Schweizerische Eidgenossenschaft
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Swiss Agency for Development and Cooperation SDC

WASH Cluster
Water Sanitation Hygiene

9TH EMERGENCY ENVIRONMENTAL HEALTH FORUM (EEHF)

18-19th June 2019 GENEVA, SWITZERLAND

THEME: Disease Outbreaks and Their Control

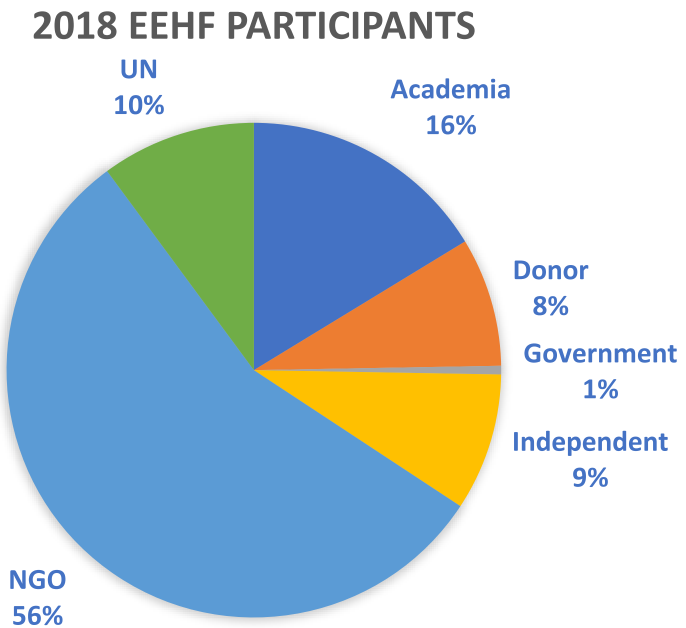
- Originates from the Interagency Group to encourage public health focus and academic rigour in evaluations

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

Participants

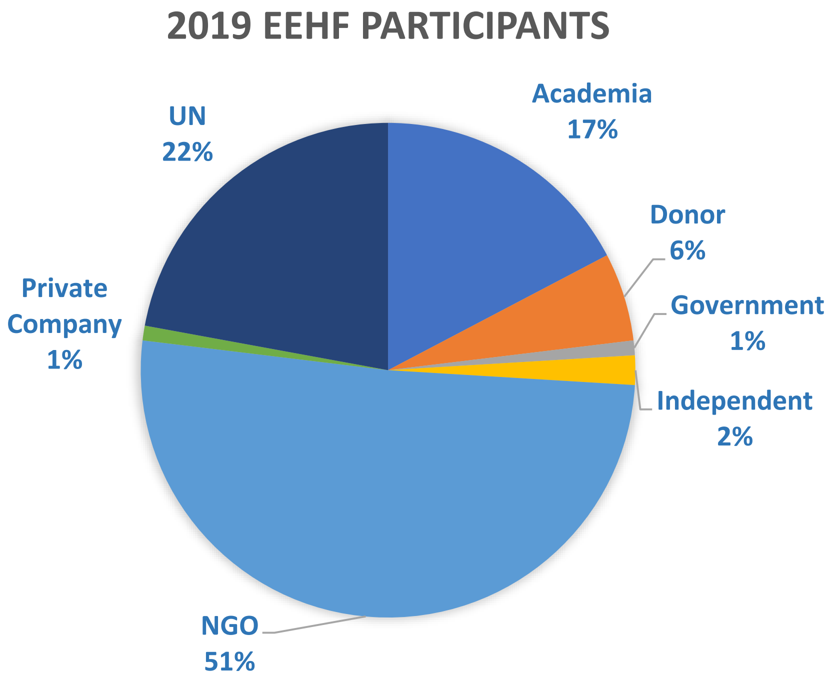
2018 EEHF:

- 178 participants



2019 EEHF:

- 110 participants



Expectations

- Encourage note taking and questions
- Encourage you to leave other work for another day
- Conference report, abstracts, presentations & posters will be shared after EEHF
- Photo taking and audio recording
- Rapporteur- Astrid Thorseth
- Please give your name and organisation with each question / comment

Participant balance

Gender: presenters

18 women / 11 men

Gender: participants

Age

Countries

House Rules

- Tea & Coffee
- Toilets
- Cigarettes
- 10 mins presentations + 5 mins for clarifications
- **#EEHF2019**
- **#RESEARCHINTOACTION**
- **#EMERGENCYWASH**

Sli.do

- Questions during panel discussions
- Questions in the evaluation
- 1. Connect to wifi: “Conference” no password needed
- 2. Type **slido.com** into phone or laptop browser
- 3. Enter **#GWC19**
- Questions and poll functions: active in sessions
- Ask Lauren / Johannes if you cannot access

Key Note Speaker: Dominique Legros

Capacity of the WASH sector in epidemic and pandemic response

Jeff Fesselet- MSF

Claudio Deola- Save The Children

Eva Niederberge- Oxfam

Monica Ramos- GTFCC/UNICEF

Linda Doull- Global Health Cluster

Questions for the panel

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

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

- Acknowledging that we need to improve our response to epidemics and pandemics, what actions should be prioritised or should already be in action among NGOs, NPOs, and the UN agencies?

- And what else can help create a facilitating environment:
  - Do we need new partnerships among NGOs and UN agencies, new research or new thinking?

Disease Outbreaks and Their Control
Emergency Environmental Health Forum
18-19 June 2019
Geneva, Switzerland

Day 2 - 18 June 2019

		Session	Presenter	Organisations/s	Chair	Time
13:00		**Registration Opens and Coffee**				*01:00*
14:00		Opening Address: to include the EEHF's Institutional framework (IAG), objectives of forum, summary of upcoming sessions, research questions and housekeeping	*Andy Bastable*	Oxfam		*00:15*
14:15		Key note speech	*Dominique Legros*	Global Task Force for Cholera Control (GTFCC)		*00:30*
14:45		**Panel discussion**: Capacity of the WASH sector in epidemic and pandemic response	*5 Panellists*	TBA	*Dominique Porteaud*	*00:30*
15:15		**Plenary 1: Cholera- elimination, prevention and preparedness**			*Robert Fraser*	
		Cholera hotspots: bridging outbreak response to long term investment in cholera control and elimination	*Kate Alberti*	GTFCC		*00:15*
		Cholera in Yemen: a case study of preparedness and response in a conflict-affected state	*Ruwan Ratnayake/ Daniele Lantagne*	LSHTM & John Hopkins & Stanford University		*00:15*
		Questions and discussion 15 minutes				*00:15*
16:00		***Coffee***				
16:15		**Plenary 2: Handwashing, acceptability of interventions and community engagement**			*Sunny Guidotti*	
		Determinants of handwashing behaviour: a summary of evidence from stable settings, outbreaks and crises	*Sian White*	LSHTM		*00:15*
		Improving children's handwashing through play: a proof-of-concept study in an IDP camp, Iraq	*Julie Watson*	LSHTM & Save The Children		*00:15*
		The Supertowel: assessing the efficacy and acceptability of a novel soap alternative for humanitarian crises	*Torben Larson*	Real Relief & LSHTM		*00:15*
		Community engagement during the Ebola outbreak, North Kivu, DRC 2018 – listening to and advocating for community priorities	*Eva Niederberger*	Oxfam		*00:15*
		Questions and discussion 15 minutes				*00:15*
17:30		***Close***				
17:45-19:30		***Side Event – Engagement with the Private Sector – Venue TBC***				*01:30*

Day 3 - 19 June 2019						
		Topic	**Presenter**	**Organisations/s**	**Chair**	**Time**
09:00		**Opening of Day 2**				*00:30*
09:30		**Plenary 3: Cholera- control and containment of outbreaks**			*Emma Tuck*	
		Monitoring and evaluation of rapid response teams: a global review and case study from the 2018 cholera outbreak in Harare, Zimbabwe	*Anu Rajasingham & Monica Ramos*	CDC & UNICEF		*00:20*
		Effectiveness evaluation of household spraying in cholera outbreaks	*Karin Gallandat*	Tufts		*00:15*
		A process evaluation of the implementation, context and mechanisms of impact of hygiene kit distribution during a cholera outbreak in Kasaï-Oriental, Democratic Republic of Congo	*Lauren D'Mello-Guyett*	LSHTM & MSF		*00:15*
		Questions and discussion 10 minutes				*00:10*
10:30		***Coffee***				
11:00		**Plenary 4: Hepatitis E and Vector Control**			*Nick Brooks*	
		VIRWATEST and Faircap: towards preventing waterborne viral outbreaks in humanitarian contexts	*Silvia Bofill-Mas*	University of Barcelona & Faircap		*00:15*
		Functionality and user acceptance of a family vector control response kit	*John Thomas*	UNICEF & Mentor Initiative & KEMRI		*00:15*
		Impact of indoor use of attractive toxic sugar baits on malaria vectors in DRC	*Maite Gardiola*	MSF		*00:15*
		Questions and discussion 15 minutes				*00:15*
12:00		***Poster presentations***				*01:00*
13:00		***Lunch***				*01:00*
14:00		**Plenary 5: Faecal sludge management and sanitation**			*Liz Walker*	
		Comparison of the different FSM plants in Cox's Bazar, Bangladesh	*Andy Bastable & Anna Grieve*	Arup & Oxfam		*00:15*
		A collapsible septic tank kit to improve sanitation in emergency camps	*Thorsten Reckerzügl*	BORDA		*00:15*
		Reducing risk of water related disease through sustainable sanitation solutions in Bangladesh	*Ryan Schweitzer*	UNHCR		*00:15*
		Women focused sanitation research to changes in practice	*Andy Bastable*	Oxfam		*00:15*
		Questions and discussion 15 minutes				*00:15*
15:15		***Coffee***				
15:45		**Plenary 6: Household water treatment and safe storage**			*Kit Dyer*	
		Chlorine tablet use for household water treatment in emergencies: development and field piloting of tablet selection guidelines	*Marlene Wolfe/ Daniele Lantagne*	Tufts		*00:15*
		Efficacy of jerrican disinfection methods	*Gabrielle String*	Tufts		*00:15*
		Evaluation of the effectiveness of bucket chlorination in outbreaks and emergencies: case studies from Bangladesh, DRC and Haiti	*Anu Rajasingham & Gabrielle String*	CDC & Tufts		*00:20*
		Questions and discussion 10 minutes				*00:10*
16:45		**Panel discussion**, closing Remarks and plan for 2020 Emergency Environmental Health Forum	4 panellists at a top table	TBA		*00:30*
17:30		***Close***				

Evaluation of 2019 and plans for 2020 EEHF

- How much did you get out of this years EEHF?
- What works well?
- What could be improved / changed?
- What is the best length of time for an EEHF?
- Theme for next year?
- Can we increase the fee?

- Join **slido.com** for your responses and access with **#GWC19**

Disease outbreaks and their control

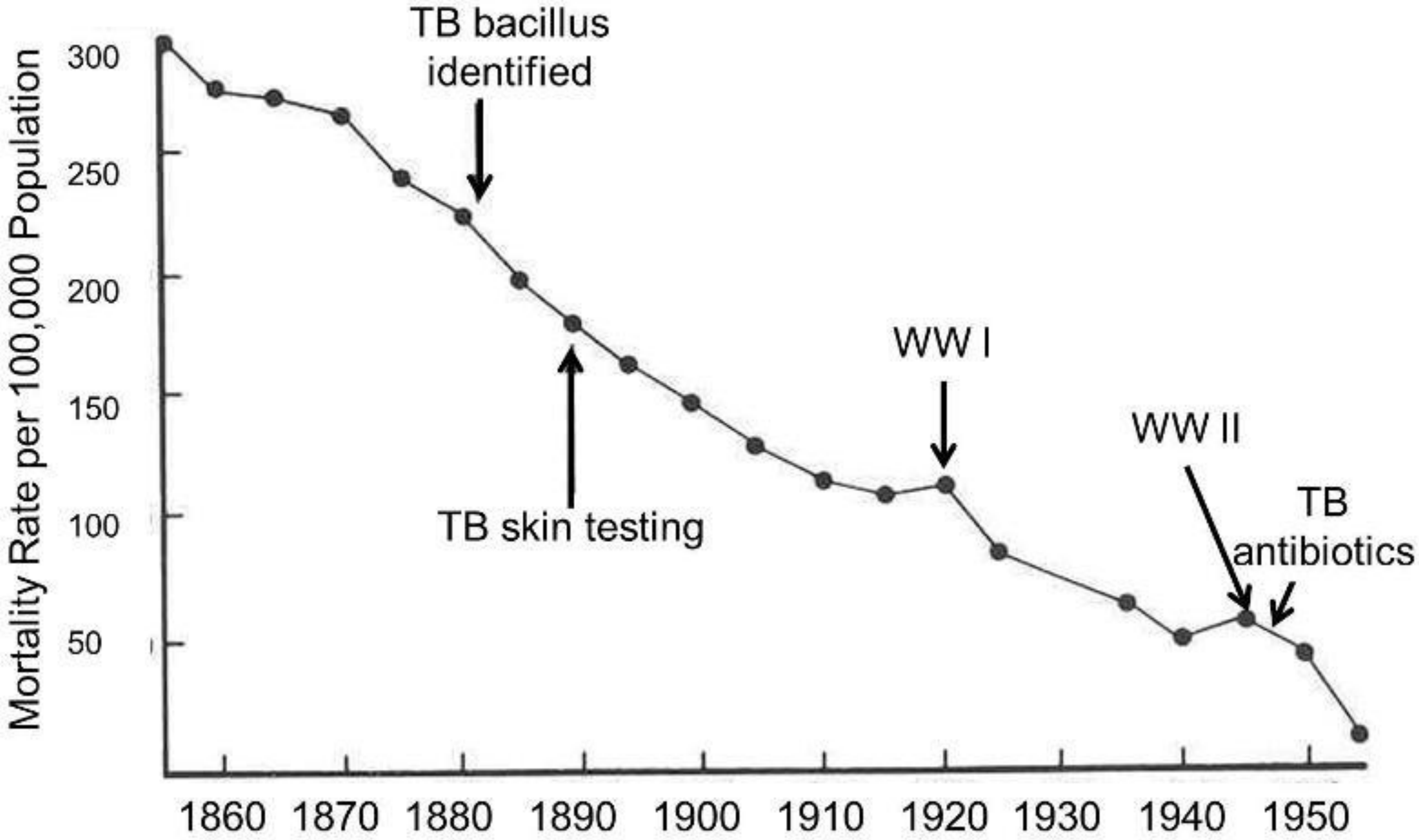
Dr Dominique LEGROS

Photo: WHO

Control of Outbreaks of infectious diseases in the Northern hemisphere

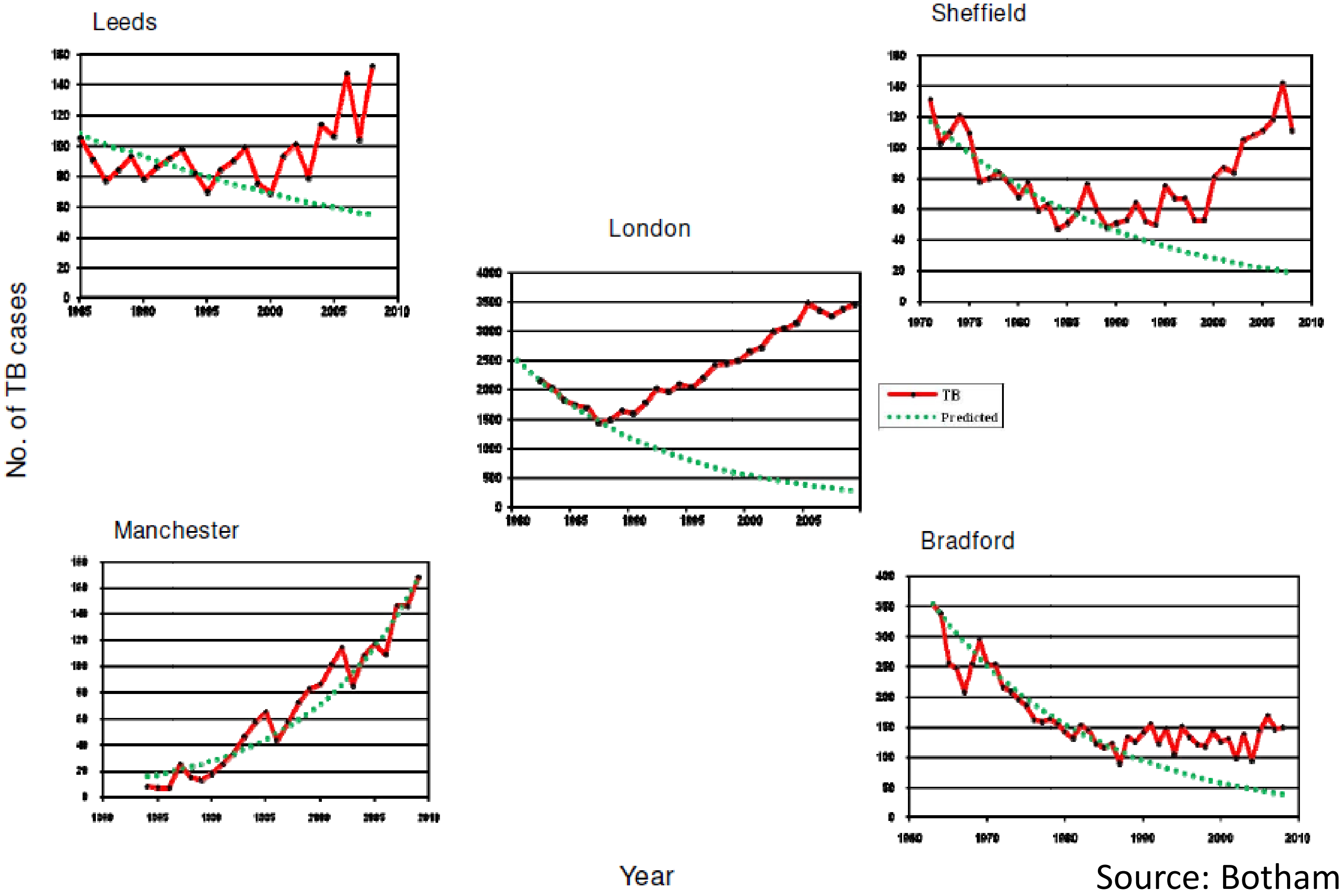
- Advances in diagnostic and health care practices
- Development of vaccines and antimicrobial agents
- Early warning systems, for a quick response and containment
- Implementation of prevention programmes
- Investments in water, sanitation and public health systems

