)

✓ Diarrhea = 32%

(% U5 admitted into HCs)

- **ACF nutritional activities**

✓ Among other activities, ACF supports 40 health centers for outpatient therapeutic program (OTP) on SAM

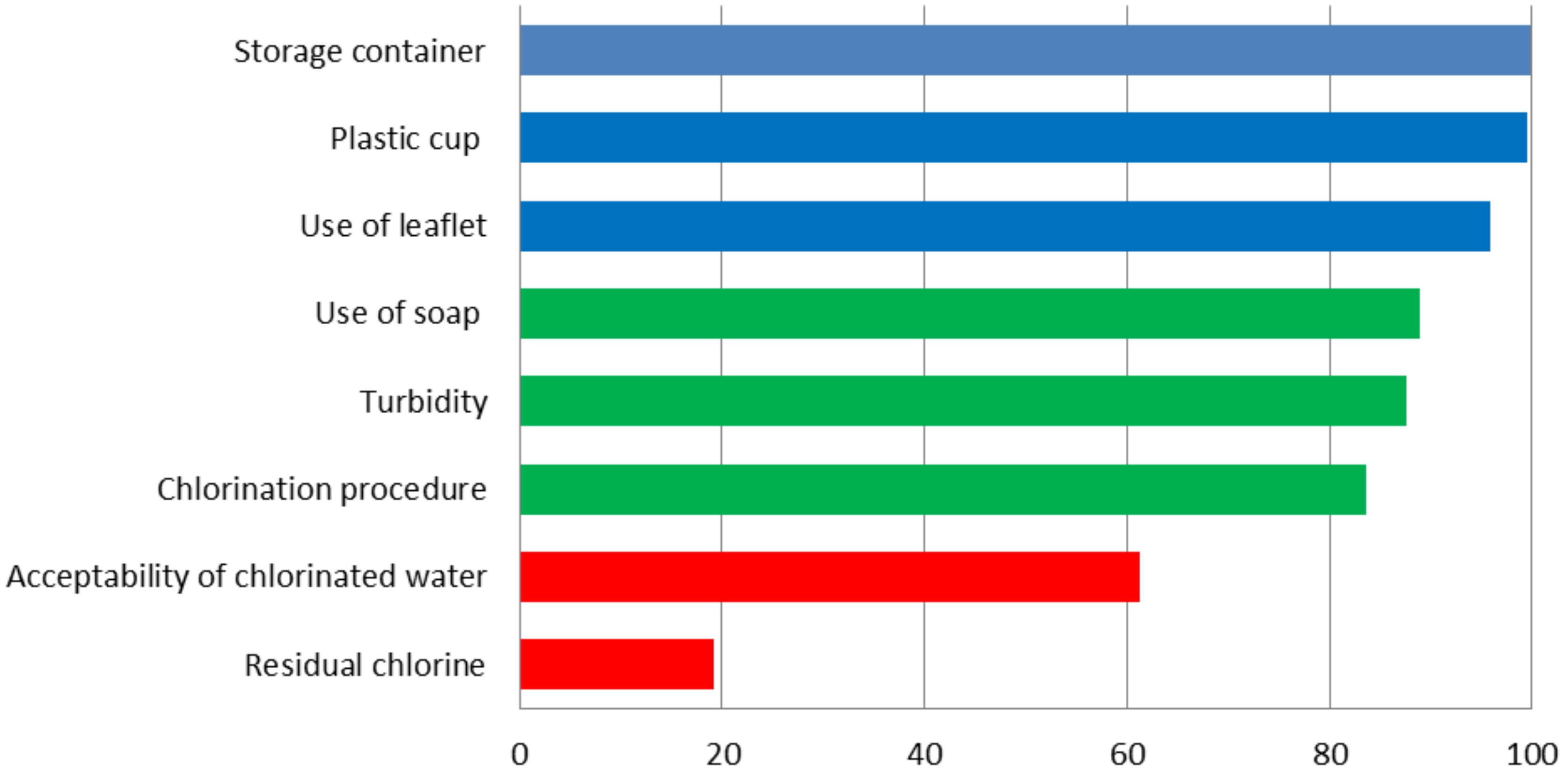
Household 3 months WASH kit given at admission (HC)

Content
safe drinking water storage container
Soap 750g x 3 months
Aquatabs / 3 months
A plastic Cup
Instructions leaflet

Price of the kit = 10 euros /HH for 3 months

Demonstration of the kit done at health center, at admission repeated at each weekly visit of the child-mother dyad

Result 1 - WASH kit adherence at HH level (observed 4 to 8 weeks after admission)



Note: Residual chlorine tested > 0.2 mg/l (WHO)

Results 2 - Morbidity outcomes
collected at HC among treated children

Average number of cumulative sick days during the treatment (#50 days)

Significant reduction of diarrheal and vomiting duration (#40%) for intervention group

Results 3 - Nutritional outcomes

- Statistically significant effect on recovery (10.9%) due to non-responder reduction, correlated with diarrheal morbidity decline in the intervention group
- Tendencies on time to recovery (9.4%) & weight gain (11.6%)
- No effect on relapse

Research operational challenges

Human resources: finding qualified staff that speak local language in a remote and unsecure setting.

Shortage in RUTF: but didn't affect the study as it concerned both intervention and control group.

Nutritional protocol adherence: anthropometric criteria for discharge were not strictly applied by MOH staff. This could have introduce a misclassification bias. However, ACF did a sensitivity analysis (2nd analysis based on real discharge anthropometric criteria). The effect size between the groups remains the same.

Conclusions

- **Improving Kit use:** even if the WASH kit was globally well accepted and use, there are still potential for improvement and therefore, on its effect, particularly on the water storage system (tap) & treatment use.

- **Nutrition outcome:** WASH component enhanced programme performance by increasing the proportion of recovery (curation rate), most probably by decreasing the duration of infection episodes among children qualified as "non-responders" to nutrition treatment.

- **Ensuring sustainability:** no statistical effect on relapse proportion, but the WASH kit was not enough sustained at discharge. IGA (Wata kit delivered at community) should sustain this benefit.

- → **Operational outcome:** application of the WASH minimum package to areas with high level of non-responders and high diarrheal incidence.

What's next?

Research:

- Chad DDMAS, UNICEF, cas / temoin on WASH HH determinants of Acute Undernutrition (12 months, starting 01/12/2016). Funded
- Madagascar: relations between EED, WASH environment, FSL and Nutrition Indicators, to be submitted ACF Research Foundation 03/2017, Tufts, Avignon. Not funded yet

Productions:

- WASH'NUT operational manual ACF-ECHO-UNICEF (released 01/01/2017, launched March 2017, Dakar), followed by translations & e-learning
- Baby WASH publication (released 01/01/2017)
- 2 publications (R2HC/ELRHA and OUADINUT NEEP/PATH)

Advocacy:

- SUN and SWA are moving together on the topic (joint 2017 agenda)
- SuSanA WG12, German WASH Network, GTO, UNICEF

Pushing the limits of CLTS/ (CATs) in emergency response

<u>Pre earthquake</u>

- Nepal excellent progress towards ODF driven by CLTS/CATS approach
- **Low subsidy, approx. $10/family but varied**

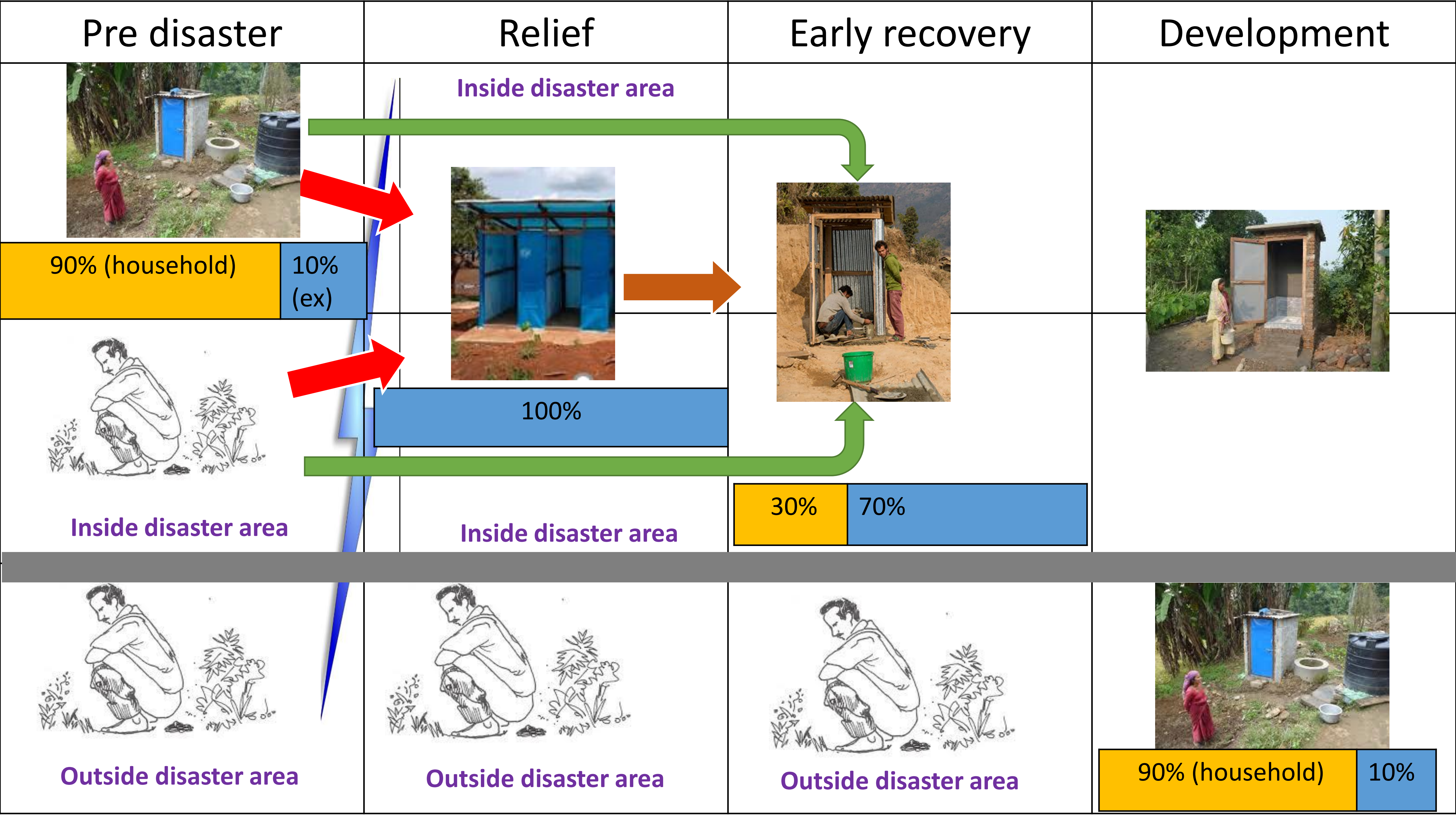
<u>Earthquake 25th April 2015</u>

- Extensive damage and destruction due to earthquake
- **The aid and high subsidies start**

Contradictions of relief verses development
Very different levels of subsidies

(who pays- household versus external)
in development and relief

Unconditional goods+cash	Conditional cash+goods	Unpaid labour
Relief phase	**Transition phase**	**Development phase**


Pre disaster
Relief
Early recovery
Development
Inside disaster area
90% (household)
10% (ex)
100%
30%
70%
Inside disaster area
Inside disaster area
Outside disaster area
Outside disaster area
Outside disaster area
90% (household)
10%

Programme policy issues to consider

A need to stop doing supply driven relief to make space for (re) starting development

Key issues to resolve in advance;

- **When we "do" emergency latrines and when to bypass to support self recovery**
- What is the right level of subsidy in recovery
- What recovery modality to use; materials or conditional cash/vouchers (i.e. don't build for HHs),
- What about those who did not have toilet before – are they entitled to high subsidy
- If we want to build back better/safer who pays for extra costs – family or external
- Agency compliance within similar envelopes so we don't have contradictory approaches
- What do we say to those who are unaffected by disasters but looking on at subsidies
- How to link improved sanitation with the shelter/house reconstruction – making it integral

Programme/response policy preparedness

The paradigm shift required is to plan for a demand led intervention at the outset to enable early transition, while implementing quite limited supply driven emergency measures as required in the relief phase.

We need;

- global and national WASH programme policies pre-prepared with this goal
- stronger leadership from the global level to ensure it is implemented
- agencies to follow national policy to ensure consistency + coherence

I suggest we cant do this well in the heat of the response, so need *programme policy preparedness*. "so we can give it to agencies as they arrive at the airport"

BIOLOGICAL ADDITIVES TO ENHANCE SANITATION FACILITIES LIFESPAN IN REFUGEE CAMPS

Murray Burt – UNHCR

The Product - LICE

- The Consortium LICE contains selected natural microorganisms (10^{6} to 10^{12} CFUs) seeded in a mineral absorbent's internal cavity: Zeolite
- Consortium Lice SM consists of aero-anaerobic microorganisms selected for their ability to quickly digest the organic matter of septic tanks or latrines. These microorganisms are simple Saprophytes of Group 1 of the infectious agents' classification.
- The Zeolite protects the exogenous microorganisms (as a shell) from the endogenous microorganisms brought with the faecal organic matter, with which they are in competition.
- The Zeolite can absorb up to 40% compared with its initial volume without disturbing its internals cellular walls.
- The Zeolite thus works like a vacuum cleaner in constant mode and attracts pathogens and organic material to break down completely.
- When the Co/Lice is setup at the start-up of a latrine, the exogenous are in higher number, take the place of the endogenous and block the sludge accumulation.

LICE – Prior Product Testing

Ivory Coast

- LICE was used in Ivory Coast for a trial period of 3 months (Sept-Dec 2013), in partnership with the IC Red Cross & IFRC, to reduce the sludge volume in school latrines connected to a holding tank.
- Volume of excreta measured in the holding tank at the start of the project: 3 m3, (2m x 4.5m v 0.33 m excreta height in the pit), treated with 3.6 kg of bacterial additive.
- Volume of excreta measured after 12 days after the inoculation dose: 0.27 m3, (2 m x 4.5m x 0.03 m height of excreta in the pit).

After 12 days, the reduction of the sludge volume was already 90% + total loss of smell

After 2 years from the end of the piloting (as of 25 May 2015), the volume is still 0,27 m3 (1 cm sludge height) without any additional seeding + no smell

LICE –FIELD TRIAL CHAD

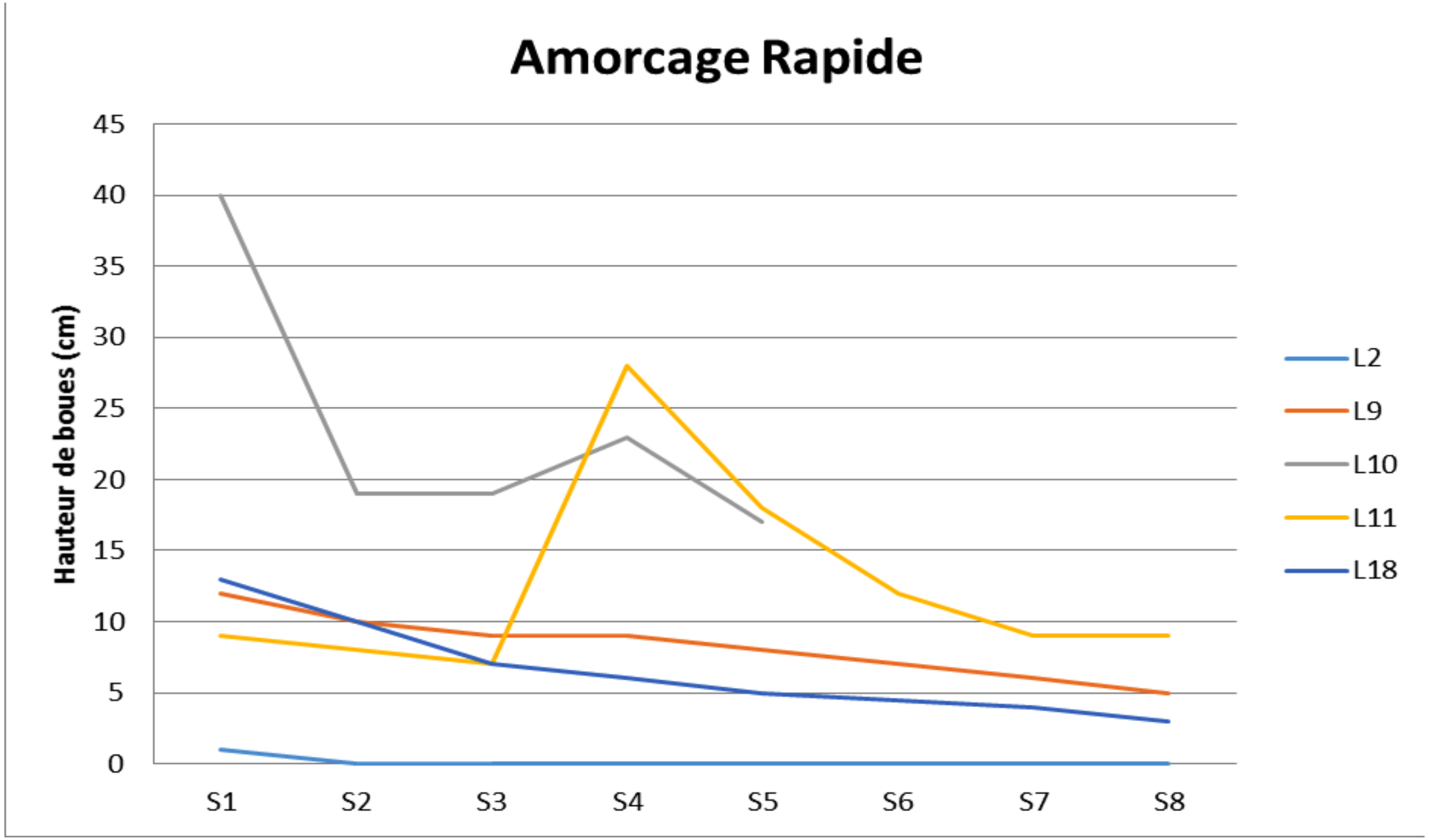
PHASE I - CHAD

- Context of the pilot: Southern Chad - Dosseye Refugee Camp
- Rational: 37% open defecation practice caused by poor maintenance and bad smell of latrines
- WASH Partner supporting with the monitoring phase: CARE
- Dates: 16 April – 4 June 2015 (50 days)
- Number of pit latrines tested: 5 in rapid priming, 5 slow priming, 10 blanks
- Results: 46% volume reduction & no smell
- Limitations: uncontrolled testing, wrong understanding of the protocol & non-regular number of users per latrine

LICE: UNHCR BIO-ADDITIVE FIELD TRIAL

UNHCR
The UN Refugee Agency

PHASE I – Results (fast priming)



LICE: UNHCR BIO-ADDITIVE FIELD TRIAL

UNHCR
The UN Refugee Agency

PHASE II - CHAD

- Repeat with fixed number of users per latrines and respecting the protocol
- Dates: 31 August 2015 – 31 March 2016
- Number of pit latrines tested: 5 in rapid priming, 5 slow priming, 2 blanks
- Results:
  - 100% volume reduction in rapid priming latrines & no smell
  - 100% volume reduction in slow priming latrines & no smell
- Limitations: some latrines dried up (L1, L2 and L6) & needed additional water injection

LICE: UNHCR BIO-ADDITIVE FIELD TRIAL

MONITORING PHASE- CHAD

- Stopped injection of LICE in March 2016 in the 10 latrines
- 7 months later, on Oct 29th 2016 the results showed:
  - In 3 out of 10 latrines the height of the excreta in the pit is stable (users diminished from 12 to 8)
  - In 2 out of 10 latrines, the **excreta level has increased** of 5-10 cm only (users halved)
  - In the remaining 5 latrines an **increase in the excreta level** was observed, which represents 1/3 of the level observed in the 2 blank / control latrines.

FIELD TRIAL LIMITATIONS

- Many uncontrolled variables:
  - Variable number of latrine users.
  - Changes in moisture content.
  - Incorrect/variable rates of LICE dosing.

- Means questionable results.
- Therefore need for a more scientific robust controlled field laboratory studies.

BIOLOGICAL ADDITIVE
CONTROLLED FIELD LABORATORY TRIAL

- **The Objective** – to test the effect of biological additives on waste in pit latrines.

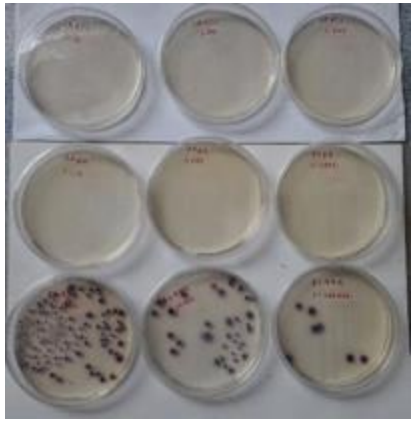
- Specifically:
  - Reduction in waste volume (to extend life of pit latrine)
  - Reduction in odor
  - Reduction in flies
  - Increased rate of sanitization
    (pathogen die-off)

BIO/CHEMICAL ADDITIVES RESEARCH

UNHCR PARTNERSHIP WITH UNESCO-IHE

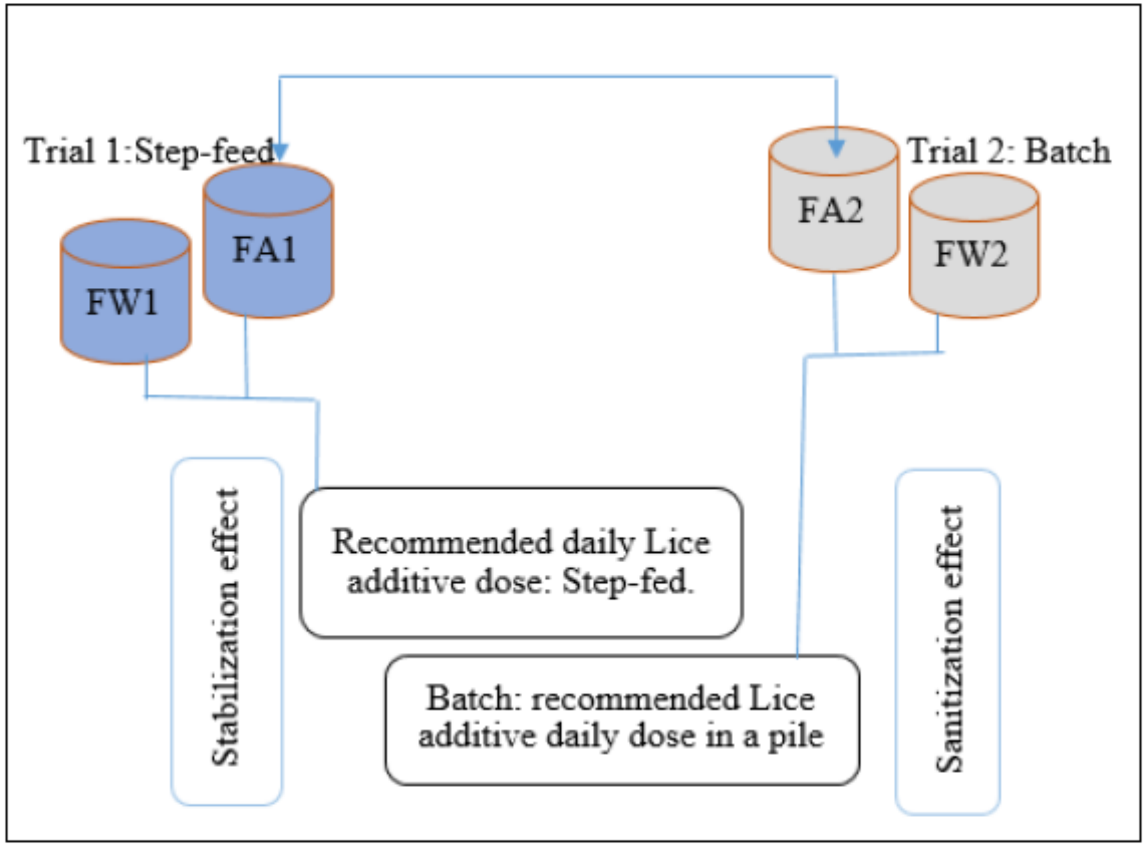
- Combined laboratory scale field research - deployment of 2 students from UNESCO IHE (Kenya – Naivasha/Sanivation) in Dec 2015 and Jan 2016 using:
  - Chemical additives: Ikati and Soda
  - Biological additives: LICE, Sannitree, Ecotreat

- Objective: in 60 days - quantification of the reduction of volume and odor. Reduction in total volatile solids, COD, E. coli and fly attraction was also determined.



Methodology

- Fresh sludge from Sanivation toilets and Naivasha Prison.
- Controlled dosing in 20L plastic buckets (x3) to simulate pit latrines
- Mesurement of volume / weight
- Odour Test
- Fly Attraction Test
- Ecoli measurement



FA = Faecal sludge + additive FW= Faecal sludge and water only (Control)
All trials are in triplicates and in 5 sets in both T1 and T2.