Annual Mortality from Pulmonary Tuberculosis in England and Wales, 1855- 1955



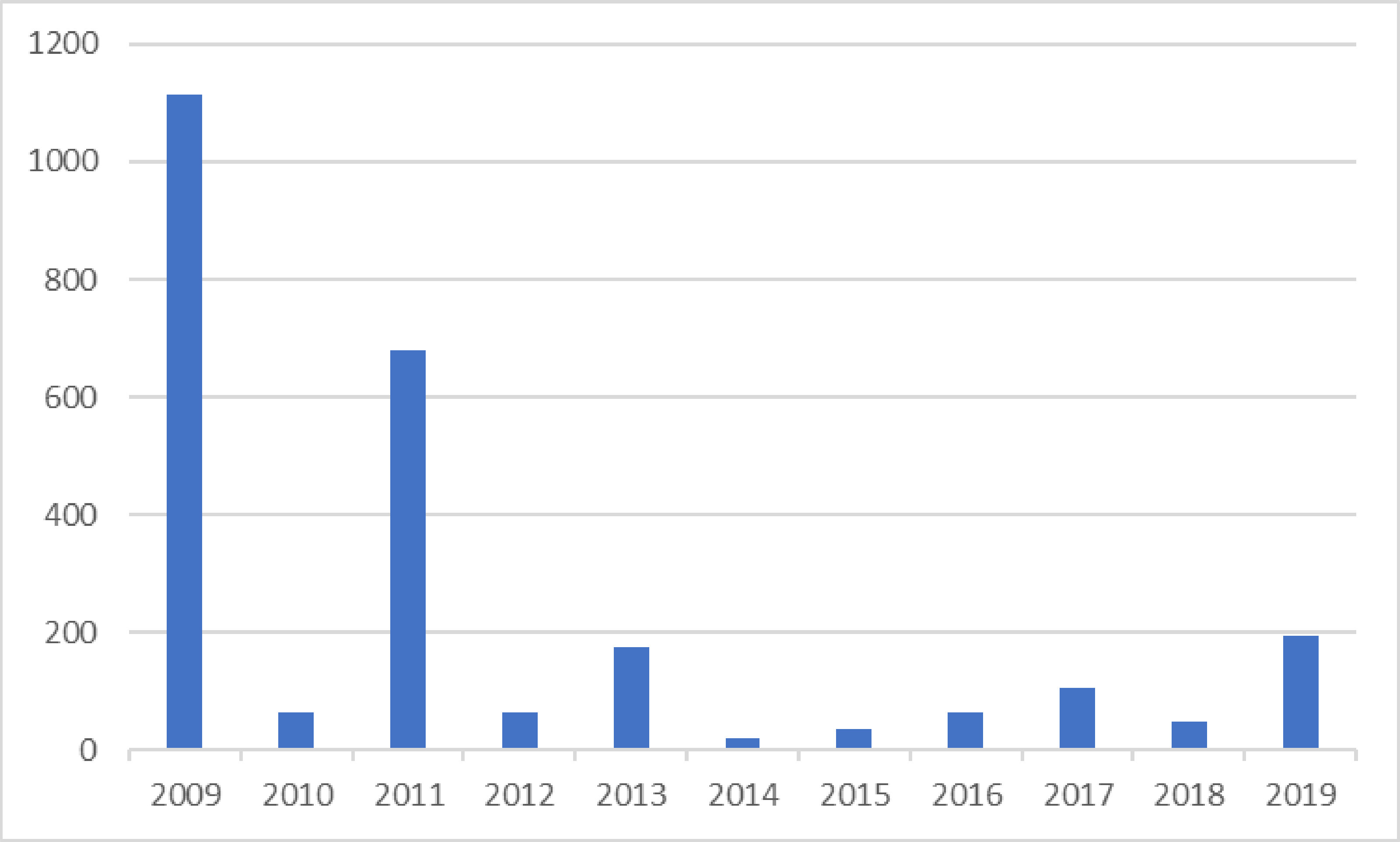
Source: Boston University School of Public Health

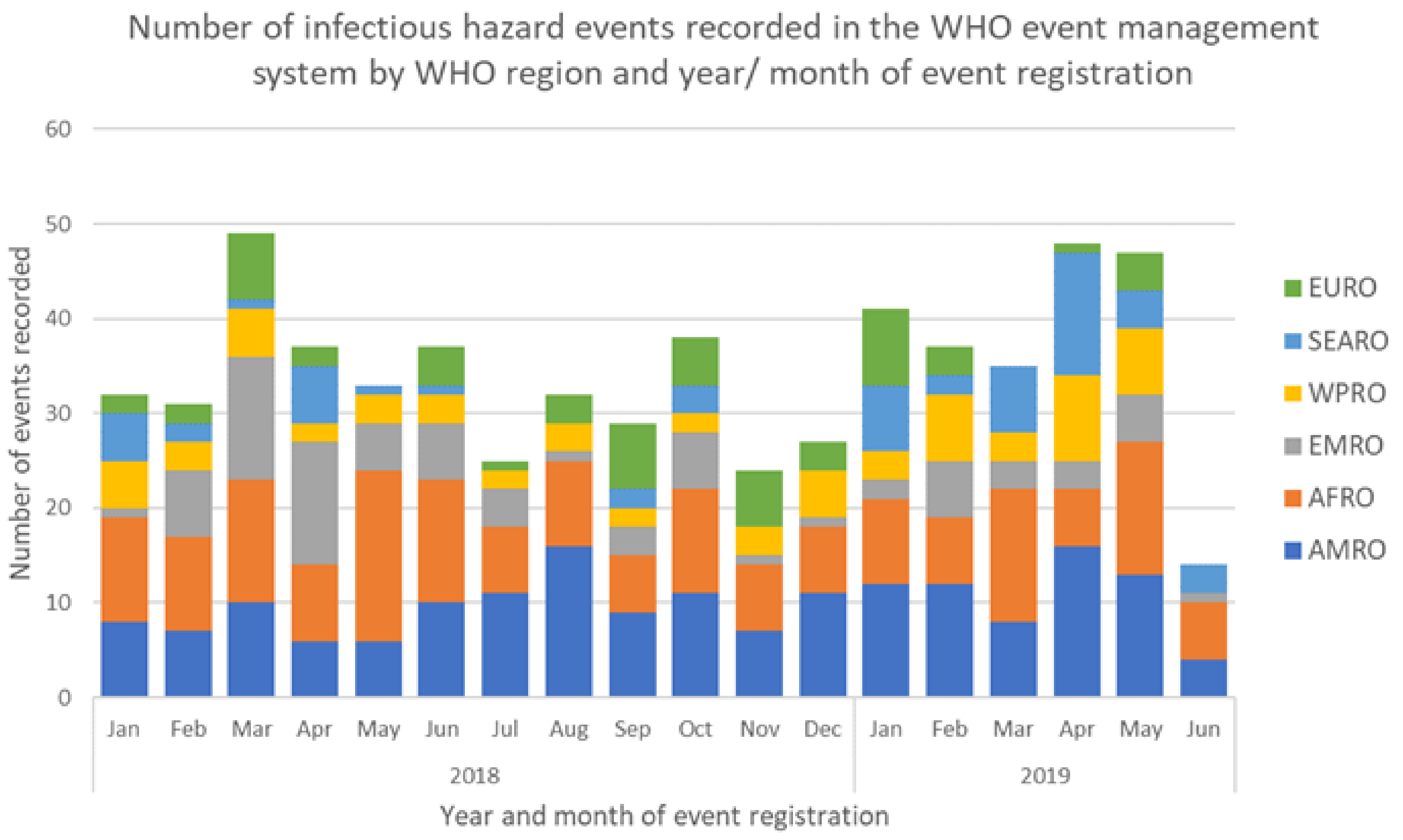
Tuberculosis cases, UK cities, 1960 – 2010



Source: Bothamley et al. BMC Public Health 2011

Cases of measles reported per year, Switzerland



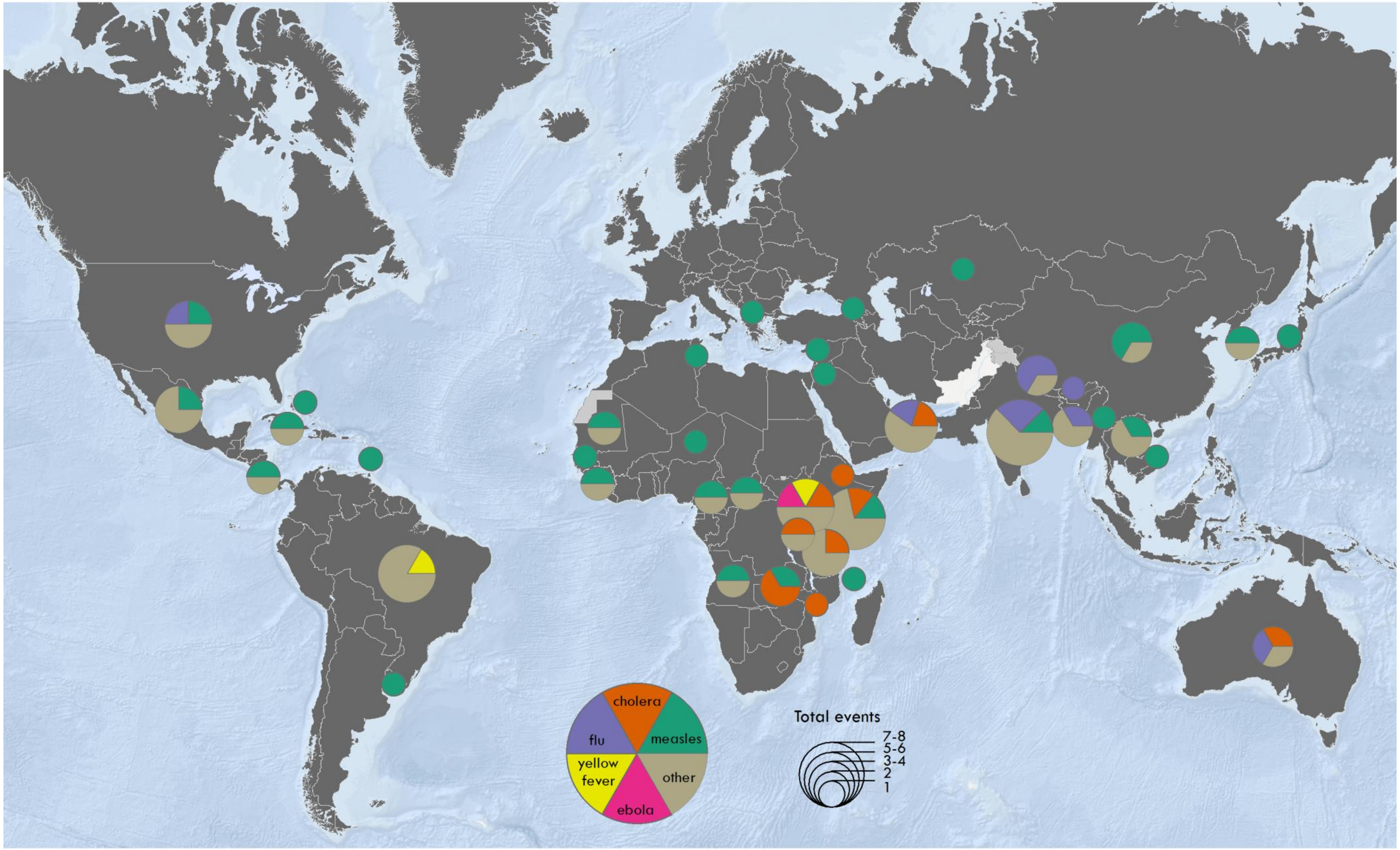


Number of infectious hazard events recorded in the WHO event management system by WHO region and year/ month of event registration
Number of events recorded
0
10
20
30
40
50
60
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
2018
2019
Year and month of event registration
EURO
SEARO
WPRO
EMRO
AFRO
AMRO

New infectious events reported in 2019 by country

World Health Organization

Map date: 17 June 2019

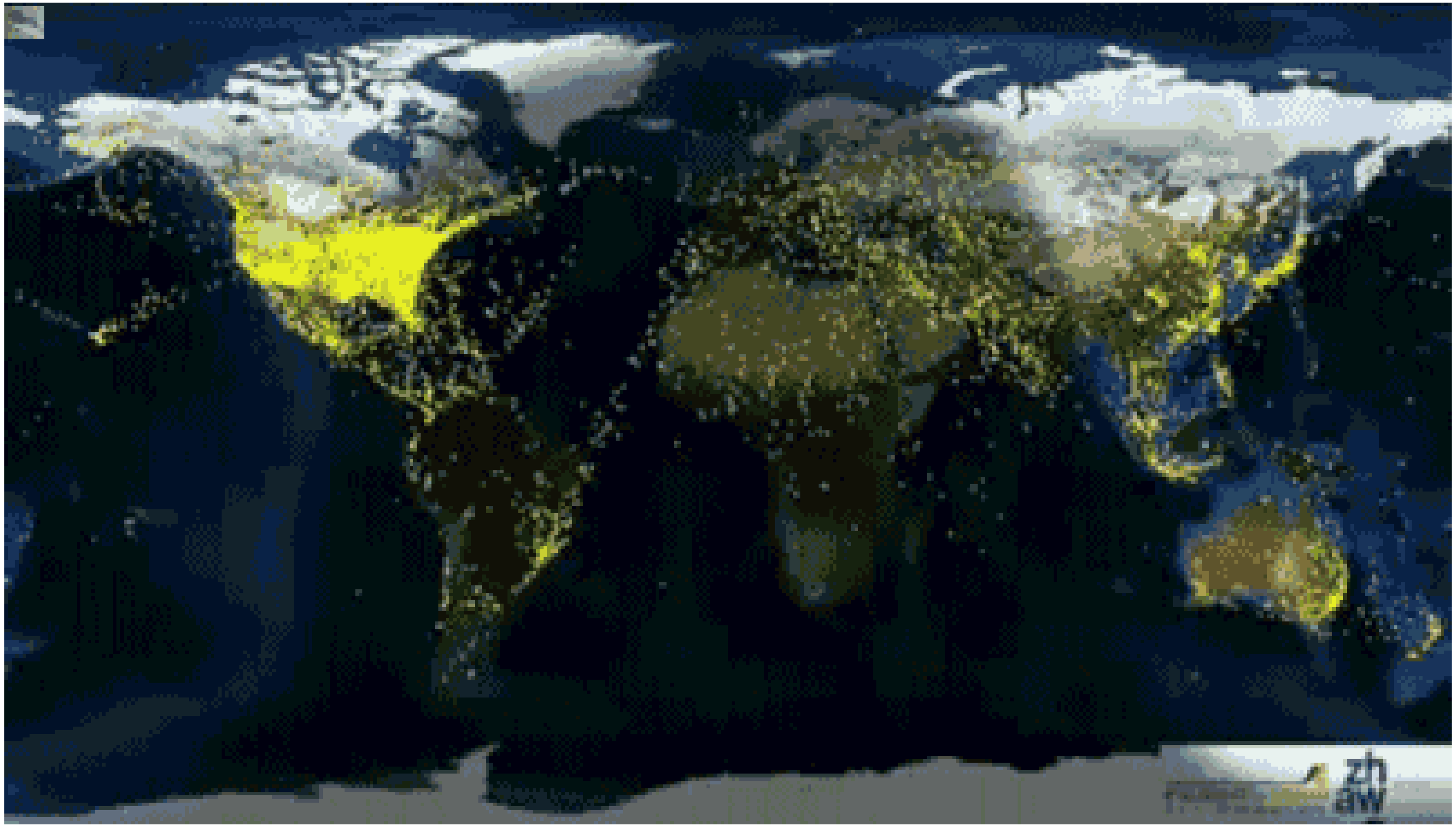


Data Source: World Health Organization
Map Production: WHO Health Emergencies Programme
Map ID: RITM00045

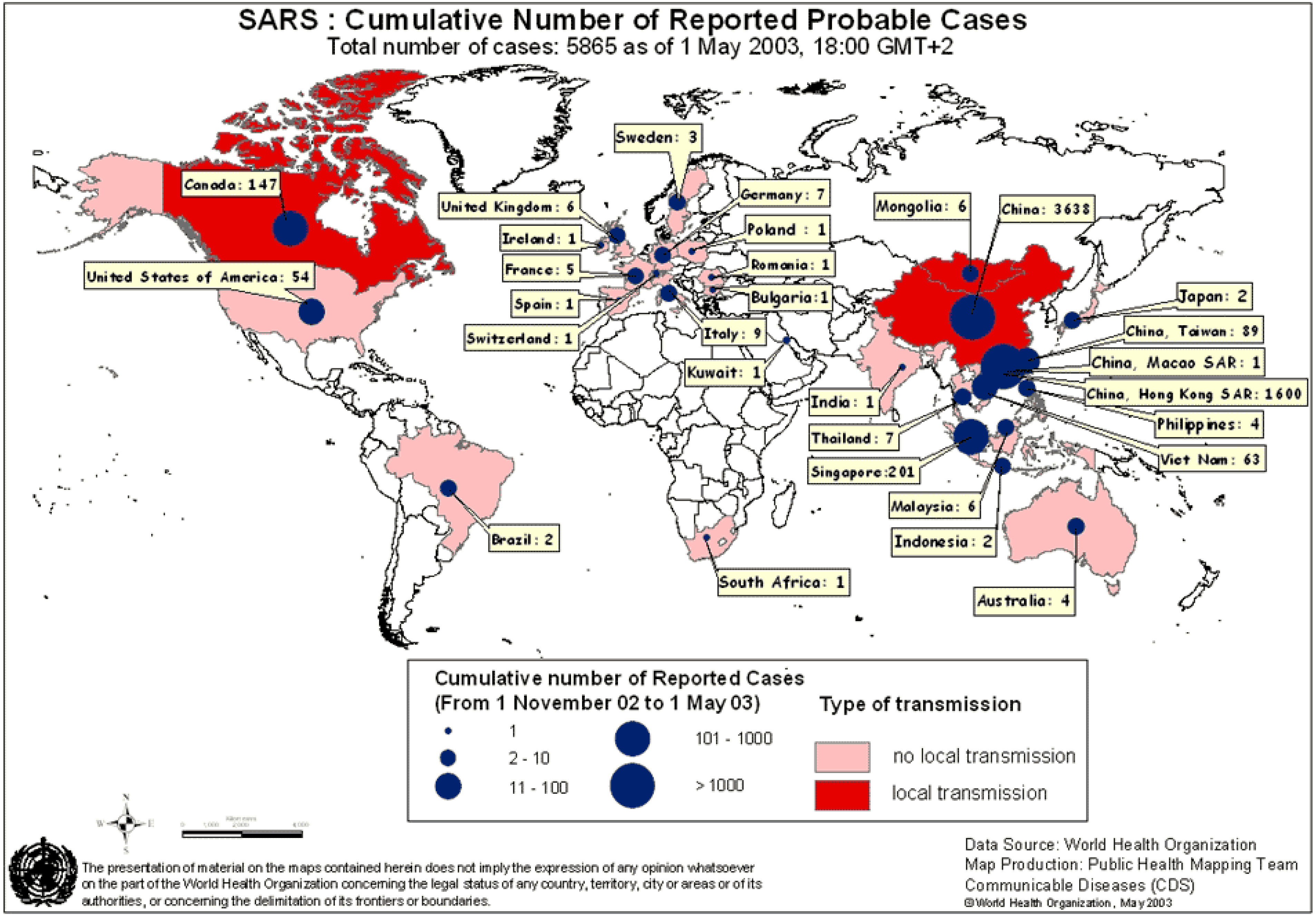
Not applicable

0 2,500 5,000 km

24 hours global air traffic

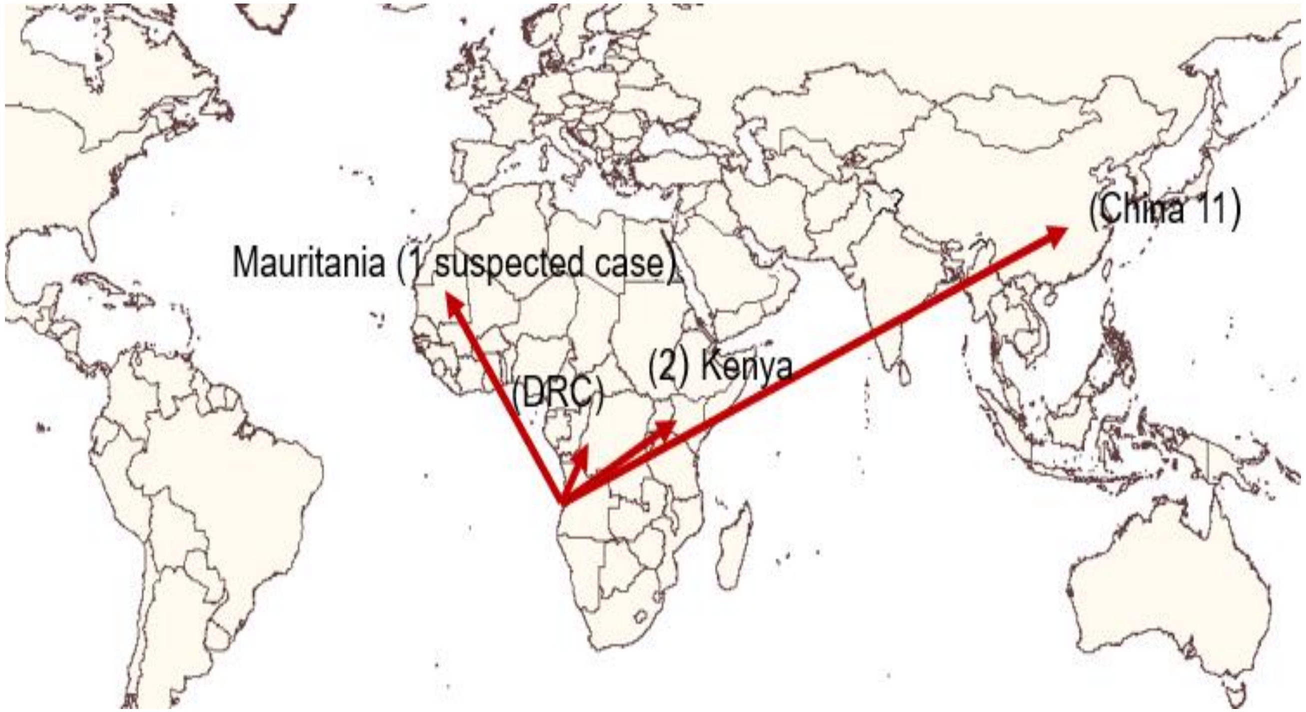


Source: Zurich School of Applied Sciences

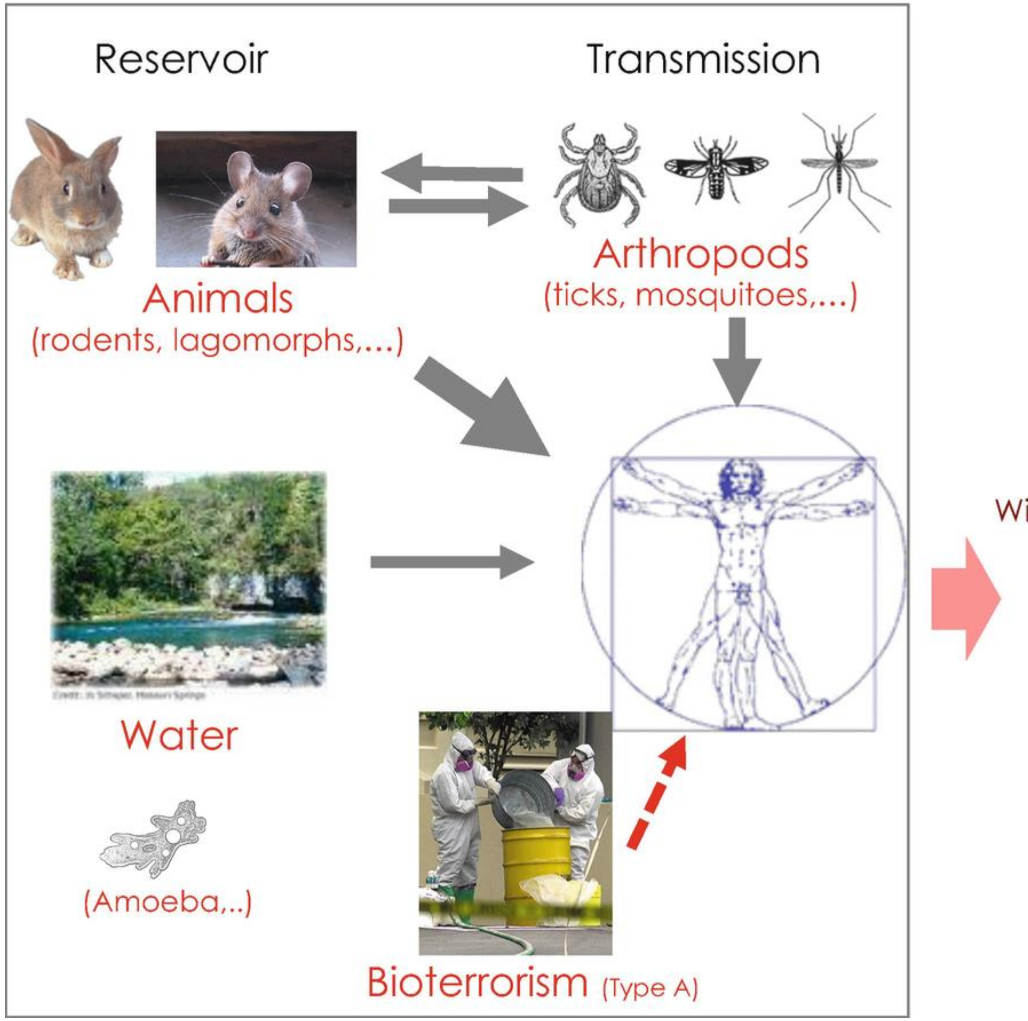

SARS : Cumulative Number of Reported Probable Cases
Total number of cases: 5865 as of 1 May 2003, 18:00 GMT+2
Canada: 147
United States of America: 54
Sweden: 3
United Kingdom: 6
Ireland: 1
France: 5
Spain: 1
Switzerland: 1
Germany: 7
Poland : 1
Romania: 1
Bulgaria: 1
Italy: 9
Kuwait: 1
Mongolia: 6
China: 3638
Japan: 2
China, Taiwan: 89
China, Macao SAR: 1
China, Hong Kong SAR: 1600
Philippines: 4
Viet Nam: 63
India: 1
Thailand: 7
Singapore: 201
Malaysia: 6
Indonesia: 2
Australia: 4
South Africa: 1
Brazil: 2
Cumulative number of Reported Cases
(From 1 November 02 to 1 May 03)
1
2 - 10
11 - 100
101 - 1000
> 1000
Type of transmission
no local transmission
local transmission
N
W
E
S
The presentation of material on the maps contained herein does not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or areas or of its authorities, or concerning the delimitation of its frontiers or boundaries.
Data Source: World Health Organization
Map Production: Public Health Mapping Team
Communicable Diseases (CDS)
©World Health Organization, May 2003

2016 yellow fever outbreaks

- 2 linked outbreaks in Angola and DRC
  - 963 confirmed cases and 137 deaths
  - Two capital cities affected, widespread in Angola
- > 30 million persons vaccinated
- 11 cases exported to China; and to other African countries
  - Risk of local transmission
- Disruption of preventive programmes over extended time
  - Global YF vaccine stockpile exhausted



Transmission of tularemia

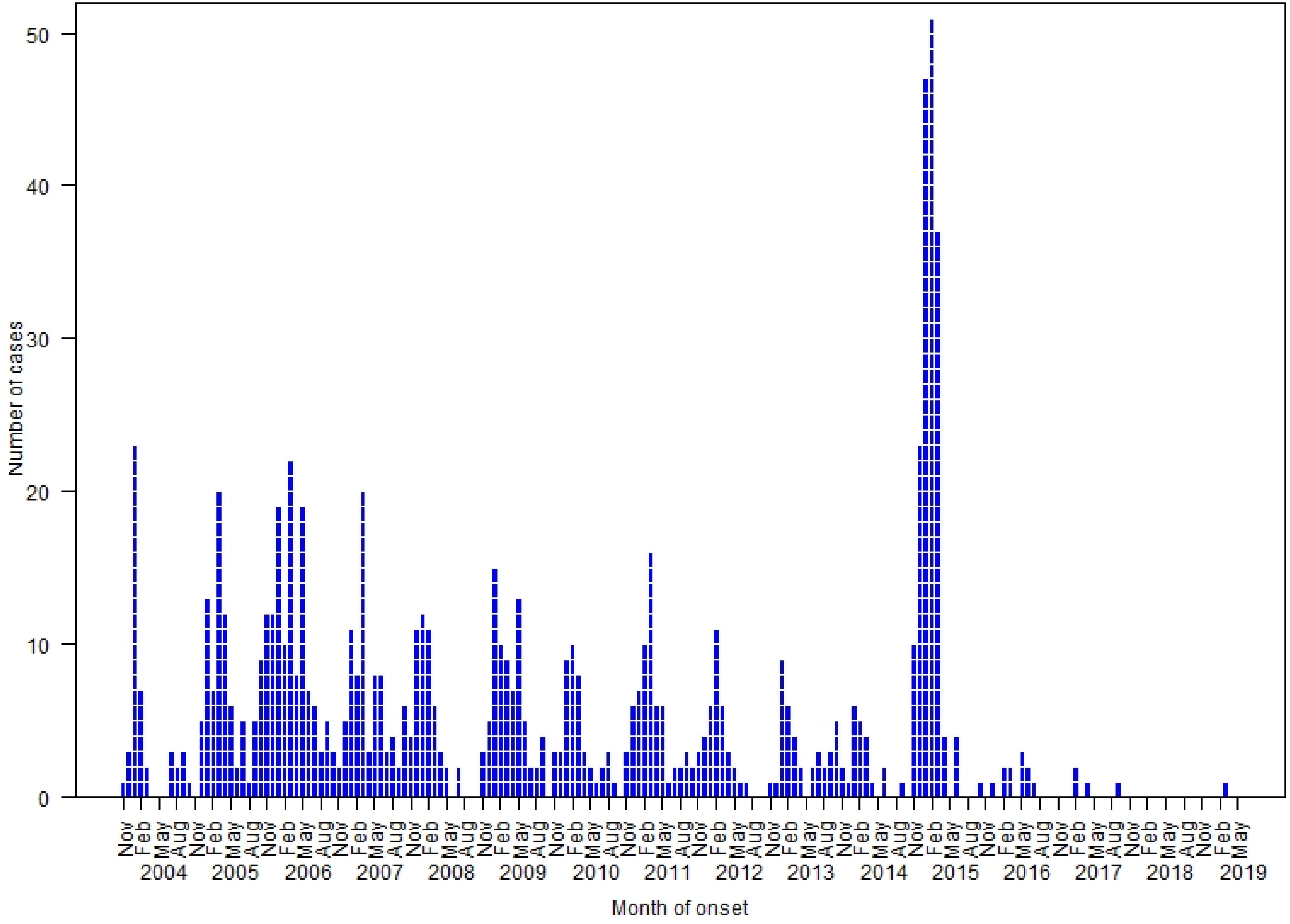


Pneumonic
Very high mortality rate
With very low infecting doses (10-50 b)

Ulceroglandular
Low mortality rate

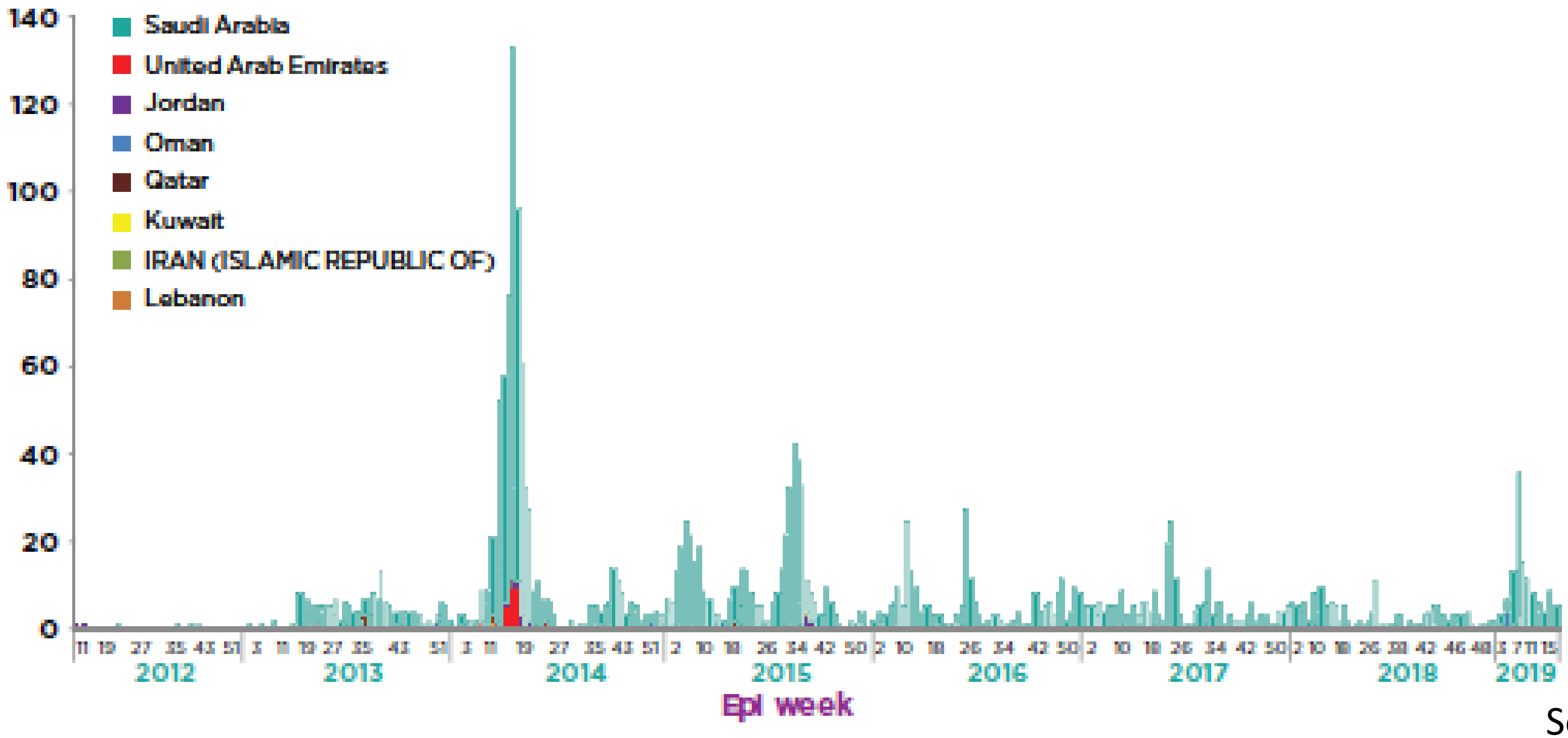
Source: M Barel, A Charbit, 2019

Epidemiological curve of avian influenza A(H5N1) cases in humans by month of onset, 2003-2019



Source: WHO

Laboratory-confirmed cases of MERS reported in Eastern Mediterranean Region, April 2012-April 2019



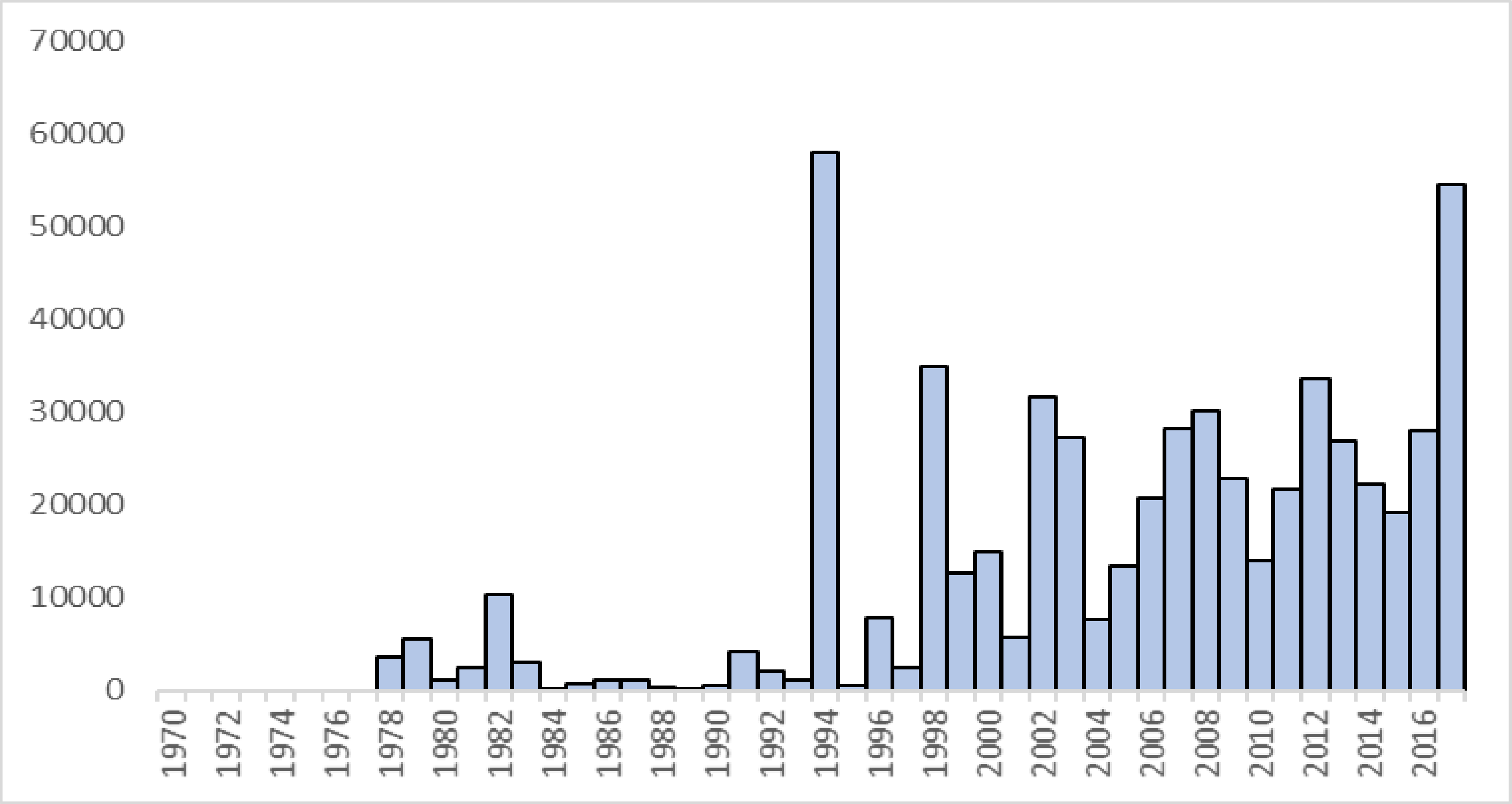
Source: WHO EMRO

Consequences of weak health systems on the emergence and spread of outbreaks of infectious diseases

- Weak surveillance / early warning systems
- Reduced coverage of healthcare services
- Poor quality of services (facilities, drugs, lab reagents, material…)
- Staff training insufficient
- Sub-standard infection control practices
- Dysfunctional disease prevention programs and focus on emergency response

Source: MSF

Cases of cholera reported per year, DRC, 1970-2017



Source: WHO

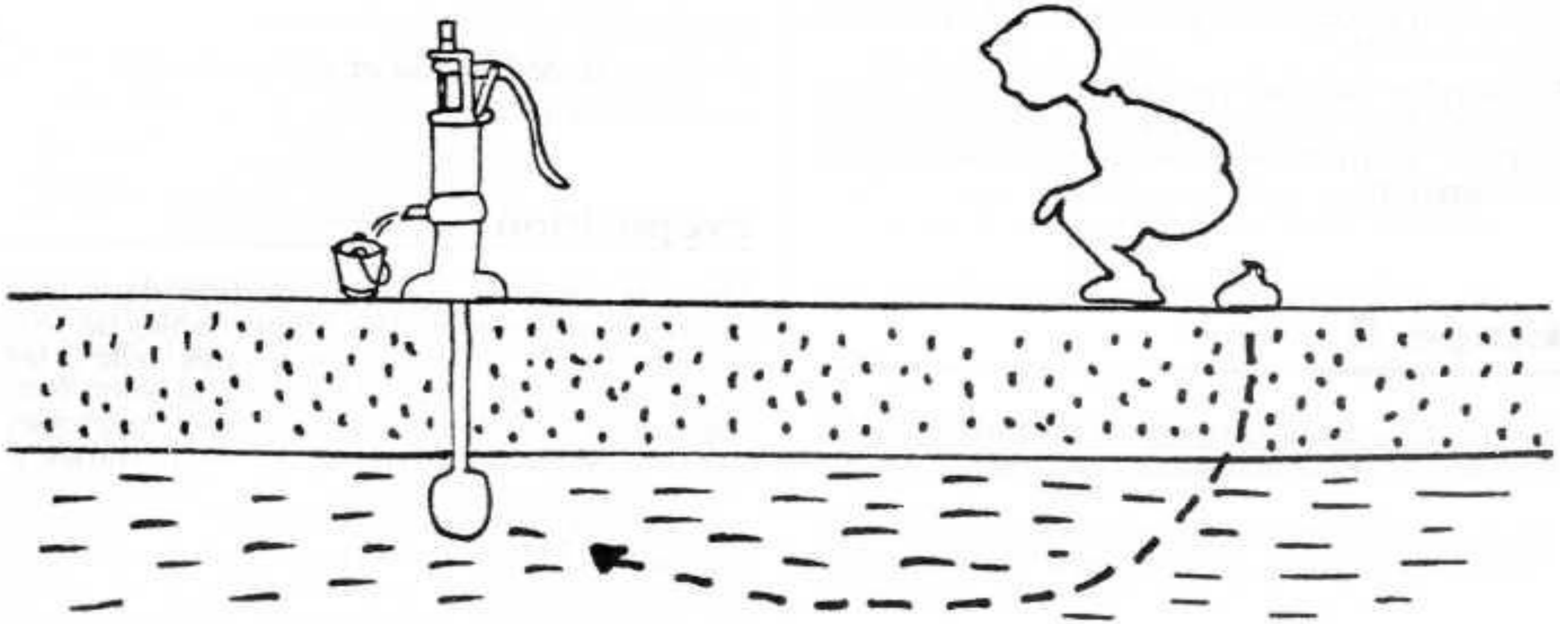


Figure n° 2. Dessin de contamination de l'eau par le sol

Source: Belec M, Hentgen V, Jauréguiberry S. Maladies du péril fécal et leur prévention. *Développement et Santé.* n°148,149, 150, août, octobre, décembre 2000