Figure 3-5: Field Experiment: Schematic for Stabilization and Sanitization.

So summarising;

Trial 1: Step-feed –9 weeks quick priming – and daily dosing

Trial 2: Batch 1 – 8 weeks – dosed once but in layers of the recommended dose.

Odour

- Significant effect of LICE on odour reduction at 95% confidence level in both step and batch trials

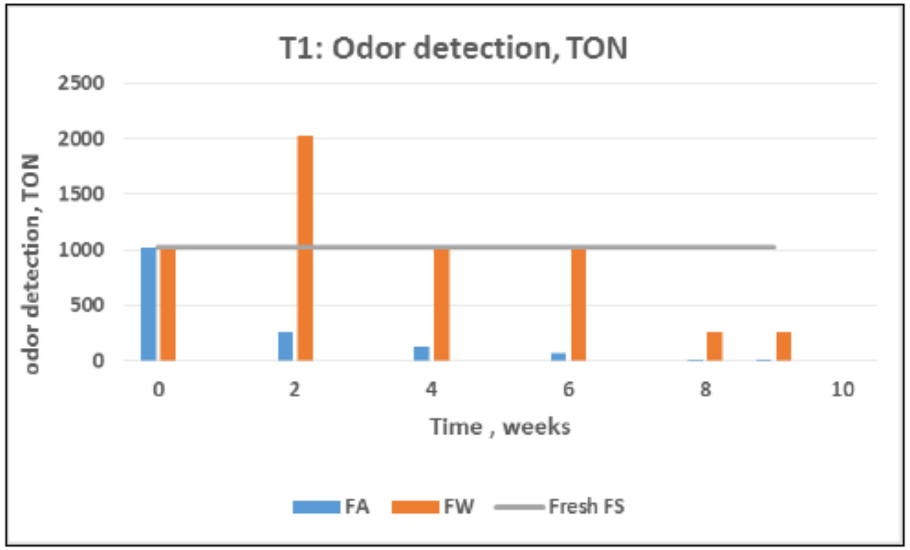


Figure 4-13: Odour detection in step- feeding trial

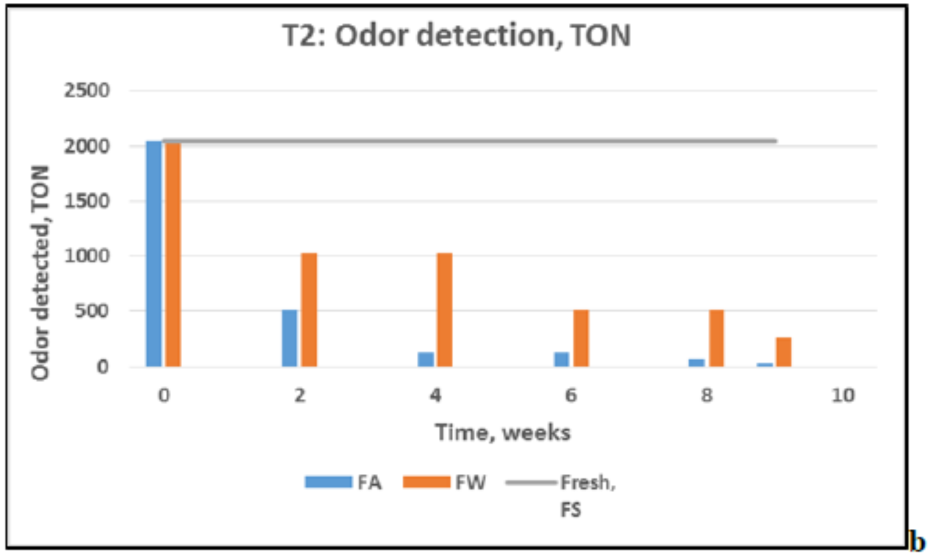


Figure 4-14: Odour detection in batch experiment

Fly Attraction

- Significant effect of LICE on odour reduction at 95% confidence level in both step and batch trials.
- Fly attraction is related to odour.

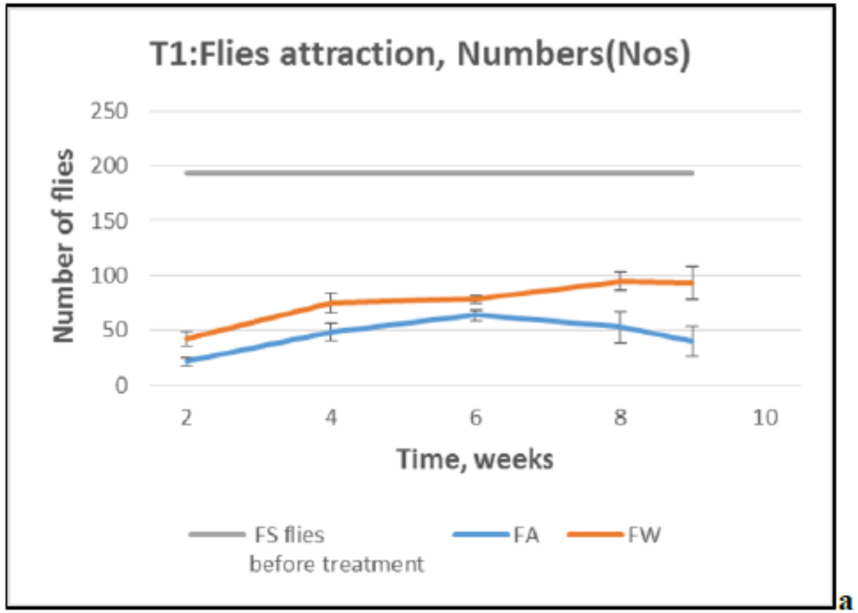
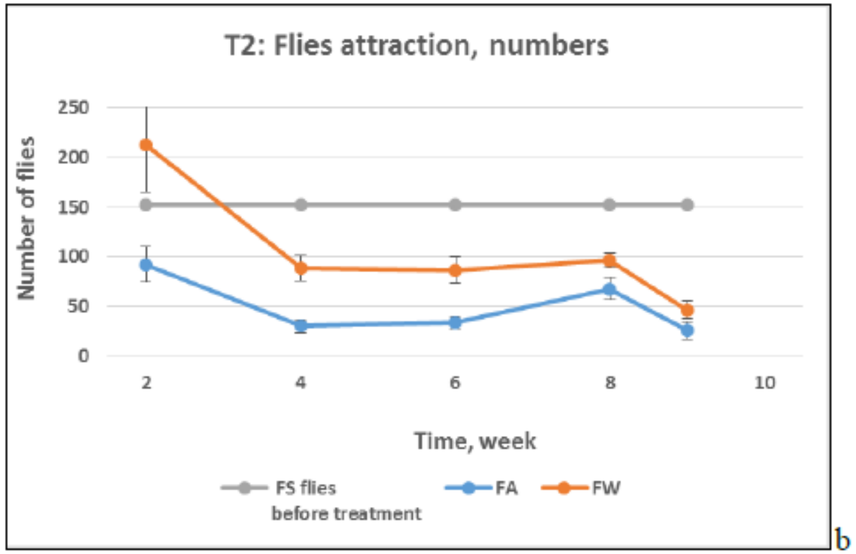


Figure 4-15: T1: Flies attraction, numbers.



Volume

- No statistically significant ($p>0.05$) effect of LICE on reduction in sludge depth (volume) in both step and batch trials over 60 days.

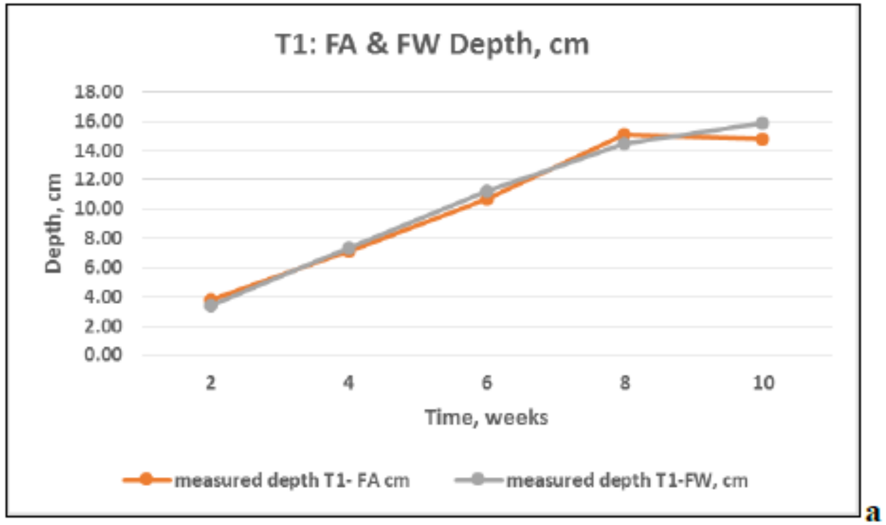


Figure 4-20: comparing measured depth, cm for FA & FW in T1.

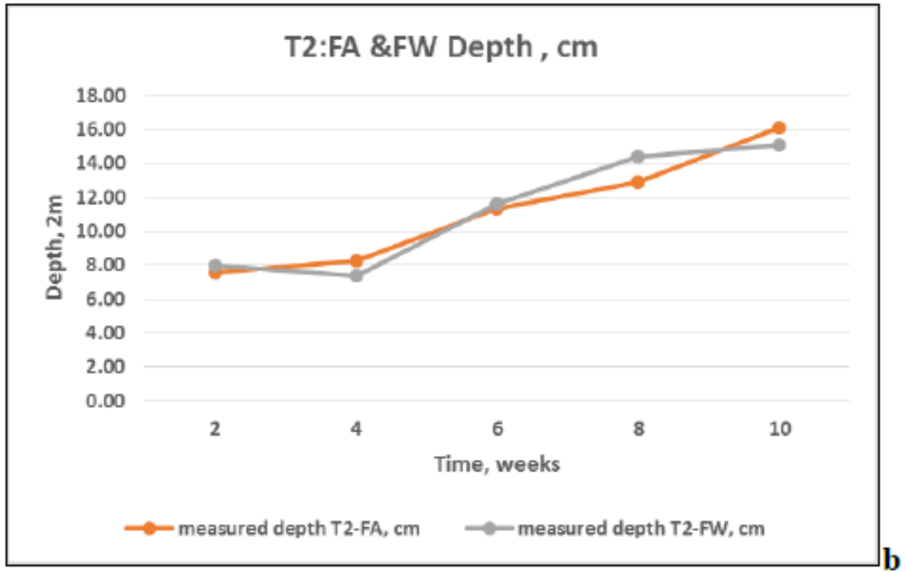
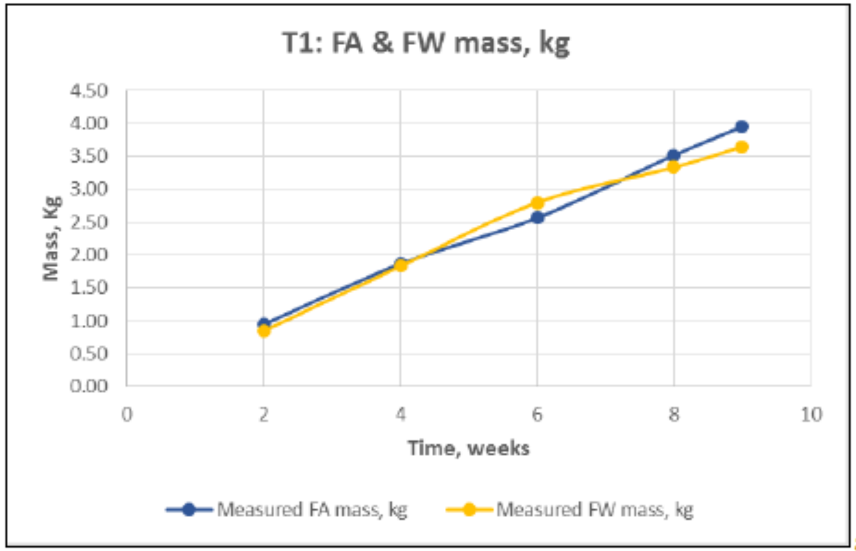


Figure 4-21: comparing measured depth, cm for FA & FW in T2.

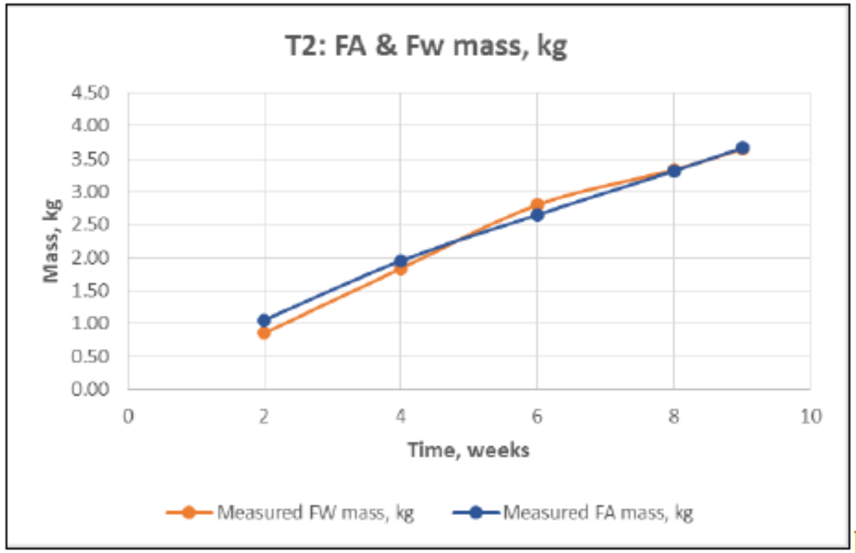
Mass

- No statistically significant effect (p>0.05) of LICE on reduction in sludge mass (weight) in both step and batch trials over 60 days.
- Weight reduction attributed to natural decay.



a

Figure 4-17: T1 (FA &FW) measured mass, kg



b

Ecoli

- No statistically significant effect (p>0.05) LICE on Ecoli (CFU) concentrations in both step and batch trials over 60 days.

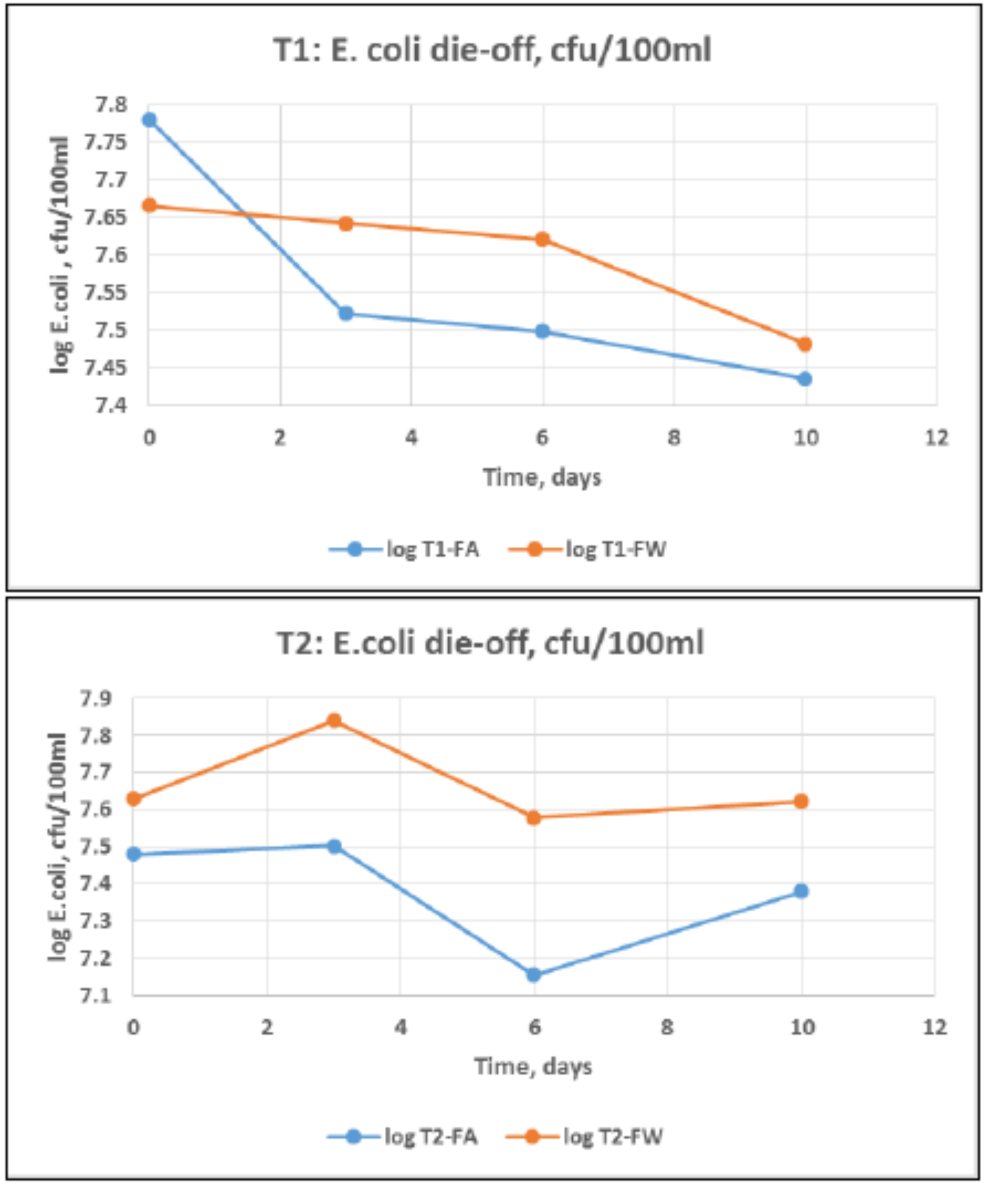


Figure 4-11: E. coli die-off in 10 days.

Cost

- Product Cost EUR620/m^3 of sludge treated
- With addition of labour and transport costs may be up to EUR EUR7,000/m^3

- RESULT: LICE achieved a 17% odour and fly attraction reduction.

Comparative Results (UNESCO)

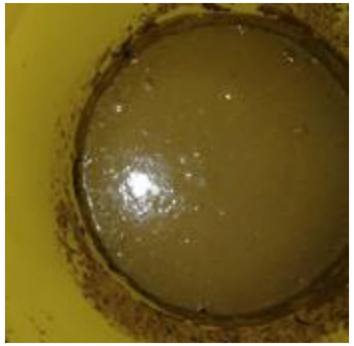
- LICE (most expensive)
- Lime
- Ammonia
- Lactic Acid
- Ikati (best Ecoli reduction)
- Soda
- Ecotreat
- Ash

Comparison performance of additives											
Id	Attribute	Criteria	Lice	Lime	Ammonia	Lactic acid	Ikati	Soda	Ecotreat	Ash
References				(Nobela, 2015)	(Perez, 2015)	(Malambo,2015)	(Kemboi, 2015)		(Zindoga, 2016)	
1	Sludge stability [%]	VS/TS ≤0.6	**46.18±9 [T2]	[-]	[-]	[-]	35	40	66.8	58.4
2	Sanitization	E.coli ≤ 3 log	5	< log 3	< log 3	< log 3	3	3.2	9.80E+07	1.67E +07
3	Sanitization time [days]	t ≤ 30-60 days	N/A	2 hours	4 to 8 days	7 to 15 days	7	7	N/A	N/A
3	Final pH value [-]	4 ≤pH≥9.5	5.95±8	11-12.5	9-9.5	3.8-4.2	9	9.5	6	7.3
	Depth,		14.8±0.2	[-]	[-]	[-]	[-]	[-]	6.4	6.7
4	Odor [TON]	lowest TON achieved	16	[-]	[-]	[-]	[-]	[-]	1818	444
5	Fly attraction reduction [numbers]	lowest count	40±14	[-]	[-]	[-]	[-]	[-]	81/m2	5/m2
6	Technology base		Biological	chemical	Bio-chemical	Biological	chemical	chemcal	biological	
7	Purchase price per kg, [€]	less than € 10	€28/kg [25-500kg] [€7.000/m^3 FS)	€12/m^3 [25kglime]	€16/m^3 (20kg urea)	€31.20/m^3 [100l milk] and € 2.20/m3 [100l molasses]	8.5/ m^3	13/m^3	€ 120.4/m^3	unknown
9	Robustness of technology	Stability and sanitization ≤ 60 days	not attained	[-]	[-]	[-]	[-]	[-]	not attained	
10	Shortfalls		Protocol difficult to interpret and or daily use	Temperature dependnet	initial homogeneous mixing	initial homogeneous mixing	Bacteria regrowth	absorbs moisture	deployment restrictions	solids accumulation
11	Disposal method	Reusability	Agriculture	soil conditioner	Fertiliser	inoculum for subsequent treatments	unknown	unknown	Inoculum	Agriculture
12	Suitability in emergency [score]	highest compliance with criteria	4	9	8	6	10	8	1	N/A

RESEARCH RESULTS SUMMARY

UNHCR PARTNERSHIP WITH UNESCO-IHE

- LICE could considerably reduce odour and flies (95%-100% reduction) in fresh faecal sludge, nevertheless, no stabilization or sanitization could be achieved, potentially due to the non-optimal ambient conditions (temperature below the optimal 37°C, which might have inhibited exogenous bacteria).
- Promising results on Ikati to accelerate sanitization of faecal sludge, though further optimization of the dosing is needed to prove impact.
- No evidence was found to support the claim that LICE (or the other Bio-Additives) can accelerate volume or mass reduction rate of fresh faecal sludge.



RESEARCH CONCLUSIONS

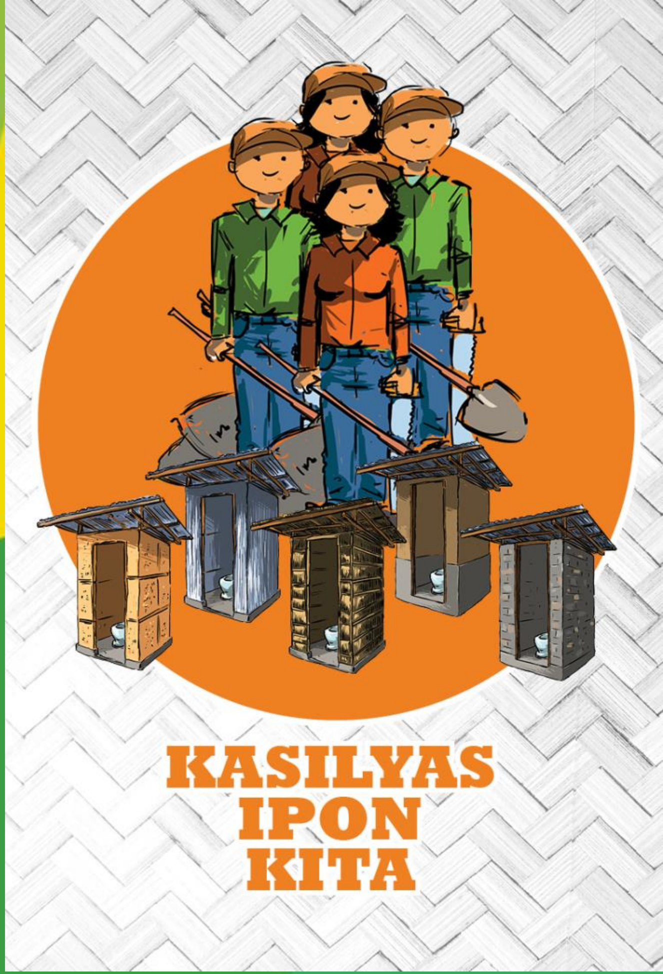
UNHCR The UN Refugee Agency

UNHCR PARTNERSHIP WITH UNESCO-IHE

- LICE has a potential for reduction of odour and fly attraction (disease vectors).
- Further evidence is required to determine the conditions where LICE may be effective at accelerating sludge volume reduction, and sludge sanitization.

ANY QUESTIONS?