Source: L Pezzoli

Source: WHO



Reducing the burden of outbreaks of infectious diseases

- Effective surveillance and response systems
- Strong health systems
- Access to vaccines
- Workforce capability
- Effective prevention programmes
- Investments in water, sanitation and hygiene

Thank you

e: WHO

Source: WHO, Kinshasa

Source: WHO, Sierra Leone

Source: icddr,b

Source: WHO, Sierra Leone

Source: WHO, South Sudan

Cholera kills an estimated 95,000 people per year and sickens more than 2.9 million more


Source: WHO

Source: WHO

Source: icddr,b

Source: WHO

Source: icddr,b

Source: Accra, Ghana, WHO

GLOBAL TASK FORCE ON
CHOLERA CONTROL

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

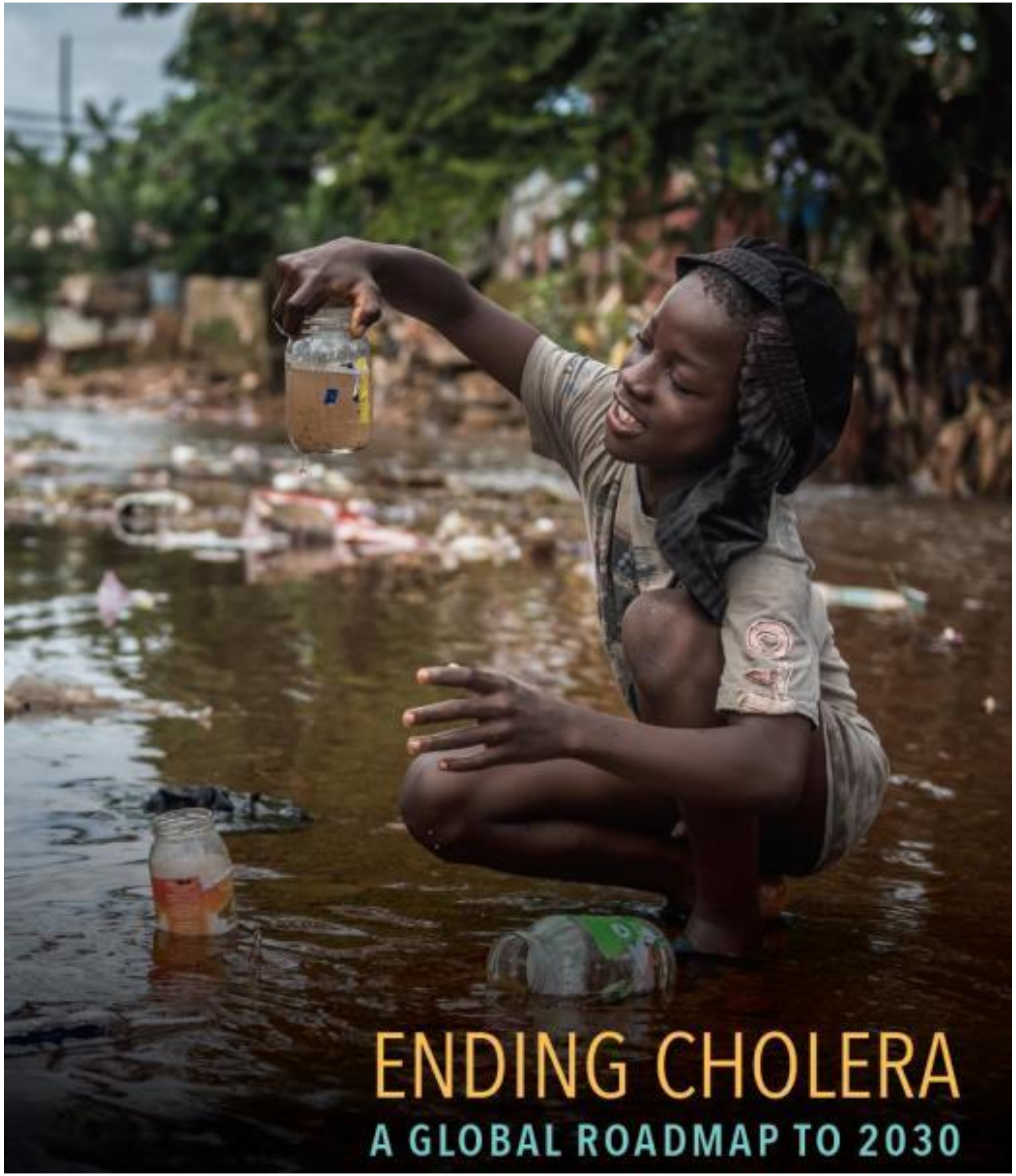
Kate Alberti WHO/GTFCC, EEHF 18 June, 2019

Cholera kills an estimated **95,000 people** per year and sickens more than **2.9 million** more

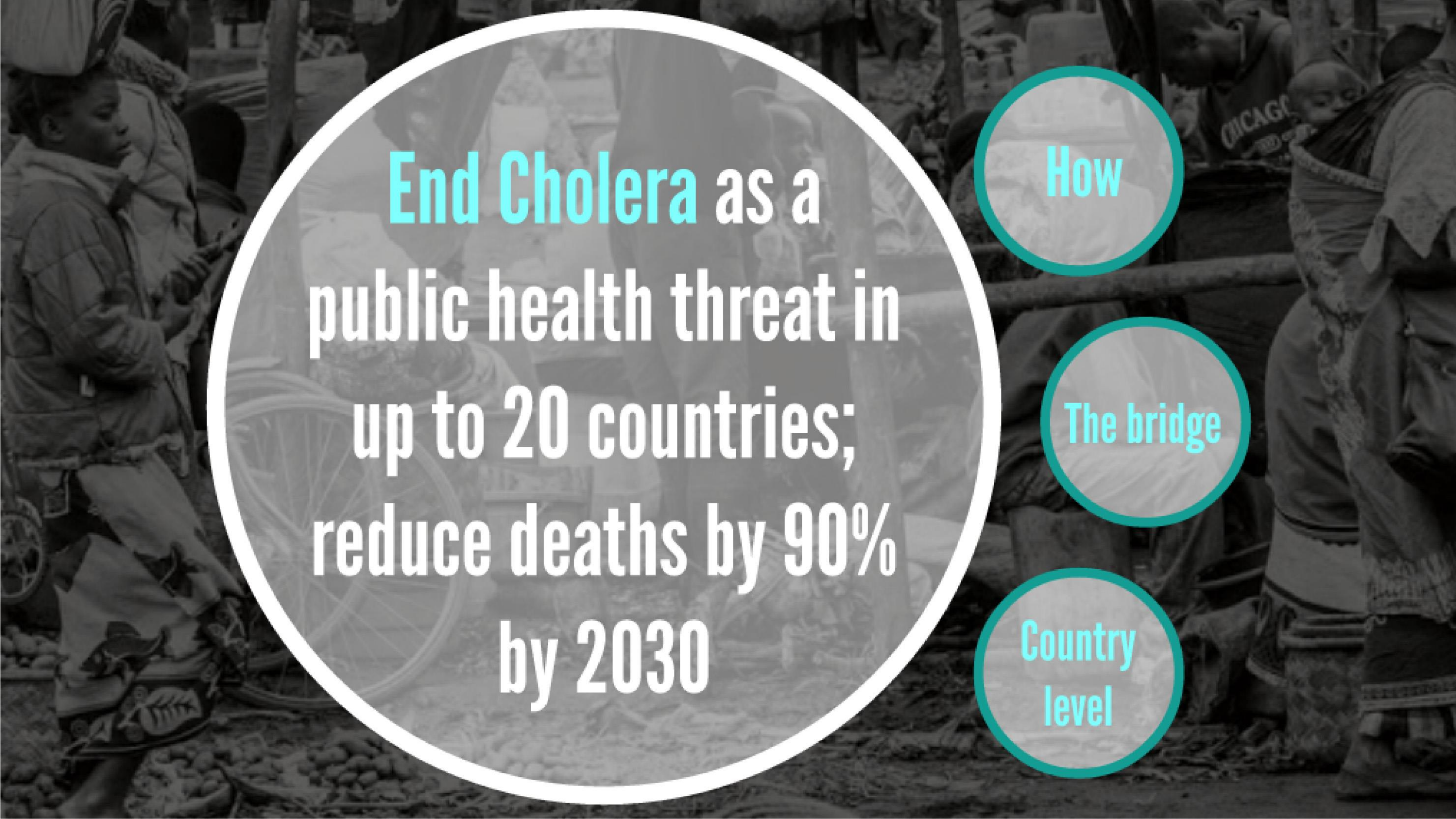
Sustainable Development Goals

Leave no one behind

Prioritise those most marginalised and disadvantaged



GLOBAL TASK FORCE ON
CHOLERA CONTROL


End Cholera as a public health threat in up to 20 countries; reduce deaths by 90% by 2030
How
The bridge
Country level

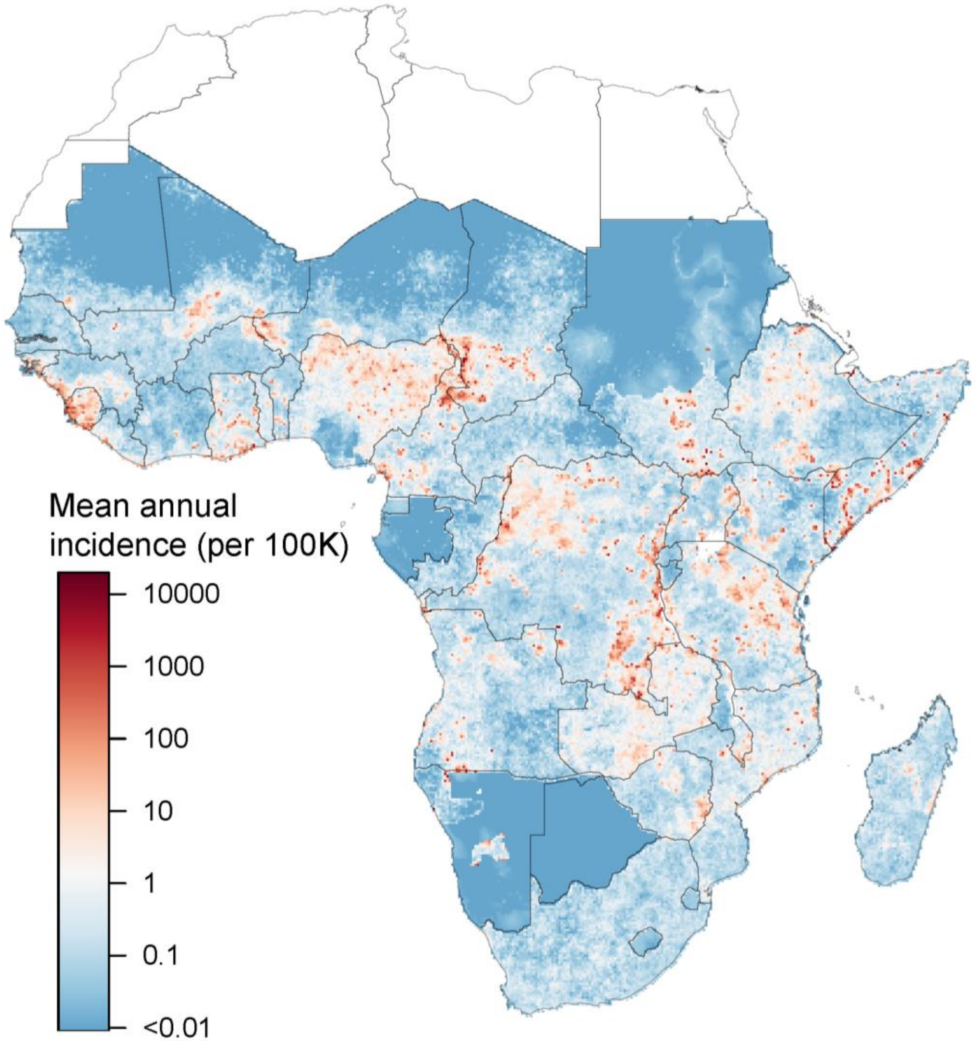

AXIS 1
Early detection and immediate response to outbreaks
Early detection and rapid response to ensure immediate containment of outbreaks

AXIS 2

Hotspot approach

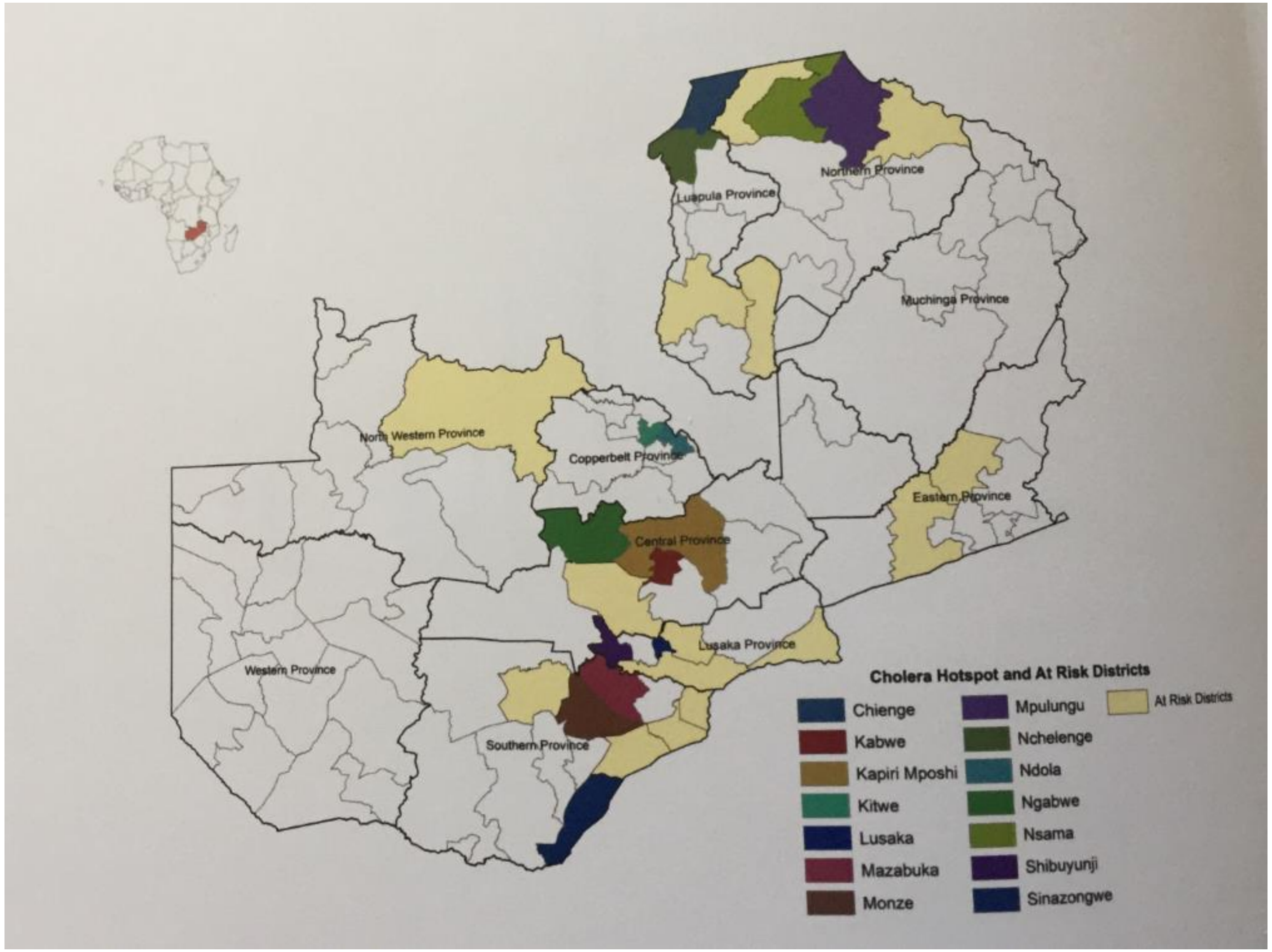
Most cases of cholera happen in highly endemic areas—called "hotspots"—where predictable outbreaks of cholera occur year after year.