Financing models to scale sanitation coverage in Philippines



Tom Wildman
senior wash advisor for asia
oxfam gb

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Vigan
Tuguegarao
Luzon
Manila
Naga
Legazpi
Mindoro
Philippines
Malay
Isla han Samar
El Nido
Panay
Tacloban
Iloilo
Pulo ng Leyte
Puerto Princesa
Bacolod
Cebu
Negros
Pulo ng Bohol
Palawan
Cagayan de Oro
Sulu Sea
Mindanao
Davao
Zamboanga
Google
General Santos
Sandakan
Map data ©2016 Goo

Support to entire sanitation chain

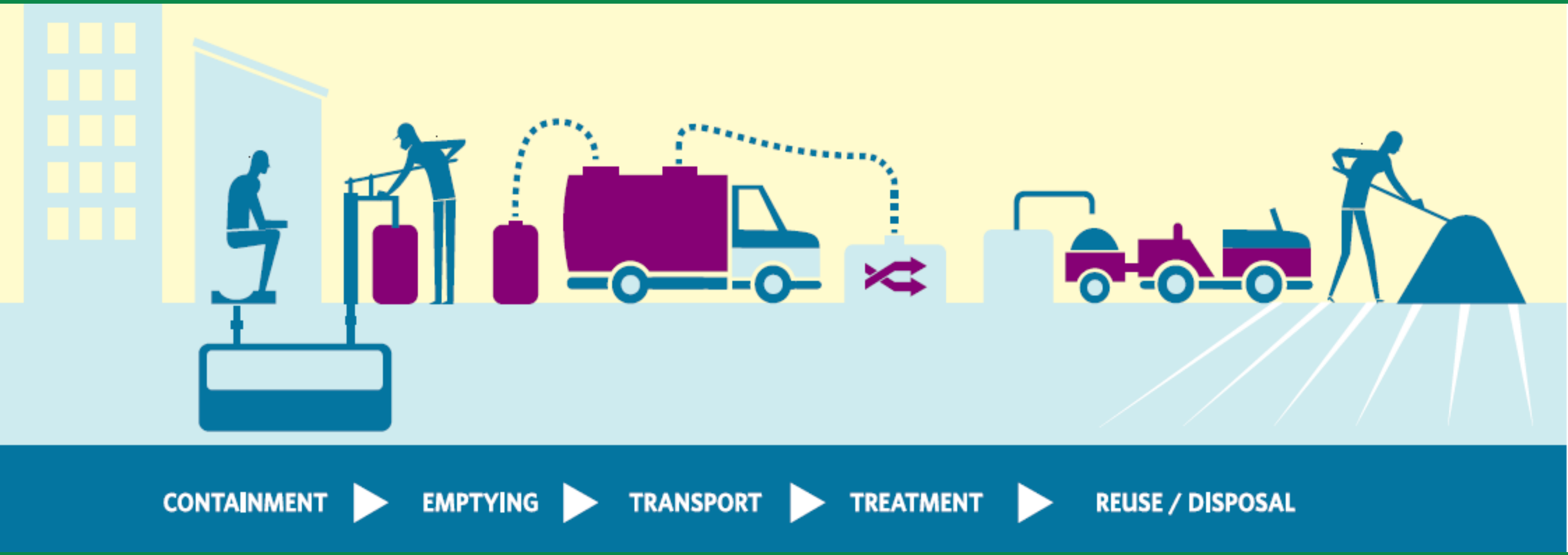

**Image taken from Water & Sanitation for the Urban Poor (WSUP), 2014*

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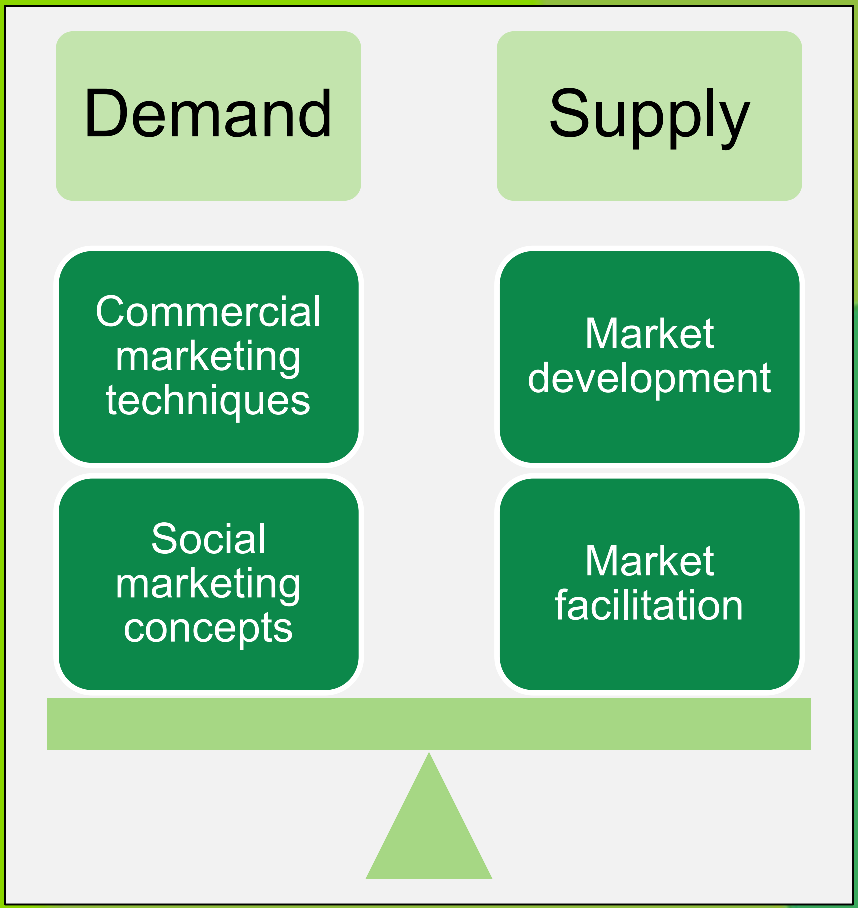
Sanitation marketing



social and commercial **marketing** approaches to scale up the supply and demand for improved **sanitation** facilities.

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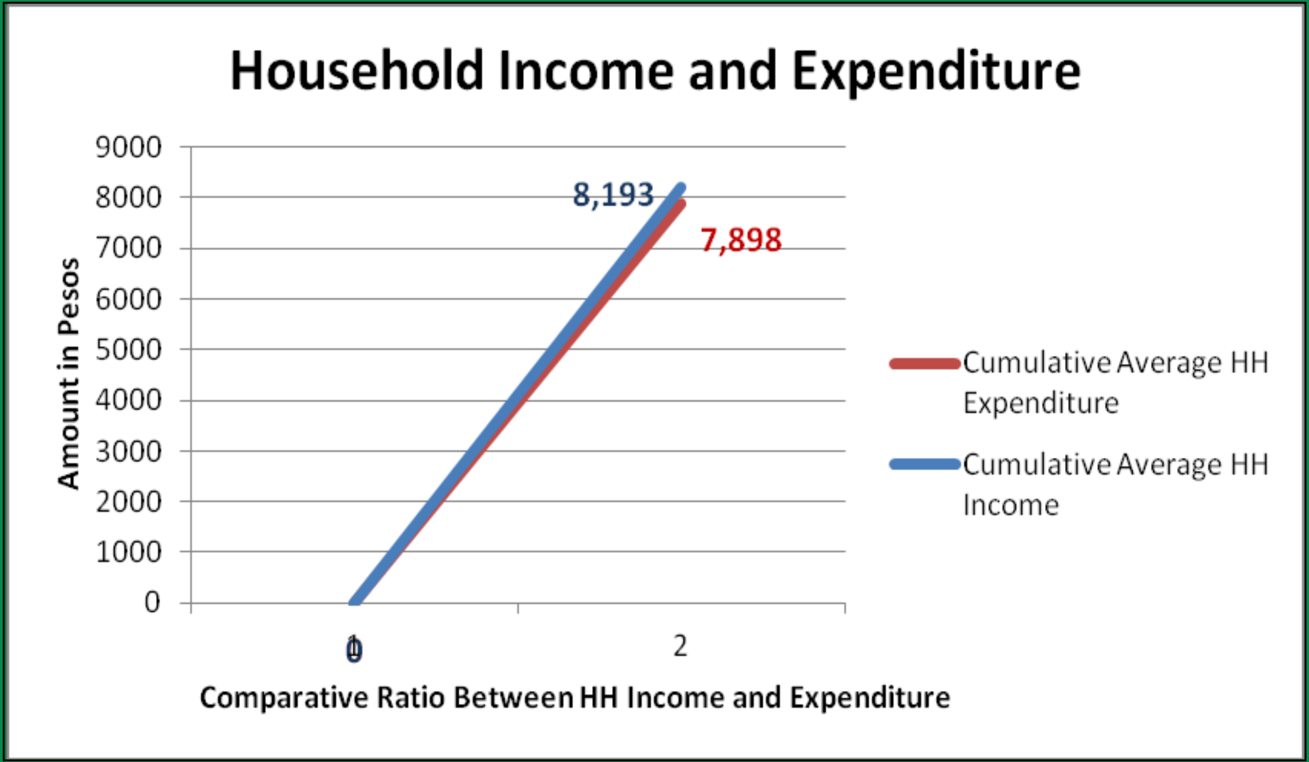
Barriers to HH Sanitation



Purchasing power

Access to pro-poor micro-finance

Low-cost options

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Support to Households

Home Toilet Construction Loan

DSWD
Department of Social Welfare and Development

Sanitation Savings Fund

CEBU PEOPLE'S COOP
SINCE 1972
Taking you Further, Starting Today.

Private MFI Subsidies

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Support to Entrepreneurs

WASH Enterprise Loan

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Top structures

AMAKAN
Wall material: Amakan
Roof material: Corrugated Galvanized Iron (CGI) Sheets
Price: PHP.

HALF CONCRETE
Wall material: Half Concrete, Half Plywood
Roof material: Corrugated Galvanized Iron (CGI) Sheets
Price: PHP.

PLYWOOD
Wall material: Plywood
Roof material: Corrugated Galvanized Iron (CGI) Sheets
Price: PHP.

Substructures

SEPTIC TANK
Materials: Concrete, PVC piping
Price: PHP.

CONTAINMENT CUBE
Materials: Concrete, PVC piping
Price: PHP.

CONCRETE RING
Size: 1 meter diameter, 4 feet deep
Materials: concrete, PVC piping
Price: PHP.

CONCRETE TOILET BOWL
Material: Concrete
Colour: White or depending on individual's preference.
Price: PHP.

Outcomes to date

Government subsidies to sanitation loans (appox 1,700 HHs)

3 pro-poor sanitation finance products by a MFI with a customer base of 45,000+ persons

Replication by municipal governments

Private Sector Influence

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Lessons learned

- Crux = Finance
- Loans aren’t for everyone...how to subsidize (and how NOT to subsidize)?
- Affordability without sacrificing standards
- Appropriate M&E
- Time frame
- Non-traditional WASH partners
- Internal Skill Sets
- Sustainability

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PEOPLE'S COOP
SINCE 1972
S.H.I.E.L.D PROGRAM
Sanitation and Hygiene Initiatives and Livelihood Development
Gibati mo ba ang kabalaka sa imong pamilya nga walay kasilyas nga kaplastaran nga luwas?
Mag KASILYAS LOAN sa Cebu People's Coop
kay kung may kasilyas ang pamilya sa bisan unsang oras walay kabalaka, nakatampo kapa sa kalimpyo sa komunidad, kaumahan, ug kabaybayunan.
Alang sa dugang kasayuran kontaka
Cebu People's Coop Bantayan Branch
B. Rodriquez St. Binaboo, Bantayan Island, Cebu
+63.32. 511 7447 | 0929 586 3159
OXFAM
44 YEARS IN LEADING THE BUSINESS OF REALIZING DREAMS
www.mycoop.ph

PEOPLE'S COOP
SINCE 1972
S.H.I.E.L.D PROGRAM
Sanitation and Hygiene Initiatives and Livelihood Development
Gibati mo ba ang kabalaka sa imong pamilya nga walay kasilyas nga kaplastaran nga luwas?
Sa PAGTIGOM sa Kooperatiba pag angkon ug kaugaligon nga kasilyas may kasulbaran na!
kay kung may kasilyas ang pamilya sa bisan unsang oras walay kabalaka, nakatampo kapa sa kalimpyo sa komunidad, kaumahan, ug kabaybayunan.
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Thank you

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ENSURING SOCIO-CULTURAL PERSPECTIVES INFLUENCE RESPONSES TO DISEASE OUTBREAKS

RECOMMENDATIONS FOR WASH ACTORS

SOPHIE T'KINT & MICHELLE FARRINGTON

MICHELLE FARRINGTON: PUBLIC HEALTH PROMOTION, OXFAM
EMERGENCY ENVIRONMENTAL HEALTH FORUM: 2016
KATHMANDU, NEPAL

OXFAM

BACKGROUND TO THE STUDY

OXFAM'S ROLE IN DISEASE OUTBREAKS:

- Supporting health facilities with water and sanitation
- Engaging communities to support preventative actions against disease transmission, enabling positive health seeking behaviour

ANALYSIS OF SOCIO CULTURAL PERSPECTIVES:

- Had we documented learning from failures, or good examples of programme adaptations based on socio-cultural perspectives?
- Had lessons learnt contributed to more effective responses?

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WHY ARE SOCIO-CULTURAL PERSPECTIVES IMPORTANT DURING DISEASE OUTBREAKS?