CHOLERA HOTSPOTS IN AFRICA 2010-2016



Source: A Azman and J Lessler, Johns Hopkins University

CHOLERA HOTSPOTS IN ZAMBIA



Source: Zambia Multisectoral Cholera Elimination Plan 2019-2025

AXIS 3

Strategic Axis 3: GTFCC as an effective coordination mechanism

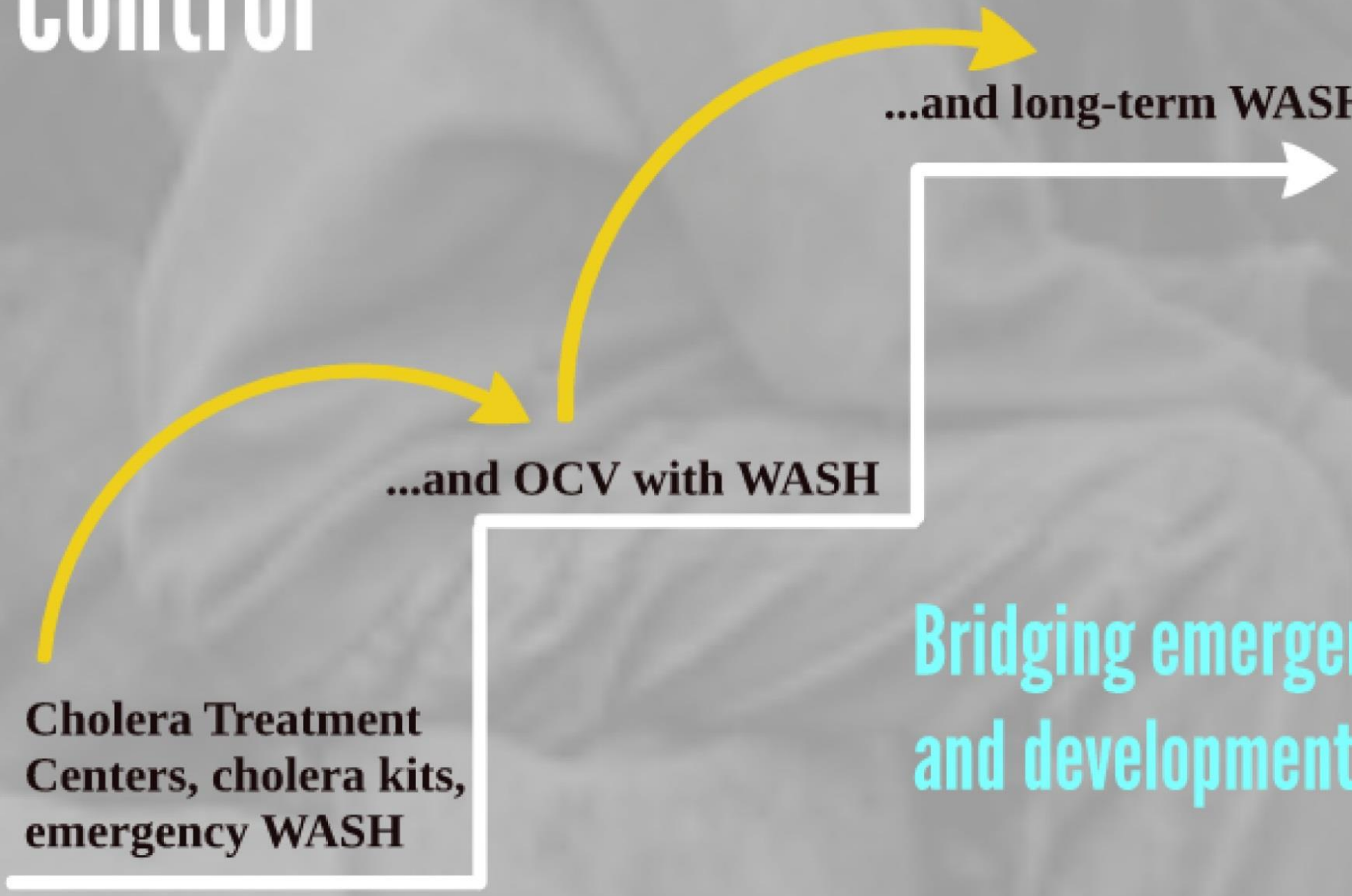
Technical Support

Resource Mobilization

Partnership at local and global levels

From preparedness and response to prevention and control

Treating patients alone has limited impact on transmission



Bridging emergency and development


Thank you
Together we can
#endcholera
GLOBAL TASK FORCE ON
CHOLERA CONTROL

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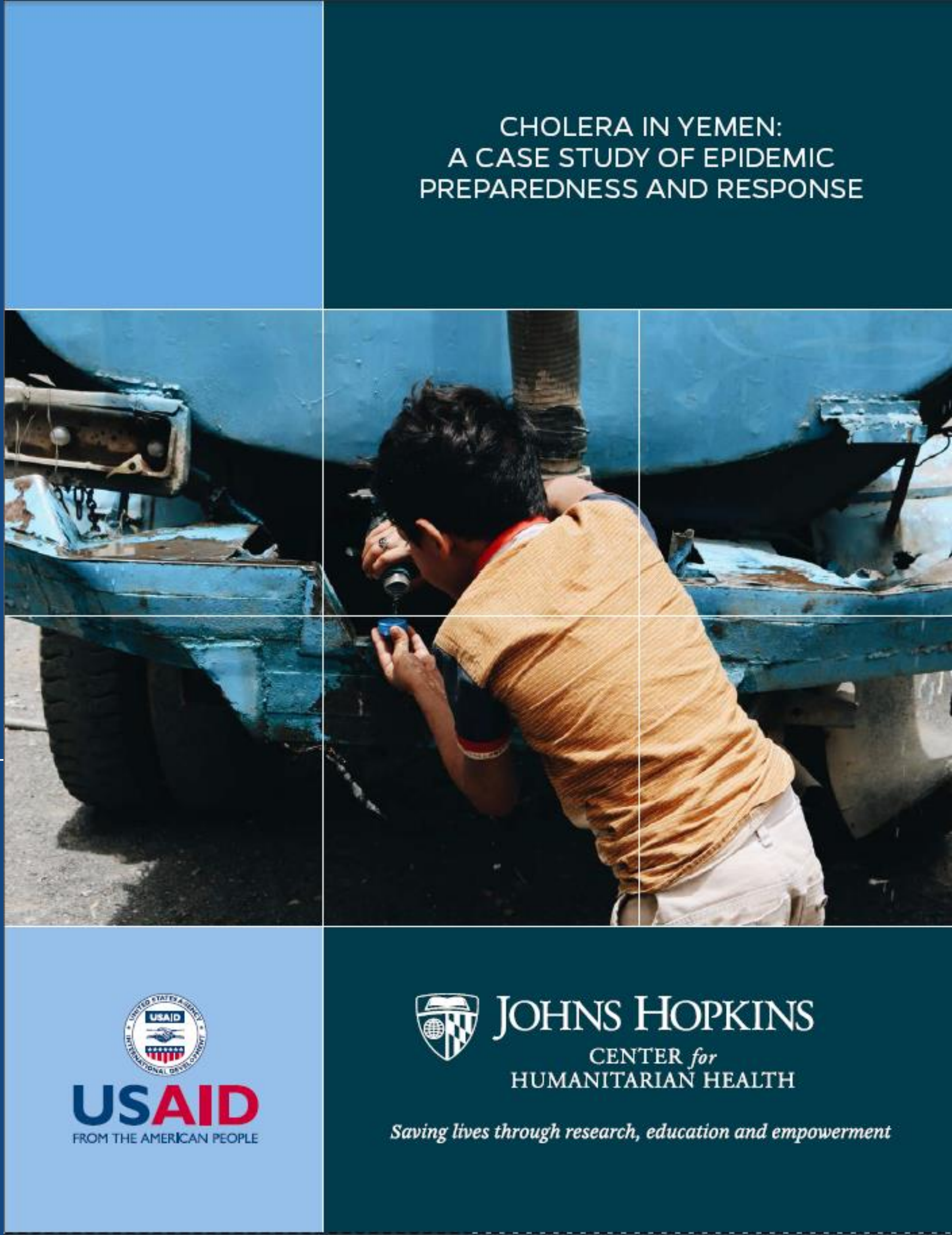
HUMANITARIAN HEALTH

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

Emergency Environmental Health Forum: Disease Outbreaks and Their Control
Geneva, Switzerland, Jun 18-19, 2019

Paul Spiegel, Johns Hopkins Bloomberg School of Public Health
Ruwan Ratnayake, London School of Hygiene & Tropical Medicine
Nora Hellman, Johns Hopkins Bloomberg School of Public Health
Mija Ververs, Johns Hopkins Bloomberg School of Public Health
Moise C. Ngwa, Johns Hopkins Bloomberg School of Public Health
Paul H. Wise, Stanford University
Daniele Lantagne, Tufts University



Context

Johns Hopkins Center for Humanitarian Health

We identified lessons from the cholera response in Yemen during the 1st and 2nd epidemic waves

- Large, prolonged cholera epidemics routinely occur in fragile/conflict-affected areas
  - Iraq, Sierra Leone, Somalia, South Sudan
- ‘Fragile’ contexts face barriers
  - Preparedness planning, coordinated delivery in difficult logistical contexts
- By 2030, the GTFCC aims for the elimination and global reduction in mortality by 90%
  - We must better understand cholera response in fragile contexts

Methods

Exploratory case study of 1st (Sept 2016-Apr 2017) and 2nd waves (Apr 2017-Jul 2017)

- **Stakeholder analysis and key informant interviews**
  - preparedness, surveillance/lab, case management, malnutrition, WASH, OCV, coordination, and insecurity
- **Literature review**
  - global cholera guidance and Yemen response documents
- **Data review:**
  - surveillance and reports on airstrikes on water systems and health facilities
- **Qualitative synthesis:**
  - using GTFCC framework and thematic analysis

Key Findings: who/what did we find?

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71 respondents: 75% had worked in Yemen
58 Yemen-specific documents reviewed

Key Findings: overall

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HUMANITARIAN HEALTH

Five major challenges identified:

1. Insufficient preparedness and planning
2. Poor capacity of surveillance/data management formonitoring
3. Late decentralization/targeting cholera-specific WASH/health strategies
4. Poor harmonization of epidemic and humanitarian coordination systems
5. Persistent airstrikes on water systems and health facilities during conflict

1. Preparedness, Strategy and Funding

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Key Findings

1. Yemen did not have adequate cholera preparedness plan
2. Initial response plans did not prioritize standard components (detailed made only after 2nd wave peak)
3. After initial shortfall, cholera funding was overall adequate

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

Epidemiologist, 1st wave

Key Recommendations

1. Prioritize multi-sector preparedness and response plans for cholera
   - Including conflict-specific elements (use cases for OCV, decentralized response, remote programming)
2. Pre-emptively train RRTs to enable targeting <u>early</u> in response
3. Integrate planning between health and WASH sectors and with Humanitarian Response Plan

2. Surveillance and Laboratory

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Key Findings

1. Early warning alert and response system was present
   - Not able to manage large outbreak
2. Data quality could have been improved after 1st wave
3. Laboratory and epidemiological investigation were inadequate

Key Recommendations

1. Surveillance system should be primed for needs of large outbreaks
2. Early, increase capacity to culture cholera via laboratories
3. Data monitoring plan to improve data collection at field level

[We realized that] it's not just where we are [in Aden], it's everywhere, and it's intense everywhere.

Epidemiologist, onset 2nd wave

We were seeing 100s of cases a day. Within a week, it was 3,000 cases a day. Nobody could respond at this level.

Senior Manager, onset 2nd wave

3. WASH

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Key Findings

1. WASH activities initially generalized
   - Cholera-specific WASH operationalized late in 2nd wave
2. FCR monitoring a gap
3. Barriers to cholera-specific WASH response
   - Insecurity, coordination, line-list access, funding to NNGOs/gov't

Key Recommendations

1. Early strategy of targeted WASH responses to interrupt transmission
2. Consider appropriate role of all partners in conflict response
   - Alternative remote approaches?
3. Work to repair/maintain infrastructure for medium to long-term

The overall struggle we've had with the cholera response is that, when the initial reprogramming came in in 2016, it didn't look like a cholera response. It looked like a WASH IDP response.

It took…well into the second phase…before… specific cholera interventions… actually kind of started and got rolled out.

4. Case Management (Health & Nutrition)

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Key Findings

1. DTCs/ORPS insufficiently decentralized
2. Health facility-based DTCs interrupted primary care
3. Quality of case management was difficult to monitor remotely
4. Large % of high-risk groups (pregnant, SAM kids)
   - Need clear case management protocols

Key Recommendations

1. DTCs/ORPs mapped, include smaller units close to communities
2. Cholera plans in crises including children with malnutrition & cholera
3. Health RRTs supervise/monitor treatment in remote settings

Some districts were completely ignored. We only addressed 1st level catchment populations and there are villages where we simply do not know what happened. [They are] very hard to reach.

Health Coordinator, 2nd wave

5. OCV

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Key Findings

1. OCV faced common challenges
   - lack OCV experience, complex environments

2. Response in 1st wave did not favor integration of OCV

3. WHO-led efforts to use OCV to interrupt spread occurred late in 2nd

Key Recommendations

1. OCV for varying contexts should be integrated into national cholera preparedness plans

2. In complex and insecure environments like Yemen, smaller, geographically-targeted OCV campaigns should be planned

South Sudan, Somalia and Yemen [are similar cases]. Each country has cholera preparedness plan. We should have revised [it] and included OCV. We only wake up when there is a cholera outbreak… we always try to introduce it once the outbreak starts.
Anonymous, 2nd wave

6. Communication and Social Mobilization

Key Findings

1. Severe insecurity made it difficult to organize community services
2. Volunteers supported not adequately mobilized under single program

Key Recommendations

1. In crises with remote programming, a single program for consistent social mobilization, referral and surveillance activities could be mobilized for CHVs

7. Coordination

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Key Findings

1. Cluster approach showed agility
   - Could not alone provide all technical, strategic, and multisector input for large-scale outbreak

2. WHO and MoPHP implemented cross-agency Incident Management System (IMS) at start of 2nd wave
   - Suffered from lack of clear mandate / support for non-WHO partners

Key Recommendations

1. WHO and partners need to develop operating procedures IMS and clusters during crises

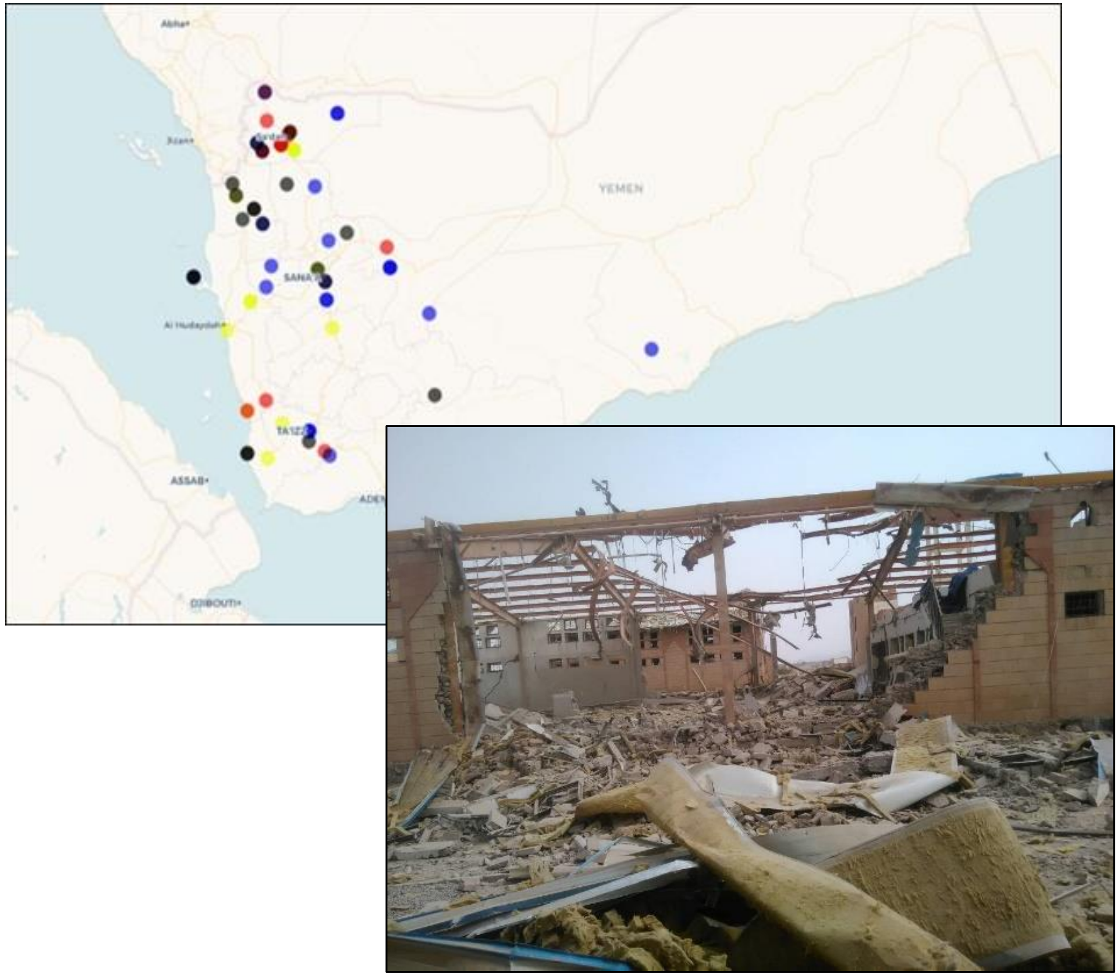
8. Insecurity

Key Findings

1. Repeated airstrikes on WASH infrastructure
    - 74 from Apr 2015-Dec 2017
    - Several desalination facilities
    - Suggests purposefully targeted

Key Recommendations

1. Attacks on health/WASH infrastructure terminated
    - UN should adopt stronger stance on WASH/health infrastructure and its monitoring/reporting/sharing locations with the Saudi-led Coalition



Map of airstrikes on water infrastructure (2015-8, data: Yemen Data Project);
Airstrike on MSF CTC, Abs, Jul 2017 © MSF

Take home messages

JOHNS HOPKINS
CENTER *for* HUMANITARIAN HEALTH

The poor operating environment and late adoption/planning of cholera-specific control measures restricted scope for prevention of larger epidemic

But please consider…	Gaps and advances…
No easy fixes in Yemen Outbreak + complex = difficult	**Persistent gaps into 2nd wave:** surveillance, datacluster/IMS coordination, specific response
Still urgent need for evidence: - Improving RDTs specificity to for where laboratory capacity poor - RRT model: evidence for timing, effectiveness, integration	**Key advances late in 2nd wave: -** cholera-specific WASH strategy - expansion of footprint with RRTs - preventative OCV - World Bank funding

JOHNS HOPKINS
CENTER *for*
HUMANITARIAN HEALTH

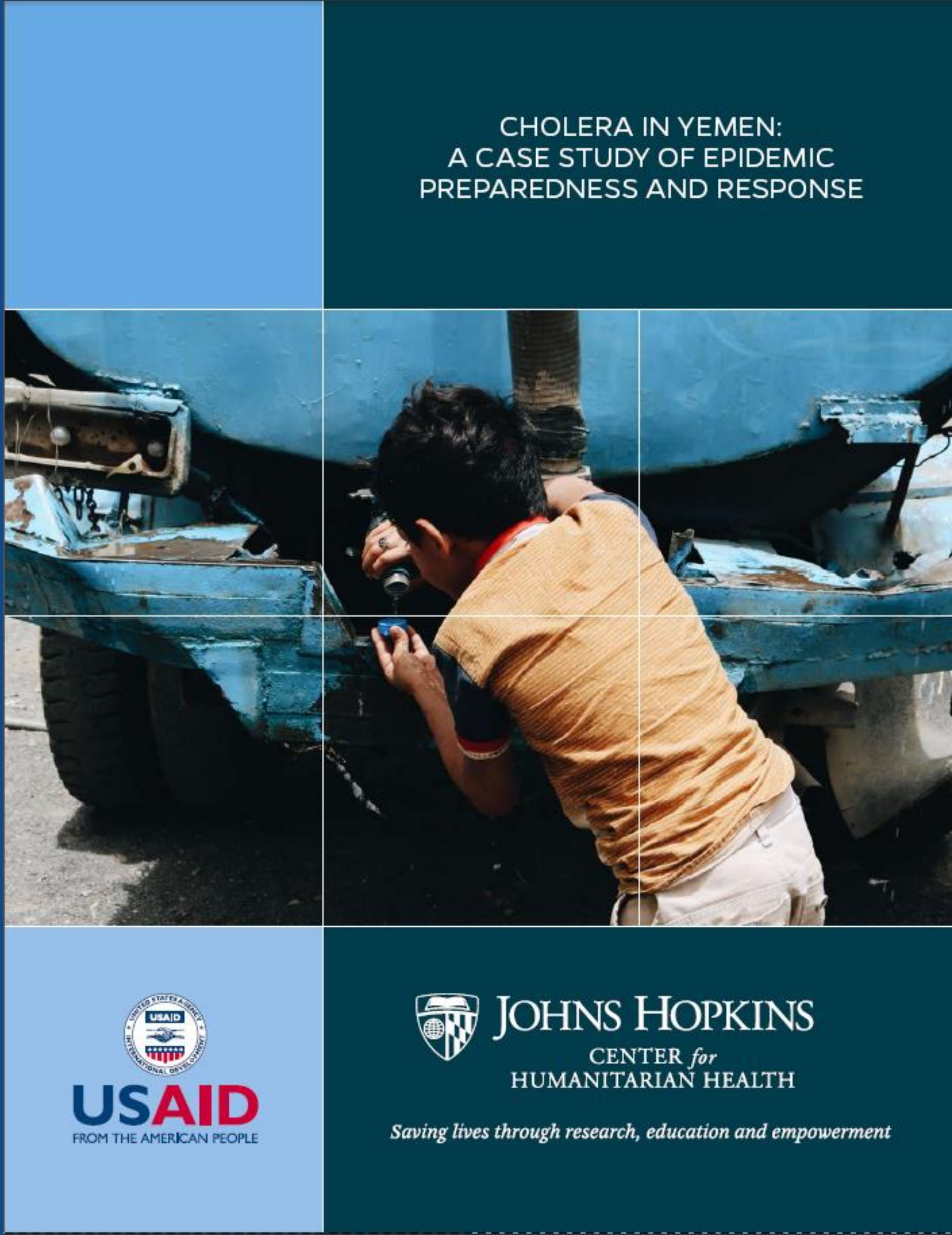
Thank you

Acknowledgements:

- Interviewees who shared their critical perspectives and organizations who supported the case study

- Christine Domingo-Cool (photos)

- Annie Shiel (airstrike map)



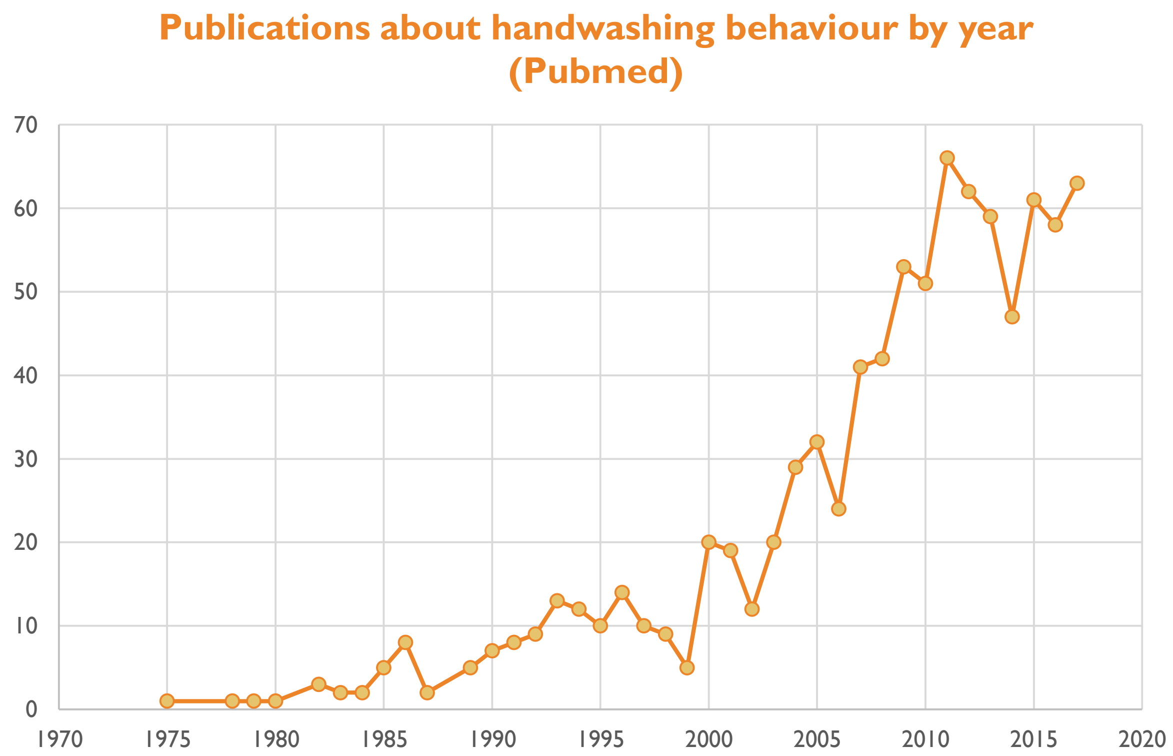
Determinants of handwashing behaviour:

A systematic review covering stable settings, outbreaks and crises.

- Sian White -


Eugghhh!
Not another literature review!

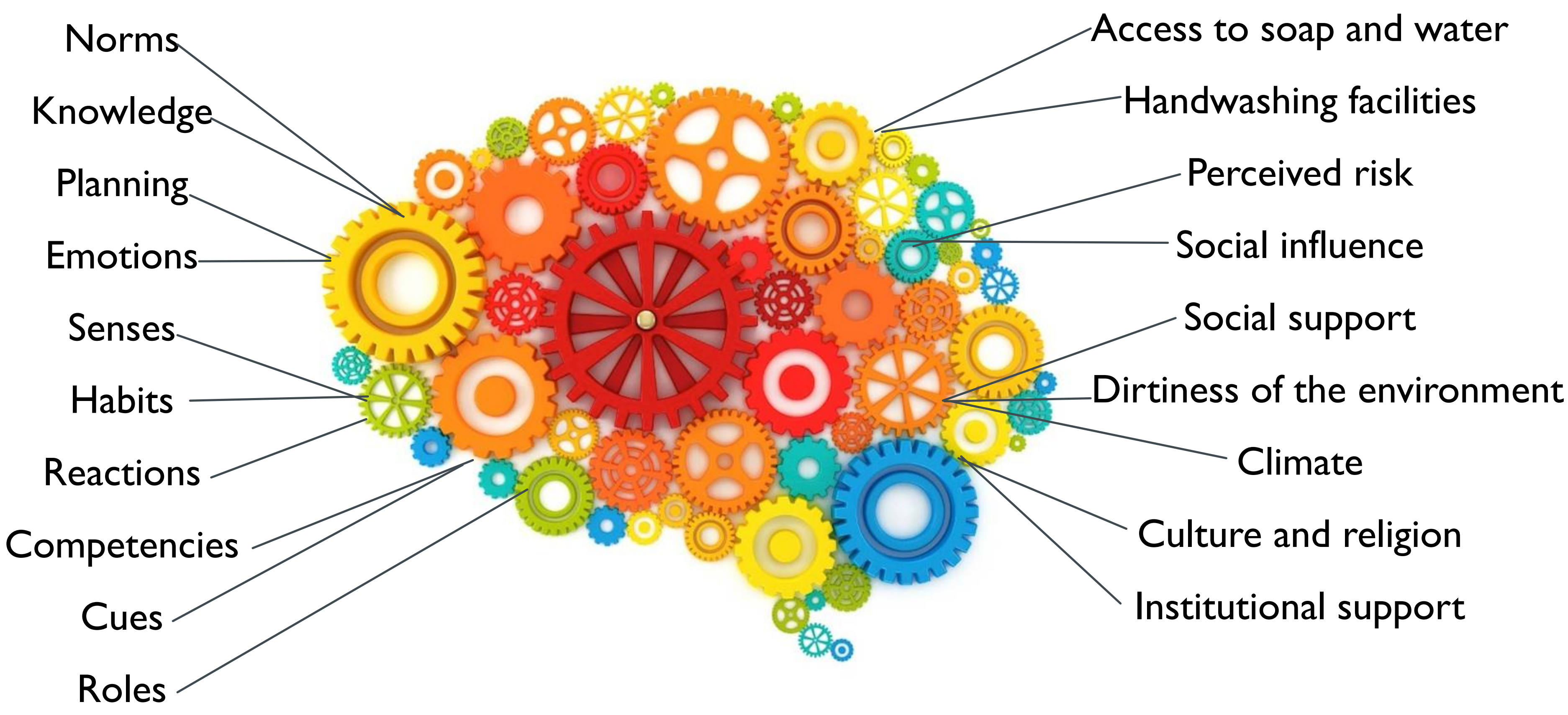
Things we know…



A lot has been written about handwashing behaviour

Theory and evidence indicates that handwashing programmes are likely to work best when they target behavioural determinants

Things we don't know…



What are all the determinants of handwashing behaviour?

And which are most important?

Things we don't know...

Do determinants of behaviour differ by context?

Stable settings

vs

Outbreaks

vs

Crises

What we did…

Integrative review

Medline = **1597** peer reviewed papers

EMBASE = **948** peer reviewed papers

Psychinfo = **617** peer reviewed papers

Total = **3159** peer reviewed papers

Exclude Duplicates = **493** peer reviewed papers

Records screened for eligibility based on titles and abstracts = **2,666** peer reviewed papers

Excluded due to not meeting search criteria = **2,259** peer reviewed papers

Records screened for eligibility based on a full text read = **407** peer reviewed papers

Excluded due to not meeting search criteria = **327** peer reviewed papers

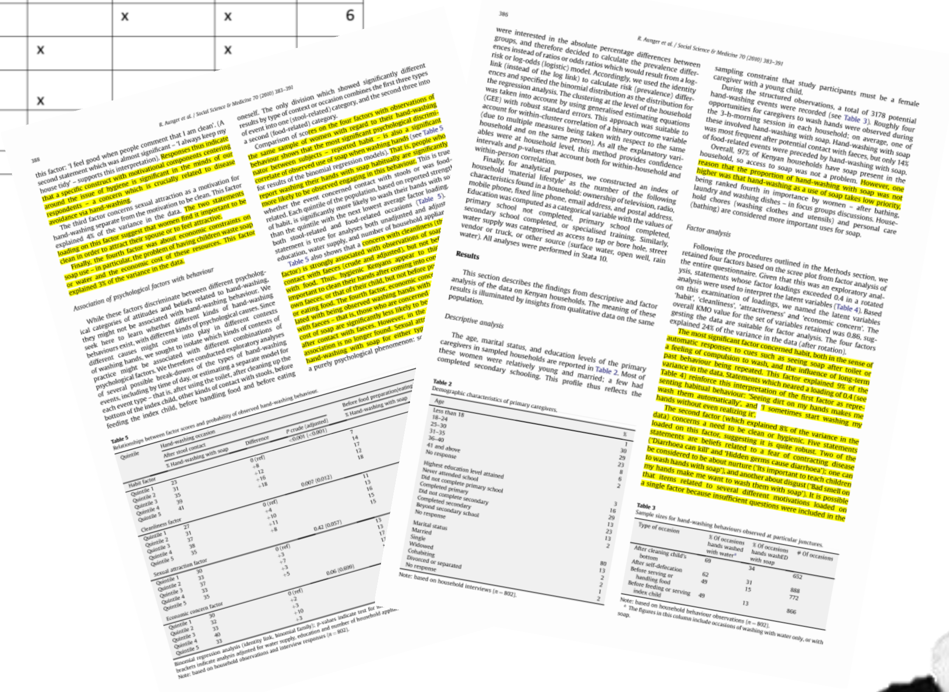
Included in final analysis = **79** peer reviewed papers

What we did...

Type of study	Author	Year	Description of Context	Participants and Sampling	Methods described	Saturation mentioned	Systematic data analysis described	Reliability and validity discussed	Reflexivity of researcher documented	Findings discussed	Score out of 8
Observational	Dell, et al.	2012	x	x	x		x			x	5
Observational	File, et al.	2015	x	x	x	x	x			x	6
Observational	Greenland, et al.	2013	x	x	x		x	x	x	x	7
Observational	Greenwell, et al.	2013	x				x			x	3
Observational	Hulland, et al.	2013	x	x	x		x	x		x	6
Observational	Lohiniva, et al.	2008	x				x			x	3
Observational	McMichael, et al.	2016	x	x	x		x		x	x	6
Observational	Nizame, et al	2016	x	x	x	x	x	x		x	
Observational	Rheinlander, et al.	2015	x		x		x	x			
Observational	Rheinlander, et al.	2010	x	x	x		x				
Observational	Usfar, et al.	2010	x	x	x	x	x				

Step 1. Grade study quality

Step 2. Extract data that reports an association between a determinant and handwashing behaviour



What we did...

Step 3. Categorise all associations to a pre-defined list

Step 4. Assess whether the determinant was well defined and assessed through a valid and reliable measure.

Step 5. Group reoccurring associations together

Step 6. Undertake sub-analysis for crises and outbreaks.

Step 7. Create some big tables and pretty graphs!

What we learned…

1. **We still know very little about what determines our behaviour.**

2. **The quality of the evidence is poor**
   - 8% of studies graded as good quality
   - 21% of the associations did not clearly define the determinant
   - 70% did not use a valid or reliable method for measuring the association.

Insufficient evidence

But we can use this review to improve hygiene research & programmes!

Handwashing determinants

(General)

- Tendency to focus on what is easiest to measure.
- Characteristics over-prevalent in the literature.

Brain

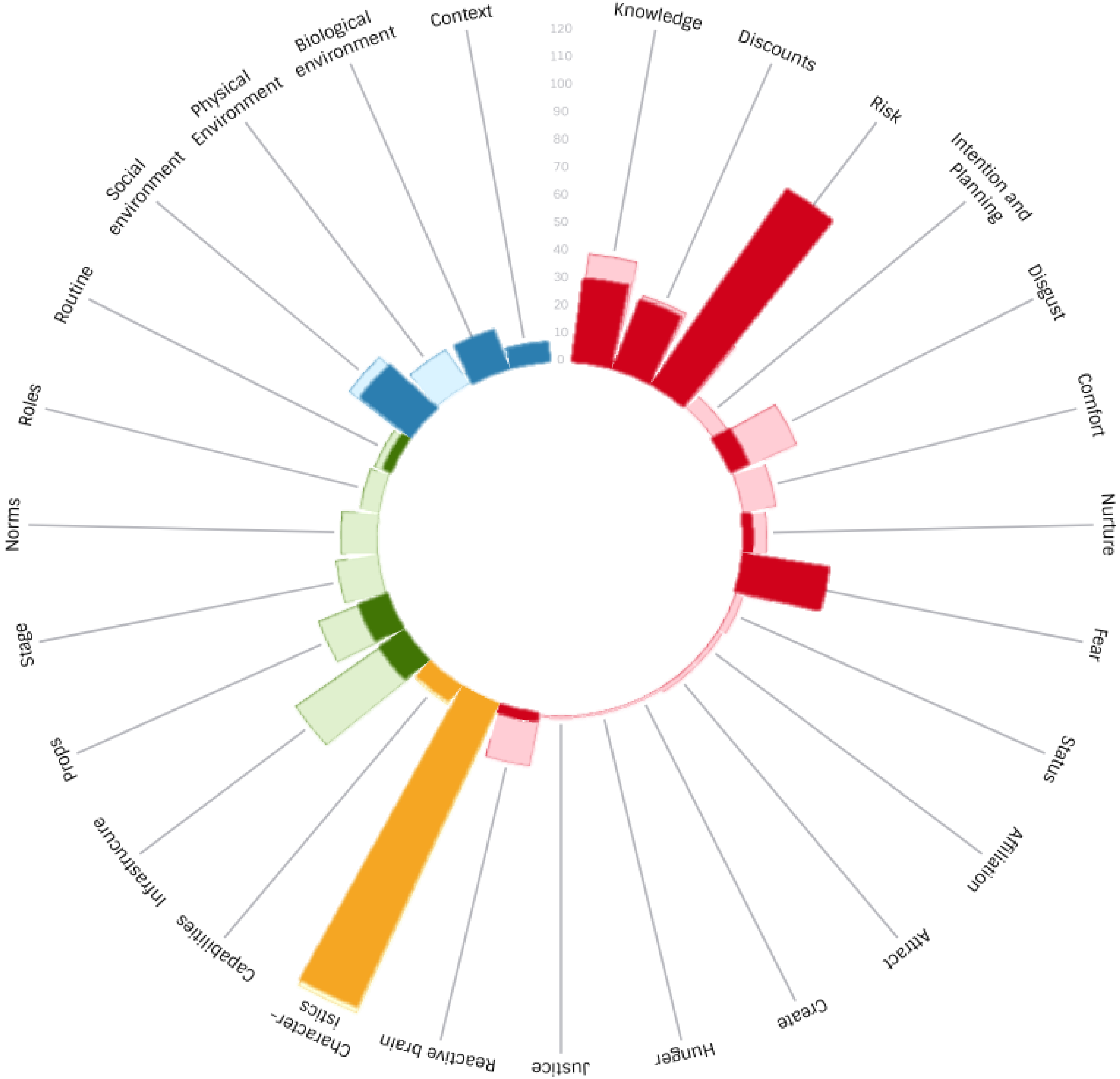
Body

Settings

Environment

Number of studies = 9

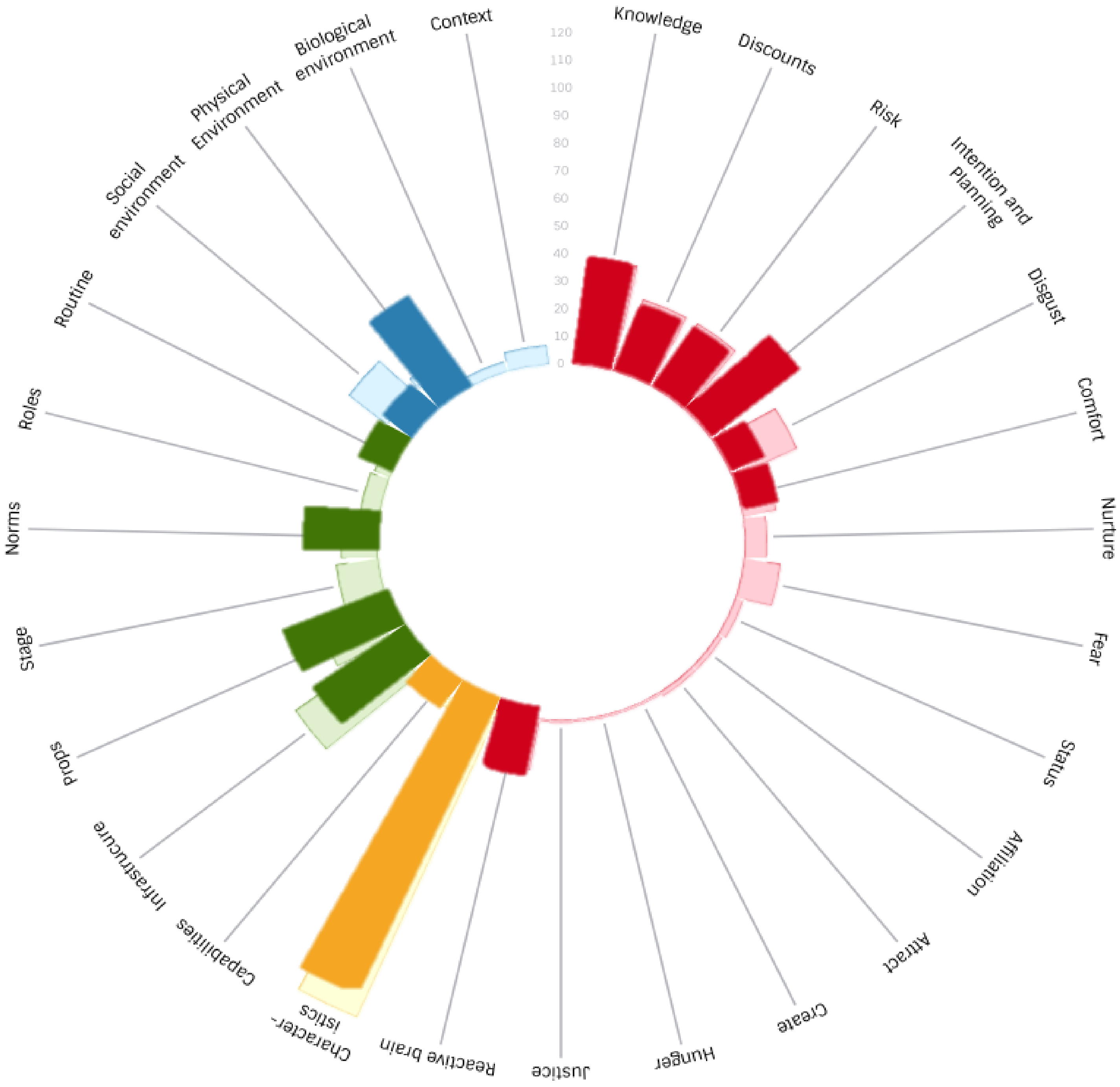
Number of reported associations between determinants and behaviour = 39



Handwashing determinants in outbreaks

- Strong focus on risk, fear and characteristics and the expense of understanding other factors.
- Typically outbreaks in high/middle income contexts
- Only 2 studies on cholera

Number of studies = 17
Number of reported associations between determinants and behaviour = 103



Handwashing determinants in crises

- Strong focus on cognitive factors and infrastructure.
- No understanding of motives and limited understanding of context.
- Overall lack of evidence.
- Nothing in acute crises.

Number of studies = 9
Number of reported associations between determinants and behaviour = 39

Determinants of handwashing behaviour

Biomedical knowledge	Risk Severity				
HW not important task	Working away from home				
Feel disgusted by unclean hands	Hands are visibly contaminated	HW facilities cue behaviour	HW habit	Higher levels of education	Being female
Being of a certain ethnicity	Living in certain geographic regions	Conveniently located HW facility.	Desirable HW facilities	Piped water/water close to home	Water available at the HW facility
Soap kept at the HW facility	People who live in urban areas	HW facility present.	HW is observable.	Being wealthy	Soapy water

50 determinates reported more than 3 times

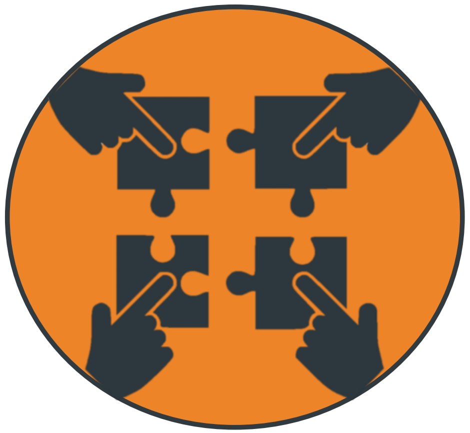
34 able to draw a conclusion about. Insufficient Evidence = **28**

Key take aways...