- Social Norms – the ‘rules’ of acceptable behaviour
- Practices – those accepted for the treatment or prevention of disease
- Socially defined-status – household, community or wider constructs of gender, age, caste or livelihood that impacts on vulnerability to disease
- Perceptions – collective or individual of risk to contracting and transmitting disease

Socio cultural perspectives have power over how an individual perceives their risk, and their options for treatment and protection

Responses themselves subvert or create socio-cultural perspectives

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THE STUDY:

8 Responses out of 14 selected for in-depth analysis

7 different countries: Primarily from Africa, but one response from Caribbean and one from the Pacific

Key informant interviews with 13 people (ex and current Oxfam staff)

THEMES:

- Disease Transmission and Treatment
- Religious Beliefs
- Fear, Mistrust, Myth and Rumour
- Perceptions of Vulnerability

Year	Location	Type of Epidemic
2006	Papua New Guinea	Cholera
2008-2009	Zimbabwe	Cholera
2010	Haiti	Cholera
2011	DRC	Cholera
2012	Sierra Leone	Cholera
2012-2013	South Sudan	Hepatitis E
2014-2015	Liberia	EVD
2014-2015	Sierra Leone	EVD

DISEASE TRANSMISSION AND TREATMENT

RECOMMENDATIONS

- Understanding the drivers for health seeking behaviour are not illness alone (cost, obligation, tradition and trust play a role)

- Focusing on the WHY of problematic behaviours, rather than only on the what.

'The link between water and health, and water's role as a curative or harmful agent, is important to practitioners encouraging water treatment as a preventative measure' Analysis of Socio Cultural Perspectives (2016)

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VULNERABILITY

RECOMMENDATIONS

- Undertaking a gendered epidemic analysis early on, and at regular intervals in the response

- Identifying those whose livelihoods leave them more vulnerable to transmission

- Focus on ‘making safe’ than prohibiting practices that will impact livelihoods

‘Women[‘s](…) care giving role places [them] in regular contact with the bodily fluids of children and other dependents, leaving them little choice to “Avoid Body Contact.” (…) One female survivor described having fallen sick (…) because of the critical social weight of women’s “sympathy” in caring for the sick and the dead. ’ M. Minor Peters(2015)

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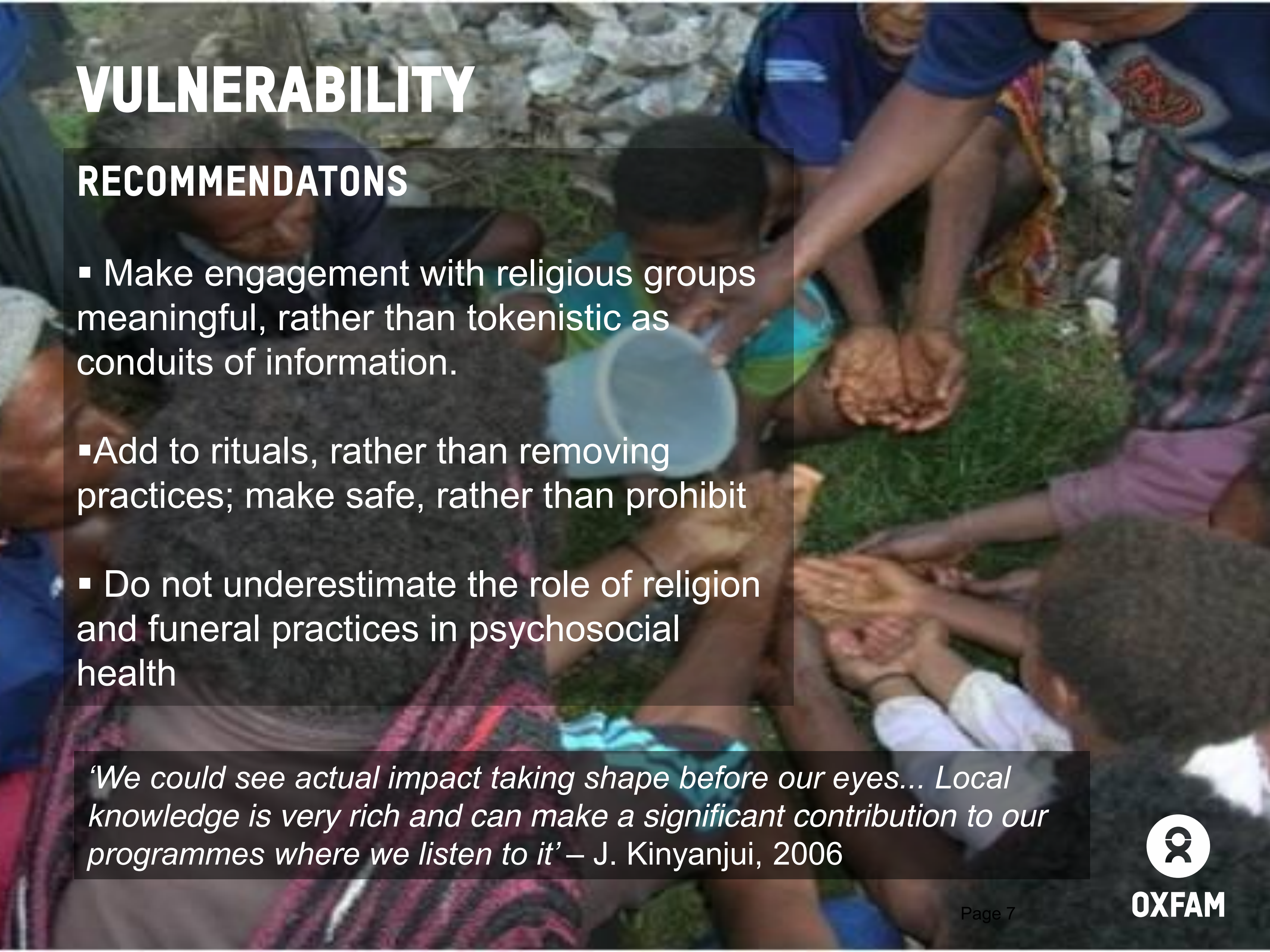

VULNERABILITY

RECOMMENDATONS

- Make engagement with religious groups meaningful, rather than tokenistic as conduits of information.

- Add to rituals, rather than removing practices; make safe, rather than prohibit

- Do not underestimate the role of religion and funeral practices in psychosocial health

‘We could see actual impact taking shape before our eyes... Local knowledge is very rich and can make a significant contribution to our programmes where we listen to it’ – J. Kinyanjui, 2006

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FEAR, DISTRUST, MYTH AND RUMOUR

RECOMMENDATIONS

- Use caution when considering the use of fear as a motivating factor
- Consider psychosocial impacts on populations associated with fear inducing language
- Determine trusted representatives for information dissemination

‘”The people are scared, they are scared the ambulance will come, they will spray you with chlorine and you will die right there, or you will go for treatment and never come back. They said there is no cure, so why would we get in that car (ambulance) and go some place only to die?’” – Female focus group discussion participant (Carter, S. *et al.*, 2015)

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WHAT'S NEXT?

Phased | Agile | Dynamic

- Phasing is important; a realistic approach focusing on rapid gendered analysis to determine high risk groups early on
- Epidemiological analysis in terms of persons affected, places where cases are high and the timeline of cases to better target responses
- Building on understanding using iterative community dialogue and adapting programmes based on this understanding to develop trust and effectiveness
- Retaining a sense of reflexivity about how the programme impacts on socio cultural perspectives

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SYSTEMATISING THE RECOMMENDATIONS

- Embedding health responses within a framework for community engagement
- Developing a toolkit
- Monitoring and reporting guides for teams to implement and test recommendations
- More documentation of positive examples

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THANK YOU

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EMAIL: MFARRINGTON@GHT.OXFAM.ORG

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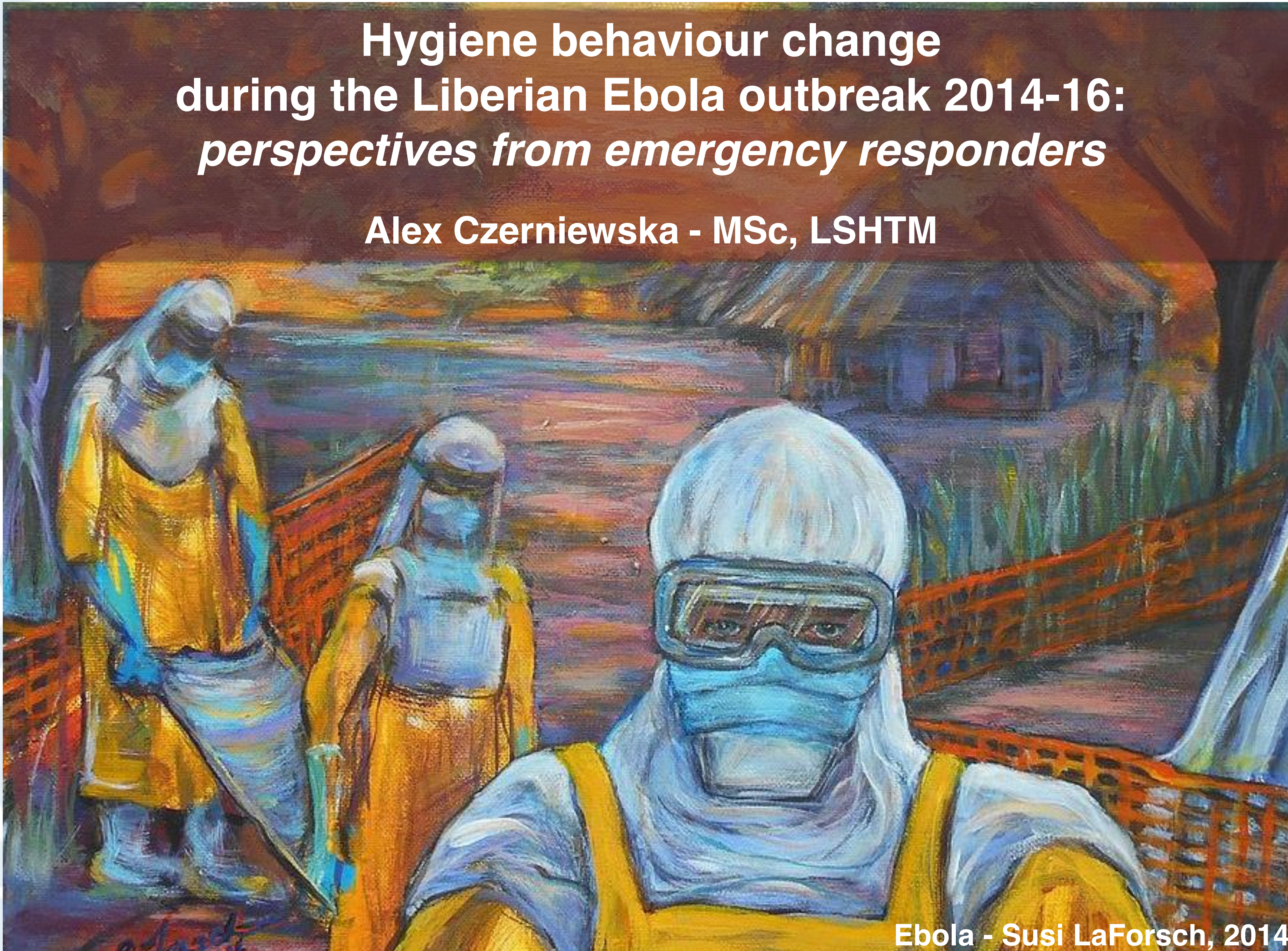
Hygiene behaviour change during the Liberian Ebola outbreak 2014-16: *perspectives from emergency responders*

Alex Czerniewska - MSc, LSHTM



Ebola - Susi LaForsch, 2014

Research aims

- Nature of hygiene promotion programmes
- Communities and health workers
- Handwashing, safe burials, reduced touching

LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

Research questions

1. What factors influenced the choices international responders made about hygiene behaviours and intervention design?

1. What did responders perceive to have been the main determinants of hygiene behaviour during the Ebola outbreak?

LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

Starting points - reflexivity

- ‘Accidental humanitarian’
- Heavy criticism of the response
- Evidence mismatch

Methods

- Small, purposive sample of 14 participants
- In depth, semi structured interviews by Skype
- Offered confidentiality
  - 9 NGOs, 3 UN agencies, 2 government agencies
  - 7 WASH/ IPC specialists, 1 communications specialist, 6 generalist
  - Senior in organisations
  - Designing, funding or implementing interventions aiming to change hygiene behaviours during Ebola.
- Thematic analysis of transcripts

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Results

- Provision of materials and educational messaging main interventions
- No expectation to plan interventions systematically or with reference to behaviour change theory

‘It was a true time of crisis and there was not a lot of time to think about the approach to how to get people to do the right behaviour. It became ‘this is what you have to do’, not ‘how do we do this together to get the right outcome?’