Our knowledge about handwashing behaviour remains imperfect

Teaching people about disease transmission is likely to have no effect on behaviour

Providing access to conveniently located, desirable handwashing facilities with soap and water is likely to be the most effective way of changing behaviour.



If you are trying to do an assessment on behaviour:

a) use the global handwashing indicator to measure behaviour

b) explore a range of determinants.

Thanks to ...

Co-writers and reviewers

- Astrid Hasund Thorseth
- Dr Robert Dreibelbis
- Dr Val Curtis
- Dr Jean Lapegue
- Tom Heath

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ACTION CONTRE LA FAIM

CAWST

USAID FROM THE AMERICAN PEOPLE

Want to know how we have been practically applying these findings in 20+ countries?

Wash'Em

www.washem.info

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Save the Children

FIELD READY

Surprise Soaps

Julie Watson

London School of Hygiene and Tropical Medicine

Funding:

HUMANITARIAN INNOVATION FUND

Rationale

Public health benefit of HWWS clear

>20% reduction in diarrhoea[1] and ARIs[2]

High disease burden among children in emergencies

Diarrhoea and ARIs leading cause of child deaths[3] , esp. in emergencies[4]

Low HWWS prevalence esp. among children

19% HWWS after toilet (2-15% children)[1]

Evidence gap in what works in HW promotion for children

HIF problem report and SR[5]

[1]Freeman et al. TMIH. 2014, [2]Aiello et al. Am J Public Health. 2008

[3]GBD Study 2016, [4] Connolly et al, Lancet 2004 [5]Watson et al, TMIH 2017

Challenges

Traditional handwashing interventions:

- Focused on health-based messaging (not a good motivator of BC)[1]
- Labour intensive
- Time intensive
- Difficult to scale up
- School-based

[1]Curtis et al, Health Edi Research, 2009

Humanitarian emergency contexts:

- High rates of disease transmission
- Rapid influx of people
- Large scale
- Limited resources
- No schools in early phases

What is needed in emergencies?

Need

Interventions that are:

- Rapidly deployable (low resource)
- Reach in & out-of-school children
- Avoiding health-based messaging

Solution

A handwashing intervention that:

- Requires little implementer training
- Delivered at the household level
- Motivation-based

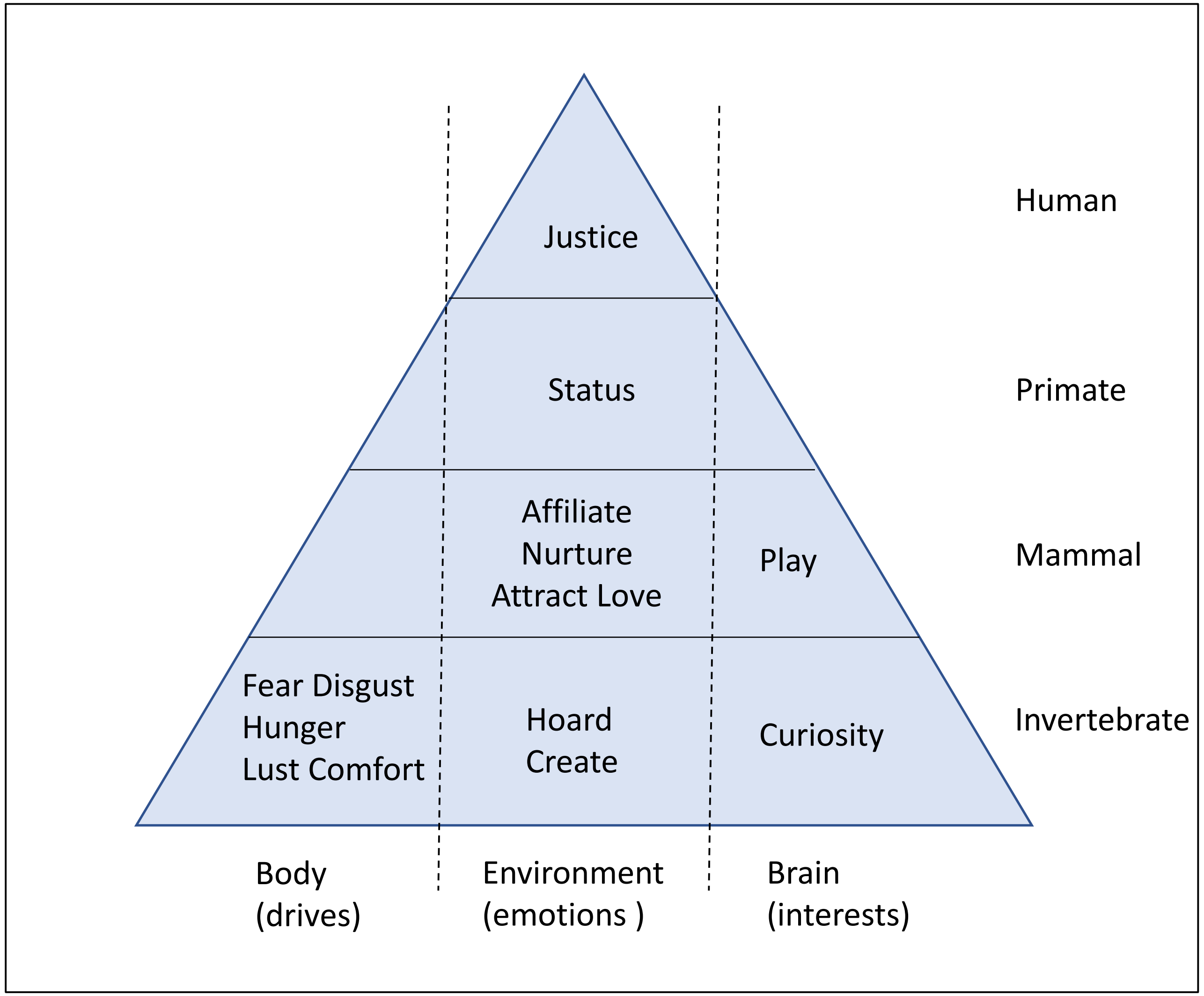
Why motivation-based?

Evo-Eco Theory[1]:

15 motives drive all human behaviour to solve evolutionary important needs[1]

e.g.

- Hunger → finding food
- Love → finding long term mate
- Play → learning new skills



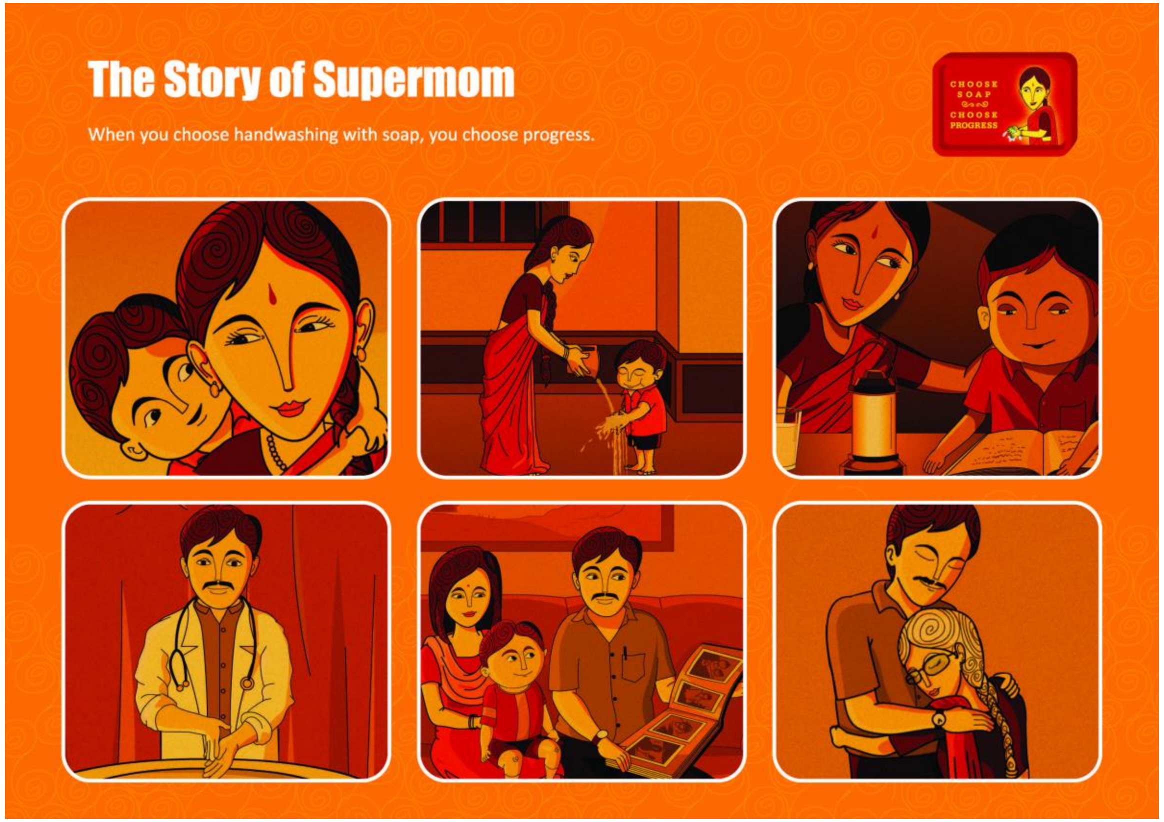
[1] Aunger and Curtis. Health psychology review. 2016

[2] Gautam et al. Am J. Trop Med. Hyg. 2017 [3] Biran et al. The Lancet Global Health. 2014

Evidence of success

Recent handwashing interventions in stable settings have targeted disgust, nurture, affiliation and status and found large increases in caregiver HWWS (≤ 63%[1,2]).

- None have used play or curiosity
- None targeting children
- None in emergency settings.



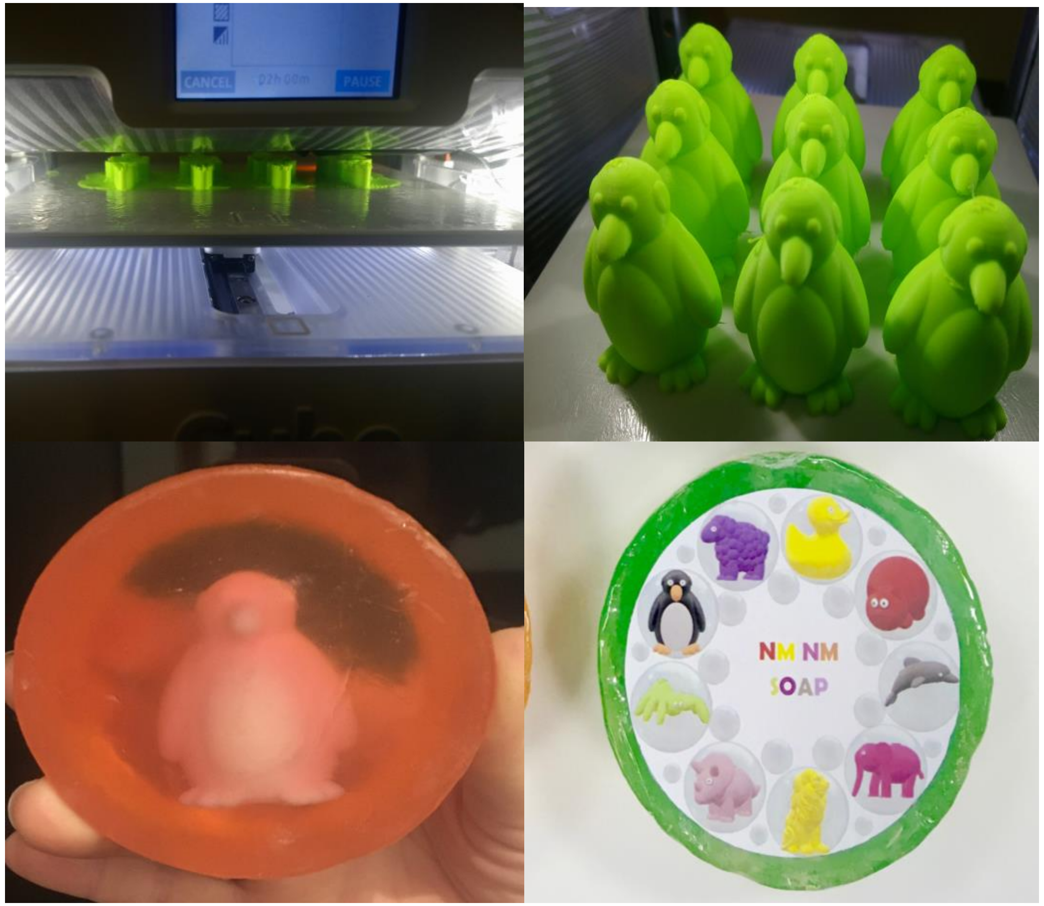
[1] Biran et al. The Lancet Global Health. 2014;2(3):145-54

[2] Gautam et al. Am J. Trop Med. Hyg. 2017

Our Innovation

"Surprise Soaps" for children age 5-12

- ✓Appeal to 'play' and 'curiosity' motives
- ✓Household delivery (5-10 min session)
- ✓NO health-based messaging
- ✓More handwashing = more quickly reaching the toy inside

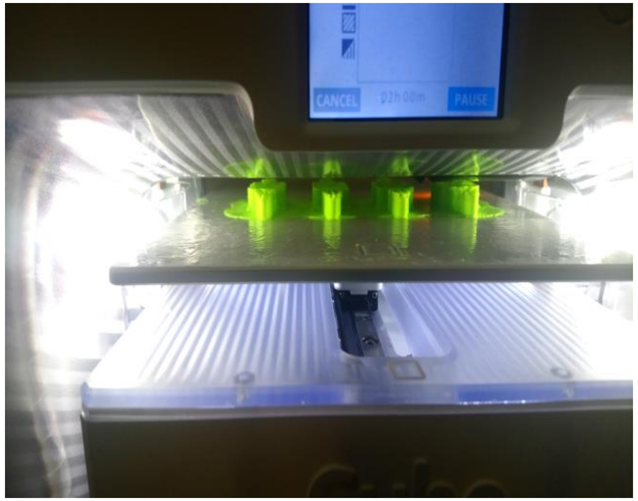


Hypothesis: A rapidly deployable handwashing intervention designed to appeal to the motives of play and curiosity will increase children's HWWS practice

Production process

Sharia Camp, Iraq

Co-design



3D printing

Production

Testing

Controlled before-after study

Intervention Arm

1) 5 soaps with toys embedded inside
2) Short handwashing promotion session at the household level with minimal non-health-based messaging using a fun glitter game and handwashing demo
(3 enumerator pairs over 1 day)

Control Arm

1) 5 plain soaps
2) Standard handwashing promotion at household level with health-based messages and handwashing demo

Recruitment & Sampling

Block B and D purposefully selected

Block B randomly assigned to control

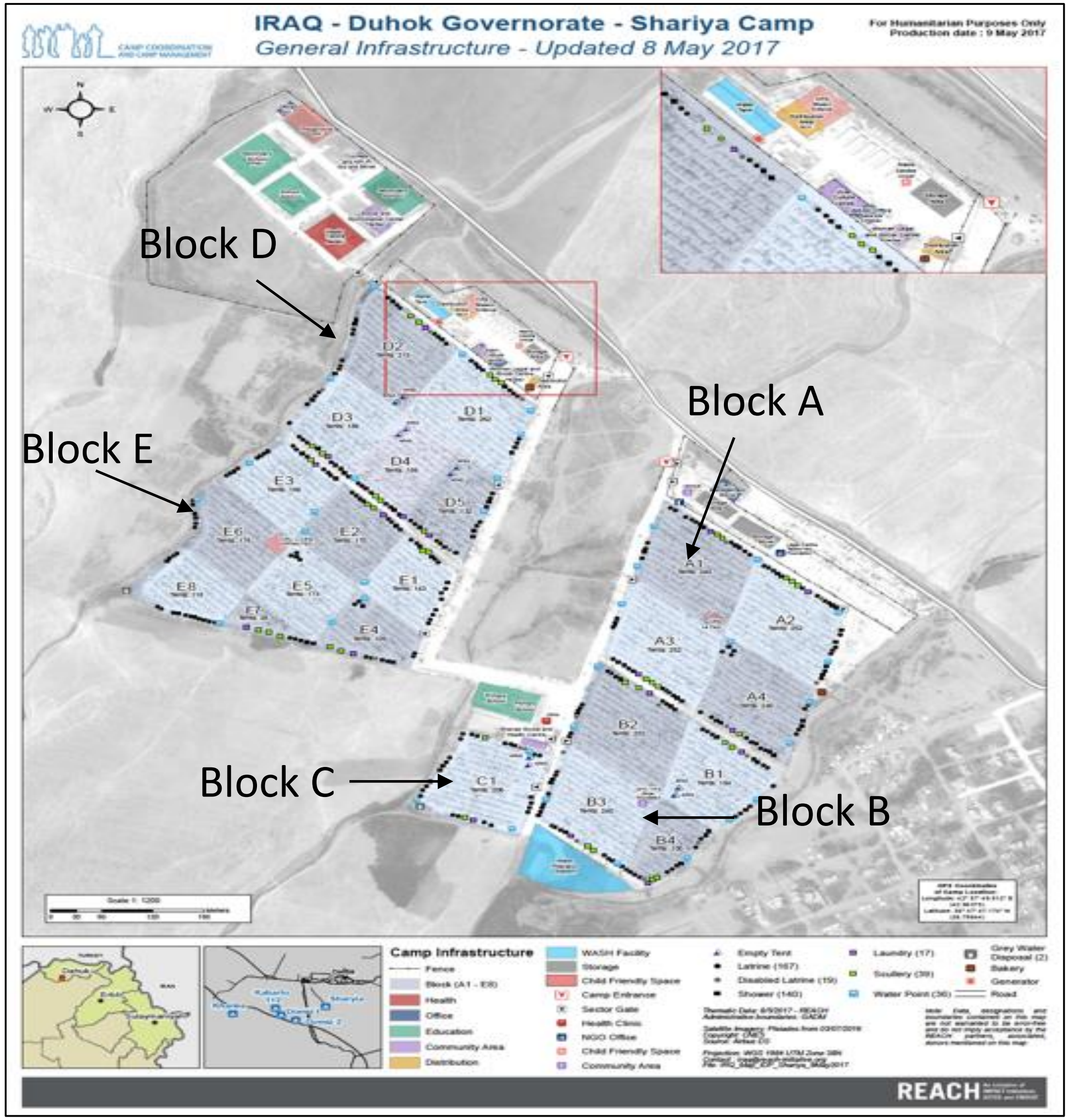
Block D randomly assigned to intervention

40 HHs randomly selected

40 HHs randomly selected

Sample Size Justification

- Population diversity
- Budget
- Time



Outcomes

Data collection

Direct observations of child handwashing:
baseline & 4 week follow-up

Soap Observations

Data analysis

- Proportion of key occasions accompanied by HWWS (DID analysis accounting for within subject correlation and clustering at block level)

- Proportion of HHs where toy soap in use (wet)/finished
- Number of 'toy cheats'

Results

Children who received Surprise Soap intervention were 4 times more likely to wash their hands with soap after key moments than if they had not received the intervention (RR=3.94, 95% CI: 1.59-9.79).

- Only 1 toy cheat
- 97% HH finished ≥ 1 soap → nearly all engaged with intervention
- 85% remaining soap wet on inspection → still engaging 1 month later

Next steps

More questions on the journey to scale:

❖Can this intervention work in more challenging humanitarian contexts such as acute emergencies and in LIC settings ?

❖Does this intervention lead to habit formation (and lead to long term health benefits)?

→ This intervention and study design are easily replicable!