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Results

1. Role of fear as motivator
2. Creation of social norms
3. Formative research?
4. Translating research into practice – challenges for outbreaks

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1.Fear

‘Fear played a very big role’

‘Everyone was afraid; if I don’t do it I’m going to die’

Unpredictable

*At first the message was 'Ebola Kills' so everybody was supposed to be waking up saying 'oh my god' [...] '**there is no alternative so why are you telling me even to wash my hands** or report to the facility?'*

'Because of the fear, people were putting a lot in the water – Dettol, chlorine, soap''

2. Social norms

'I think there's a strong human behaviour of ***peer pressure*** *and if you see everybody else doing it then you're going to be like, ok well I should do this too… I'm going to be* ***ashamed*** *if I don't'*

3. Formative research?

Mural at old Ministry of Health
Photo: Tim Hetherington
200

- Time
- Sustainability

> *'People came in at the beginning and just 'posterised' walls and radio messages as* ***'this is how to stop Ebola' instead to saying 'this is good hygiene practice,*** *this stops all diseases, not just Ebola''*

- Uniform messaging

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EBOLA MUST GO
Stopping Ebola is Everybody's Business

‘Ebola Kills’
March – June 2014

‘Ebola is Real’
July – October 2014

‘Ebola Must Go’
October 2014 - present

Jan 2014 | March | May | July | Sept | Nov | Jan 2015 | Mar | May | July | Sept | Nov | Jan 2016 | Mar

*‘If counties were having different messages, it would cause a **confusion**.’*

*‘People don’t change at the same time... but now you **take the risk of ensuring that everyone is on the same planet** ’*

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4. Translating research into policy

- Priority for epidemiological evidence
- Organisational differences

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'We were so worried that we didn't have any evidence, we didn't know whether handwashing with soap vs. washing with chlorine was better. [...] technical experts were going in circles 'cause they didn't have papers to look at and the ones that were there were fuzzy'

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Organisational philosophies

*‘In communities which were **really empowered** and took on that responsibility they were monitoring themselves and took on the responsibility for putting buckets everywhere’*

*‘The **public shaming piece is not something we would ever want to condone**; however, we have seen that there is a lot of evidence that it is successful in many settings including here in Liberia. We would usually take more of **a compassionate approach’***

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Summary of findings

- Provision of materials and educational messages were prioritised over more novel methods based on evidence from stable settings
- More 'formative research' could have improved interventions – e.g. better understanding of how fear and social norms/affiliation drive behaviour change
  - BUT barriers include time constraints, short term outcomes and desire for uniform messaging for all
- Barriers to implementing future research findings include
  - Prioritization of epidemiological certainty
  - Organisational philosophies difficult to reconcile.

Acknowledgments

Study participants

London School of Hygiene and Tropical Medicine

Liberian National Educational Review Board

Liberian Ministry of Health

Clinton Health Access Initiative, Liberia

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WASH Interventions in Emergencies: Two Systematic Reviews

Travis Yates

Tufts University

Emergency Environmental Health Forum

Kathmandu, Nepal November 2016

Tufts University

School of Engineering

Evidence

Best Practice

Experimental

Lack of Evidence

RESEARCH ARTICLE

The Impact of Water, Sanitation and Hygiene Interventions to Control Cholera: A Systematic Review

Dawn L. Taylor[1,2], Tanya M. Kahawita[1], Sandy

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14, 1001 EA, Amsterdam, The Netherlands

* jeroen.ensink@lshtm.ac.uk

RESEARCH ARTICLE

Evidence on the Effectiveness of Water, Sanitation, and Hygiene (WASH) Interventions on Health Outcomes in Humanitarian Crises: A Systematic Review

Anita Ramesh[1]*, Karl Blanchet[1], Jeroen H. J. Ensink[2], Bayard Roberts[3]

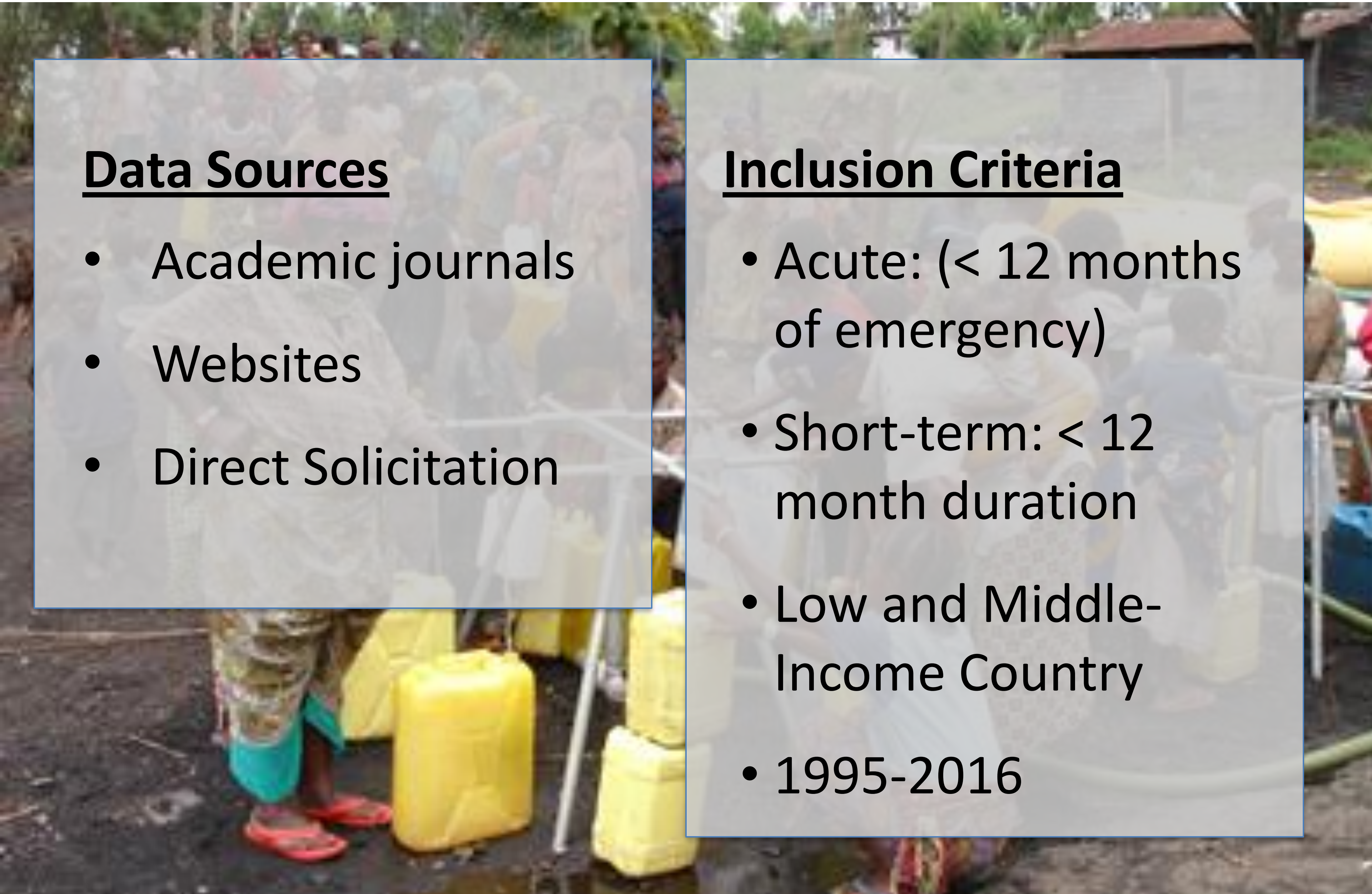
1 Department of Clinical Research, Faculty of Infectious Tropical Diseases, London School of Hygiene & Tropical Medicine, London, United Kingdom, 2 Department of Disease Control, Faculty of Infectious Tropical

- Focus on Household Water Treatment

Systematic Review of *Practical* Evidence

	Ideal	Practical
Source	Published	**Non-published (grey lit)**
Evaluation	Experimental	**Non-experimental & Qualitative**
Outcomes	Health	**Multiple – Use, Preferences, Economic, Barrier and Facilitators**

Methods



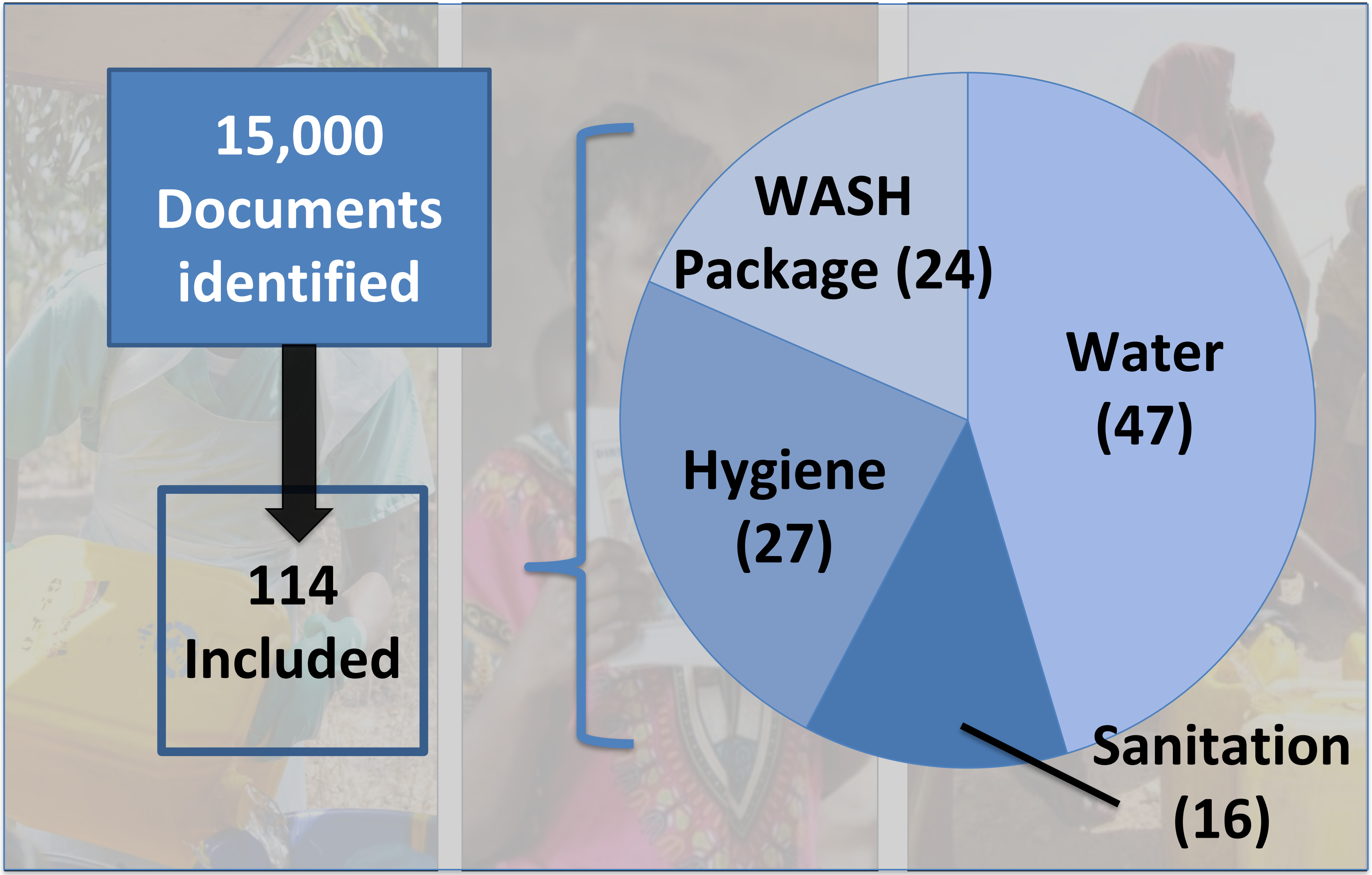
Data Sources

- Academic journals
- Websites
- Direct Solicitation

Inclusion Criteria

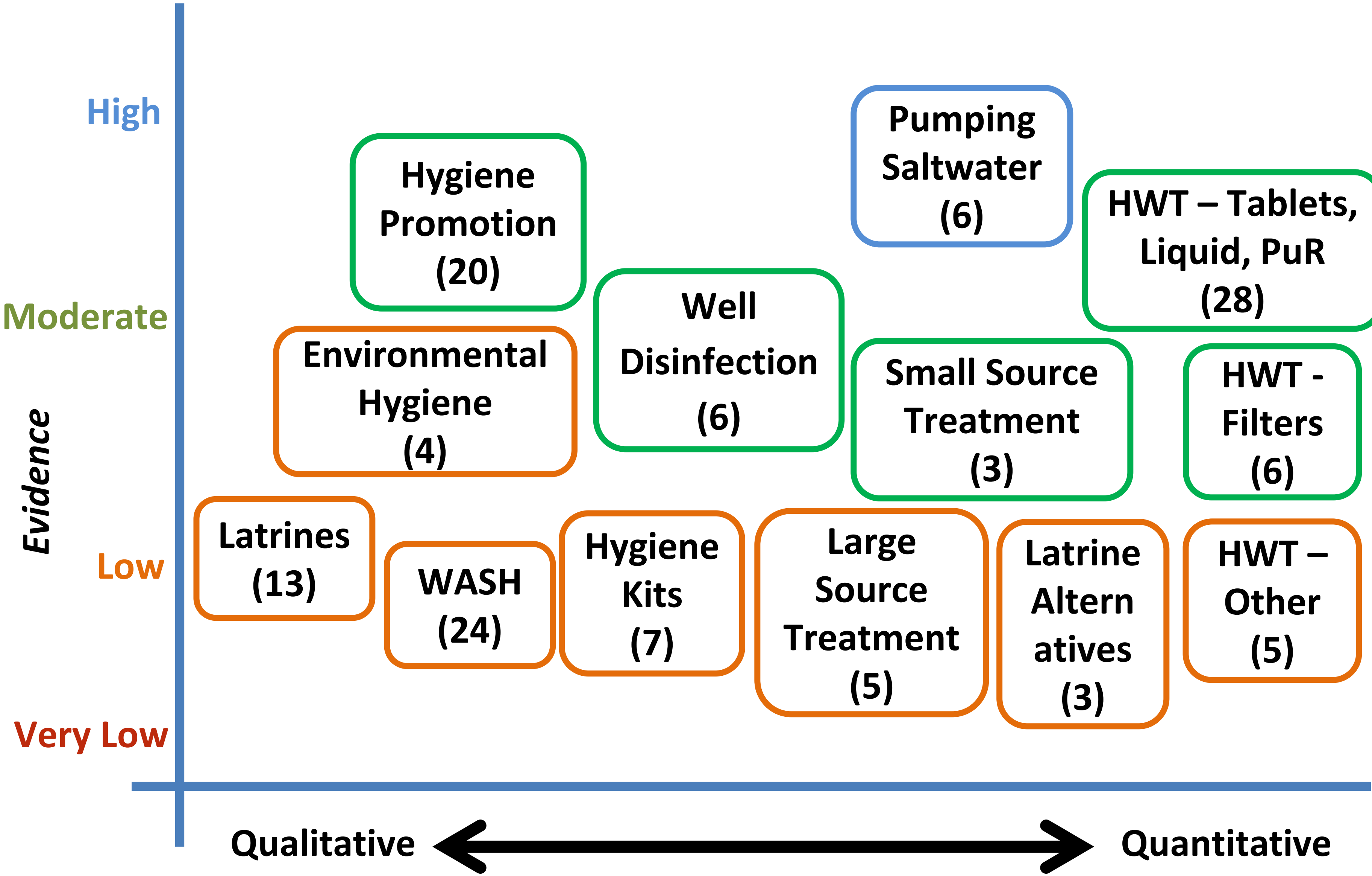
- Acute: (< 12 months of emergency)
- Short-term: < 12 month duration
- Low and Middle-Income Country
- 1995-2016

Results

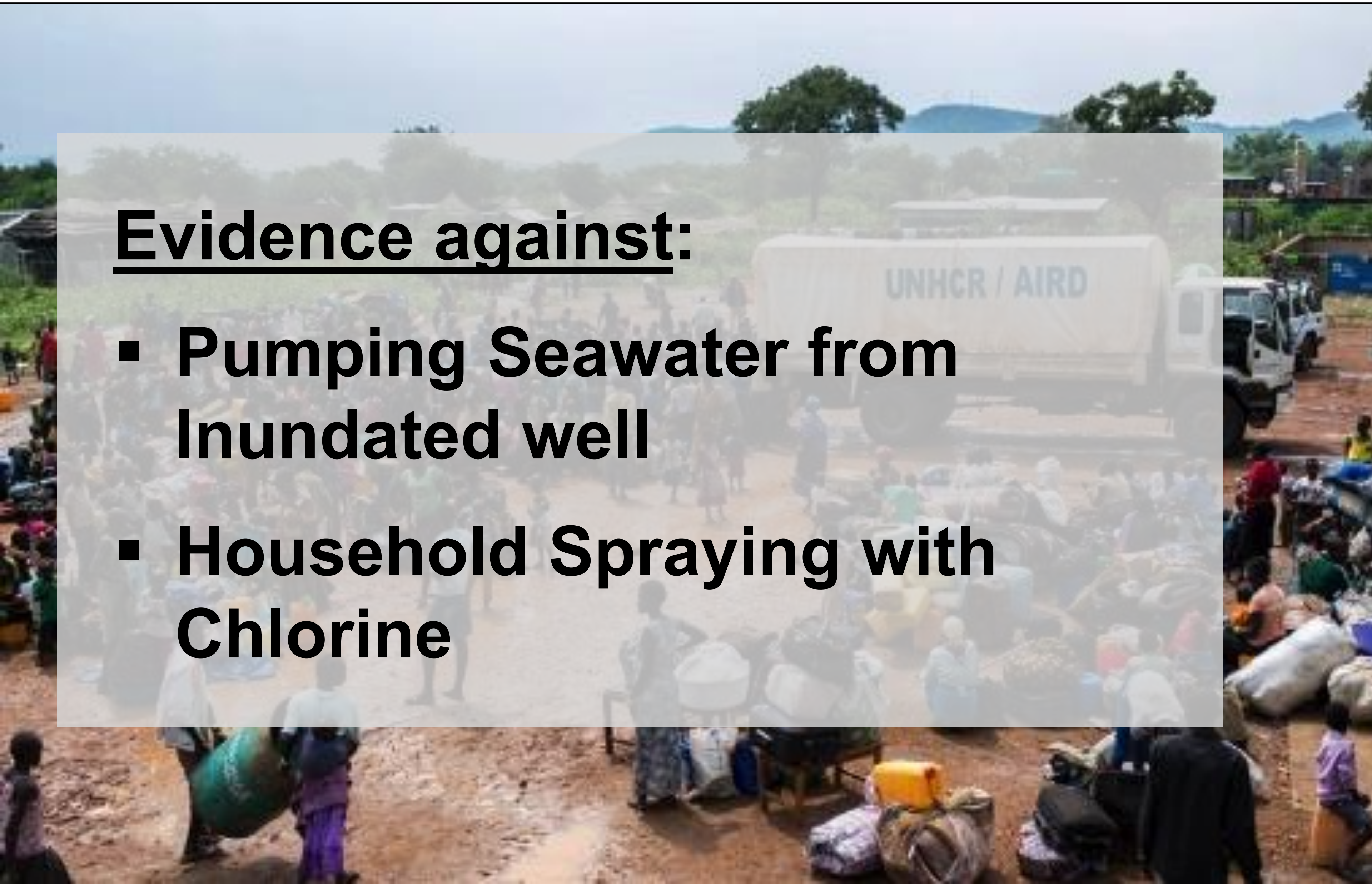


15,000 Documents identified
114 Included
WASH Package (24)
Water (47)
Hygiene (27)
Sanitation (16)

Results: 13 Interventions



Implications



Evidence against:

- **Pumping Seawater from Inundated well**
- **Household Spraying with Chlorine**

Key Findings: Project Characteristics

- **Simple**
- **Timing/Prepositioning Stock**
- **Community Driven**
- **Links with Development**

Key Findings: Beneficiary Preferences

- **Taste and Smell of HWT**
- **Receiving Hygiene Messages**
- **Open Dialog with Communities**

Conclusions

- **Evidence remains *Low* and *Lacking***
  - **Gaps:** water trucking, bucket chlorination, handwashing, economic analysis
  - **Consistent reporting > research designs**
- **No *perfect* WASH solution**

Acknowledgements

Thank you to the organizations and individuals who contributed grey literature documents that were critical to this review.

Action Contre la Faim (ACF), in particular, made significant contributions to advance this review.

Acknowledgements

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Tufts
UNIVERSITY
School of
Engineering

Thank you.

travis.yates@tufts.edu

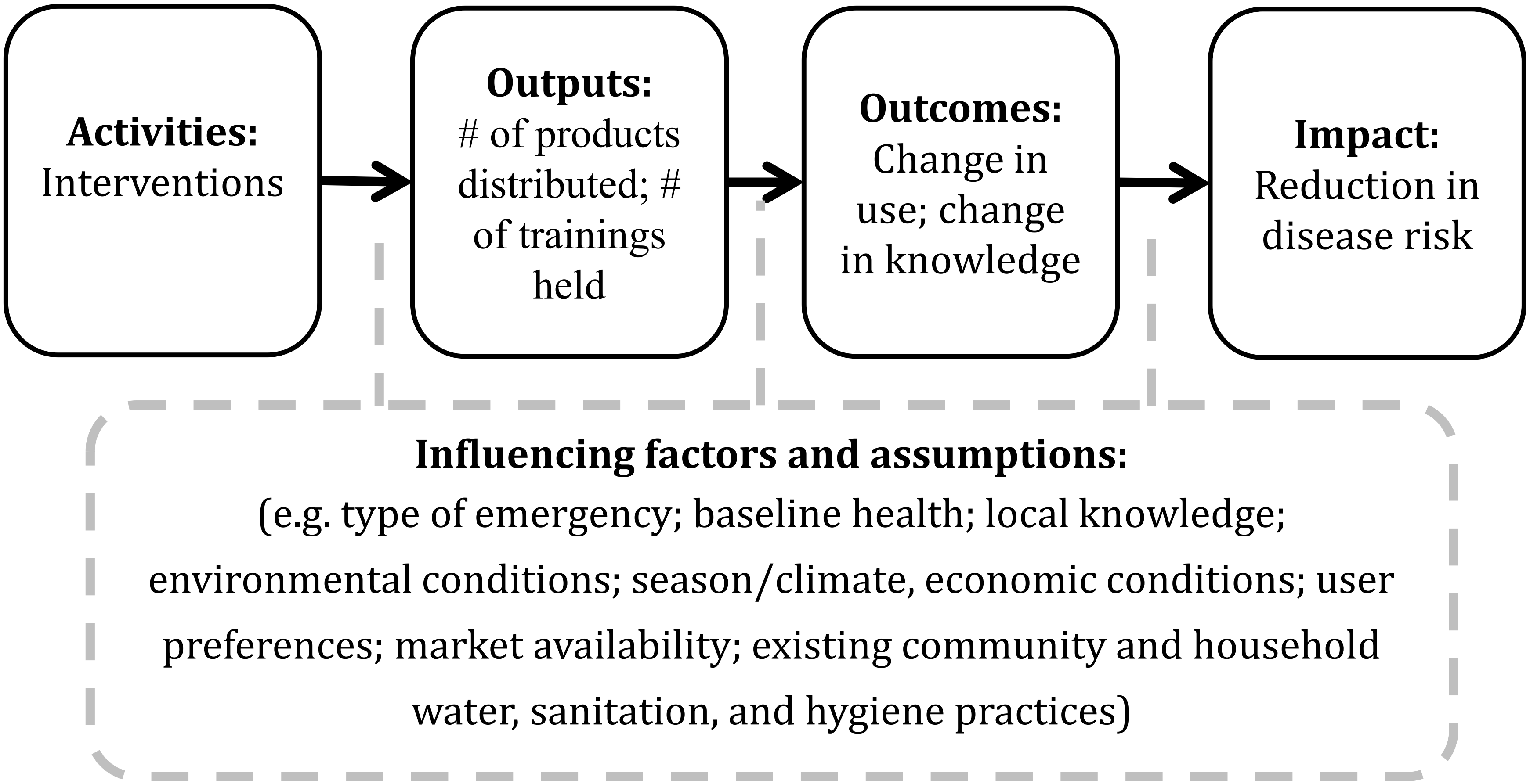
Both reports will be **freely available** for download:
WASH in Emergencies: www.3ieimpact.org and
WASH in Outbreaks: www.oxfam.org.uk/hep

A research grant to find evidence that evidence-based research for policy makers is used by policy makers to make evidence-based policy.

- JadedAid

Tufts UNIVERSITY
School of Engineering

Theory of Change



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