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Save the Children

FIELD READY

Thank you

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Claudio Deola (Save the Children)
c.deola@savethechildren.org.uk

Andrew Lamb (Field Ready)
andrew.lamb@fieldready.org

RealRelief

SUPERTOWEL

RealRelief

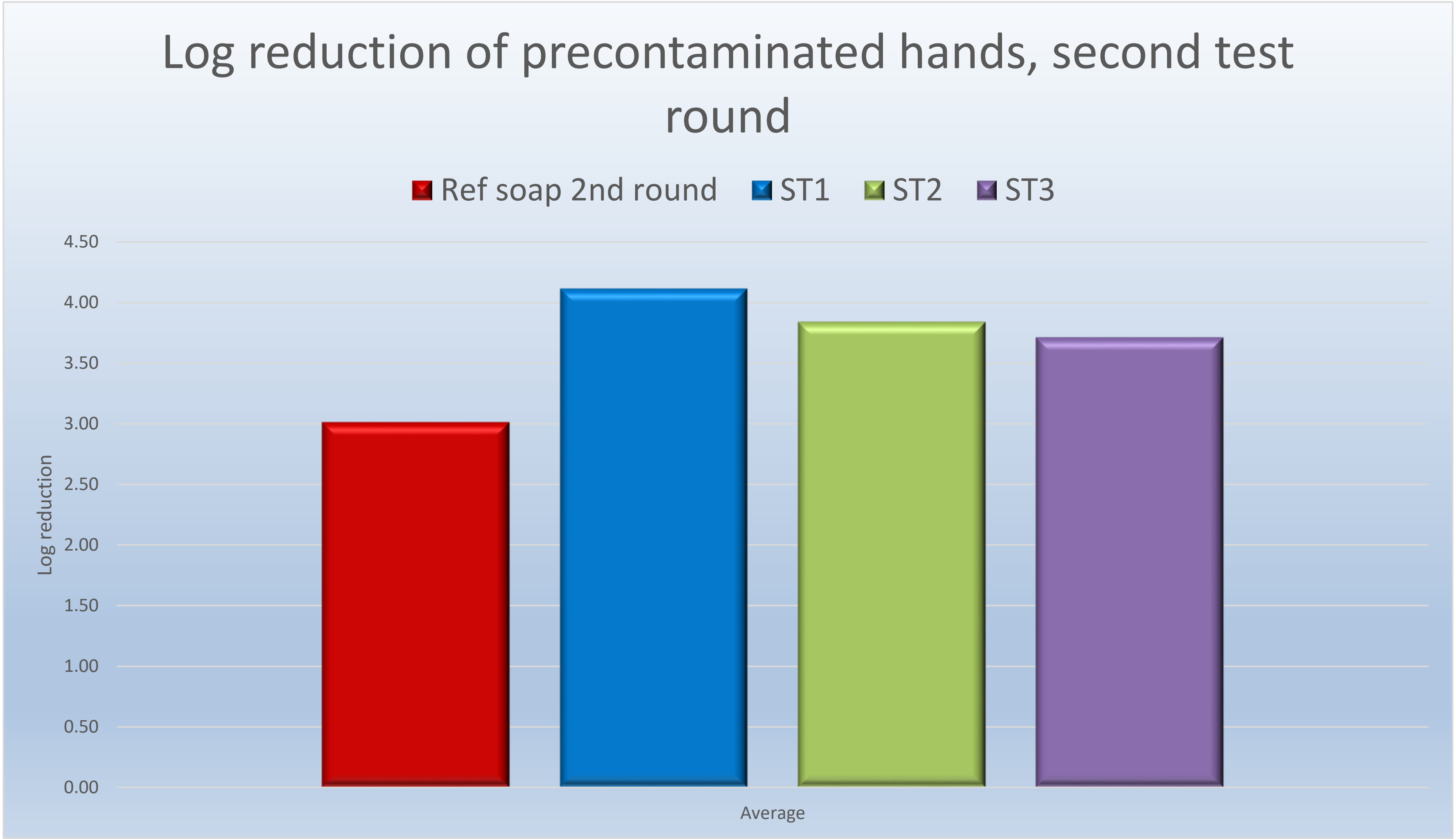
The basic idea behind Supertowel

- Handwashing without soap
- Minimal consumption of water
- Any water source
- Handwashing anywhere, anytime
- As efficient as water and soap

Lab study

16 volunteers washed their hands using three new versions of Supertowel (ST1, 2 and 3) and reference soap in a random order.

From left to right: Supertowel™ version 3, 2 and 1



Log reduction of precontaminated hands, second test round
Ref soap 2nd round
ST1
ST2
ST3
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Log reduction
Average

RealRelief

Field study

- Assessing the acceptability and feasibility of Supertowel as an alternative soap product.
- A study performed in a cooperation between LSHTM, Real Relief and DRC in Hitsats camp in Tigray region of Ethiopia

Field study – Conclusions

- People found Supertowel an acceptable and appropriate solution given that they were living in a water scarce environment and had limited economic resources.
- People liked the multi functionality of Supertowel.
- Supertowel seemed to improve handwashing frequency and ease allowing people to clean their hands at times when they might not otherwise bother (e.g. when outside the home or during food prep).

RealRelief

Where do we go from here?

- Laboratory testing with shorter time and less water.
- Durability test on Supertowel
- Ultimately – a health impact study

MOST IMPORTANTLY THOUGH:

We need YOU to commit to Supertowel by implementing it in the field.

RealRelief

SUPERTOWEL

Link to scientific papers:

- Lab study: http://www.ajtmh.org/content/journals/10.4269/ajtmh.18-0860
- Field study: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0216237

Thank you for listening.

Torben Holm Larsen, Real Relief
thl@realreliefway.com

Community engagement during the Ebola outbreak in eastern DRC, North Kivu – **Listening to and advocating for communities' priorities**

Eva Niederberger, Public Health Promotion - WASH / Raissa Azzalini and the Oxfam team in DRC

EEHF 2019

Oxfam

Introduction

Background:

142 EVD cases (Sep 2018), 97 deaths in 7 health zones, now 2019 cases (1977 confirmed - as of 10th June 2019), 1302 deaths among confirmed cases

Ongoing violence, chronic insecurity, top-down approach

Objective: Listening to communities, using their feedback to make programmatic adjustments and bring their voice to policy and decision-makers in forums they may not be able to access alone

How: tracking community perceptions using mobile technology to understand community's barriers towards the Ebola response, identify enablers and adapt program activities on an ongoing basis

Oxfam

Process

Training: of all technical teams – joint development of a database covering different categories around the Ebola response system: burial procedures, vaccination, coordination of the response, treatment, including Oxfam's work

Data collection: during community level interaction using a survey CTO app

Reports: software generating regular reports allocating priority concerns / questions per age / gender group and location: weekly reports and monthly bulletins

Meetings: regular team meetings on epidemiological trends and priority areas

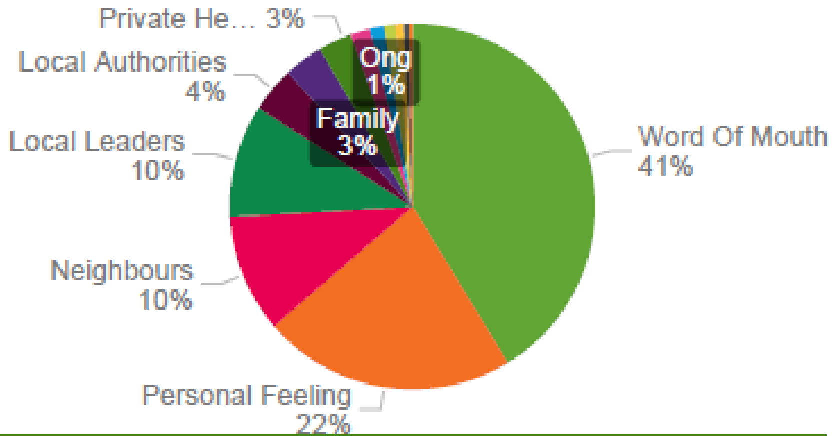
Collaboration: sharing the findings regularly with external coordination bodies and others to build up evidence on behavioural data and contextual understanding

Oxfam

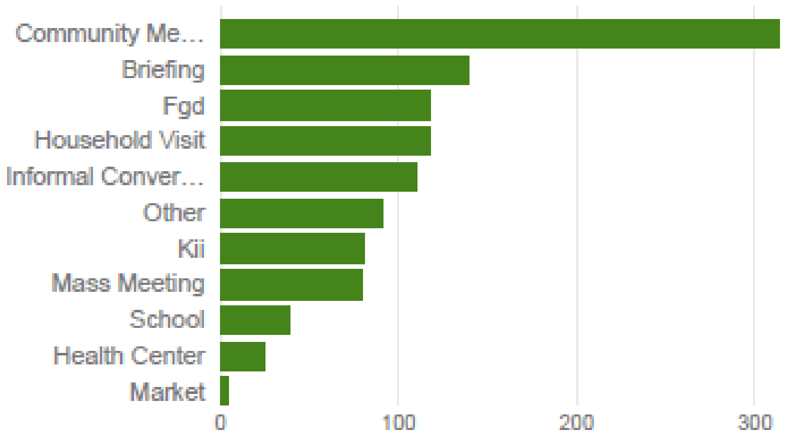
Description

Summary of responses from DRC 'Beliefs and Perceptions' survey data (ICT/PHP 'rumours' project). Use the filters on the right to explore the data.

Number of responses by source of rumour

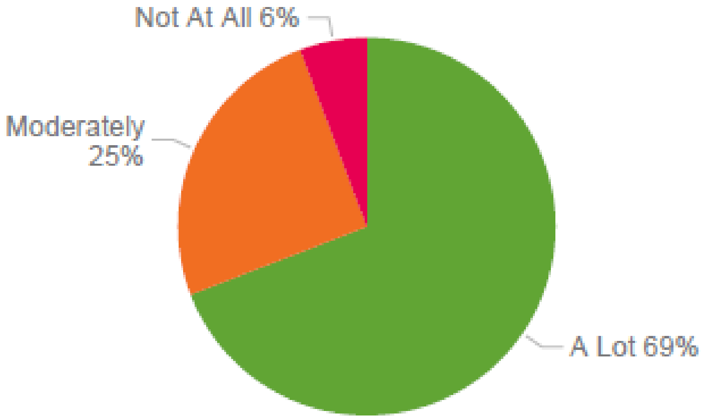


Number of responses by info_provided



Rumour Type	Female	Male	Group Response	Total
Burial Practices Sdb	42	45	5	92
Happens Health Centres	109	102	13	224
How Infected Ebola	36	45	5	86
How Prevent	74	76	24	174
Origin Existence Outbreak	63	83	9	155
Response Coordination Outbreak	48	95	13	156
Signs Symptoms	19	14	2	35
Survical Stigmatisation	2	3		5
Vaccination Ebola	77	60	4	141
Total	493	537	85	1115

Does this influence your behaviour?



Gender

- ☐ Female
- ☐ Male
- ☐ Group Response

Age-group

- ☐ Adult
- ☐ Child
- ☐ Elder
- ☐ Group Response

Disability

- ☐ Non
- ☐ Oui

Urban / Rural

- ☐ Rural
- ☐ Urban

Affected Personally?

- ☐ Non
- ☐ Oui

Oxfam

The difference it makes – internally

- Easier, faster and more systematic collection of qualitative information – real-time analysis and use;
- Adjusting programme activities per context - and in real time;
- Providing vital and accurate information: identification of information gaps (ie. measures taken but the communities are still not aware of it) to update the content;
- Equipping the team with the knowledge they need to address communities’ concerns, beliefs and questions;
- Support the behaviour change among the team;

The difference it makes – externally

Using the evidence **to advocate on communities' behalf**

- To 'make crucial course corrections' of the Ebola response – vaccination protocol, involvement of the local population in the response, changes in terms of burial protocols
- To influence policy and other decision makers – global, regional and national level (ie policy briefings) > support from WHO on Oxfam's CE approach

Challenges…

Application of the tool:

- Conscious and unconscious bias when it comes to deciding whether or not a perception is worth being collected;
- Closing the feedback loop issues raised in an awareness session;
- ‘Fatigue’;

Programmatic level:

- ‘Behaviour change’;
- Getting the right skill set;

At external coordination level:

- Closing the feedback loop and making changes in the overall Ebola response;
- Understanding of and coordinating efforts towards community-centred WoW;

Oxfam

Recommendations

- CE requires a **dynamic but structured approach** - in terms of using ICT the data categorisation needs to be flexible and adapting to evolving needs and priorities communities have;
- **Community perceptions need to be triangulated** with epidemiological data and what is overall happening in the response to make the necessary adjustments;
- Using technology is only an enabler for meaningful community involvement – it **doesn’t substitute ongoing face to face presence and interaction** with diverse community groups to build trust;
- **Investments into human resources**: recruiting staff with expertise (community participation and analysis), increased number of field-level community mobilisation staff, capacity building to make effective use of technology and the information collected;
- **Break down the concept of CE** with other implementing partners and local authorities, contextualise it and harmonise WoW;

Oxfam

While being here you may be interested in:

- More details on the findings of the action research in DRC: https://www.mdpi.com/2073-4441/11/4/862/htm
- Video on community engagement as part of Oxfam's wider WASH work: https://www.youtube.com/watch?v=8FcVKFCGBFw&t=458s

WASH RAPID RESPONSE TEAMS IN CHOLERA OUTBREAK SETTINGS

Global Review and Case Study

Emergency Environmental Health Forum (EEHF)
19th June 2019

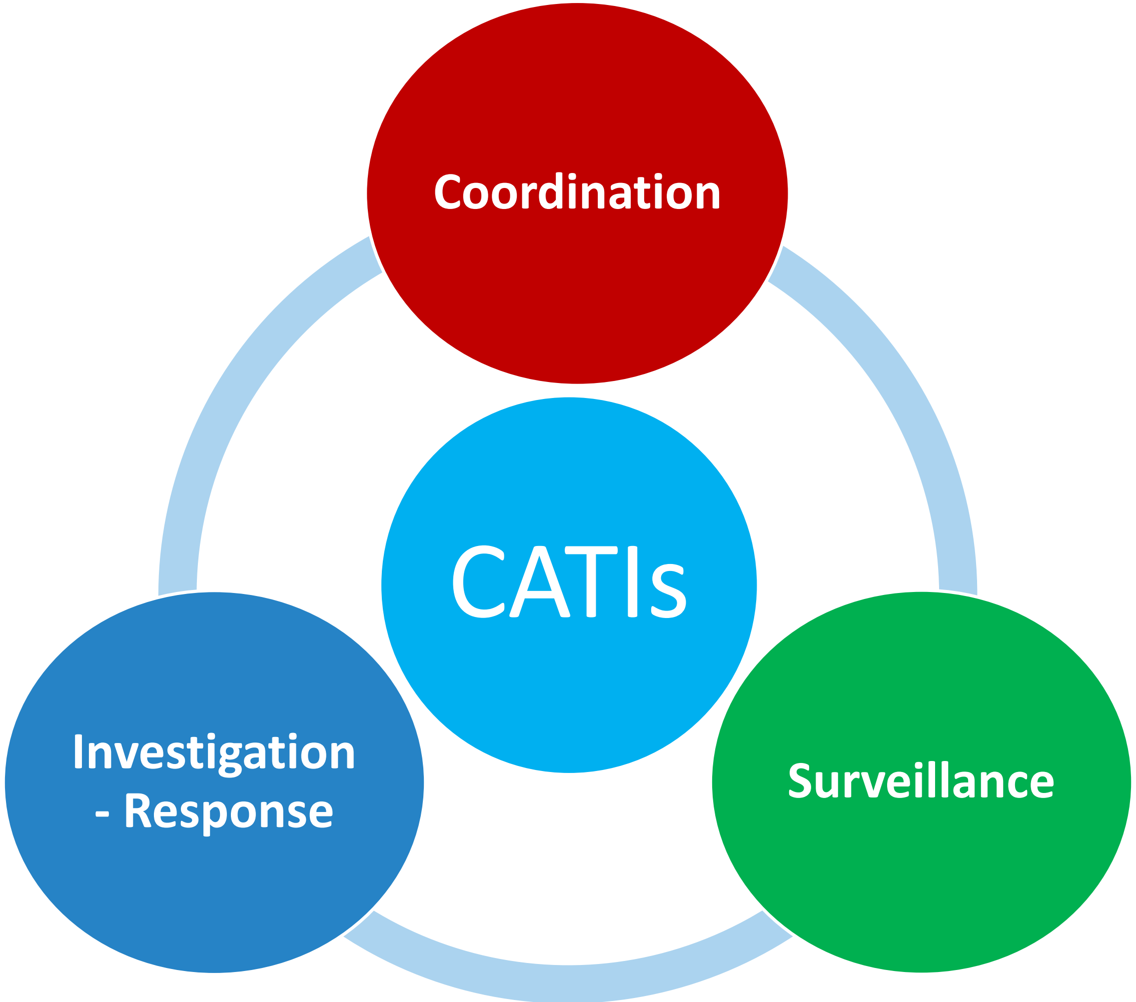
©UNICEF

Anu Rajasingham, Global WASH Team, CDC
Tim Grieve, Senior WASH Adviser, UNICEF

unicef

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

Rapid Response Teams (RRTs)



Source. UNICEF (2019)

- Multisectoral teams focused on coordination, surveillance, and investigation/response and (CSIR)
- Provide case-area targeted interventions (CATIS) through a *cordon sanitaire* around affected households and *shield* in communities
- Standard WASH package to affected and surrounding households, within 48 hours
- Aim is to reduce the risk of local transmission

Background

Source. Solidarities International, Haiti (2019)

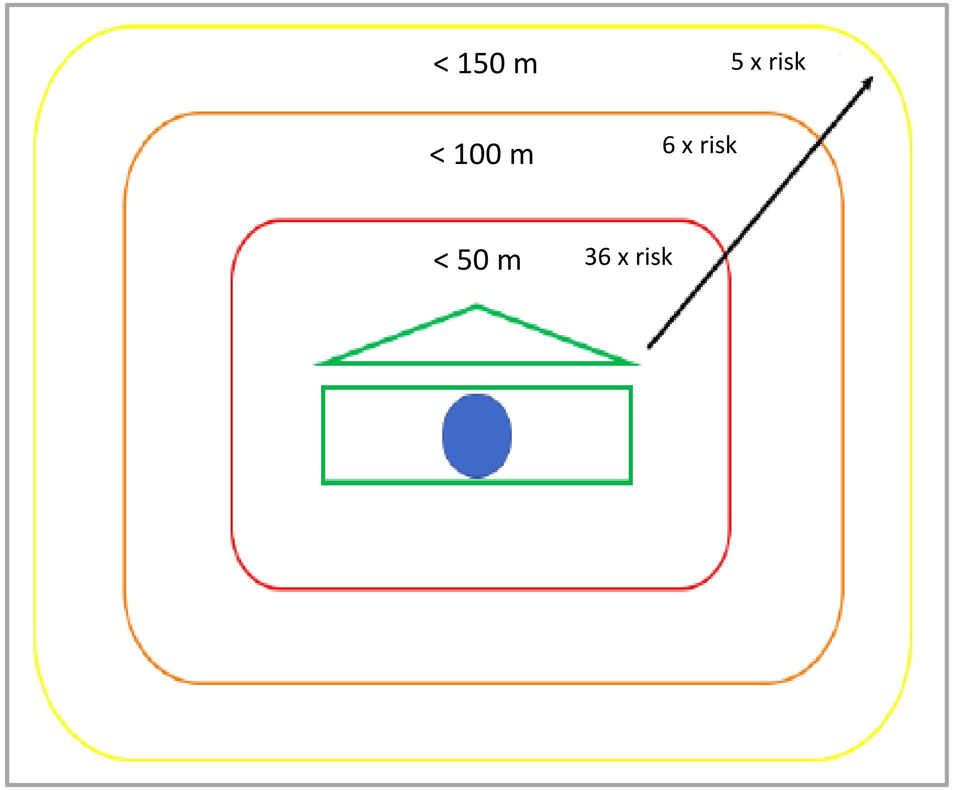
- Increased use and investment in cholera outbreaks
- Conduct a comparative analysis of operational and performance aspects
- Document challenges, lessons learned and best practices
- Generate evidence base for effectiveness and impact
- Put forward operational recommendations to guide future replication

unicef

CDC CENTERS FOR DISEASE CONTROL AND PREVENTION

Rationale and key risks factors

- Close contact to infected household, increases risk of transmission spatially and temporally
- 36 times more at risk in first 3 days within 50 meter radius (Debes, A.K et al 2016)
- Targeted WASH interventions reduce transmission by up to 50%, including provision of safe drinking water, hand washing with soap and household kits (George, C.M. et al. 2016)



Source. Modified from MSF (2017). Debes, A.K. et al. (2016) and Azman, A. et al. (2018)

unicef CDC CENTERS FOR DISEASE CONTROL AND PREVENTION

Application of the approach

Source. CDC (2018)

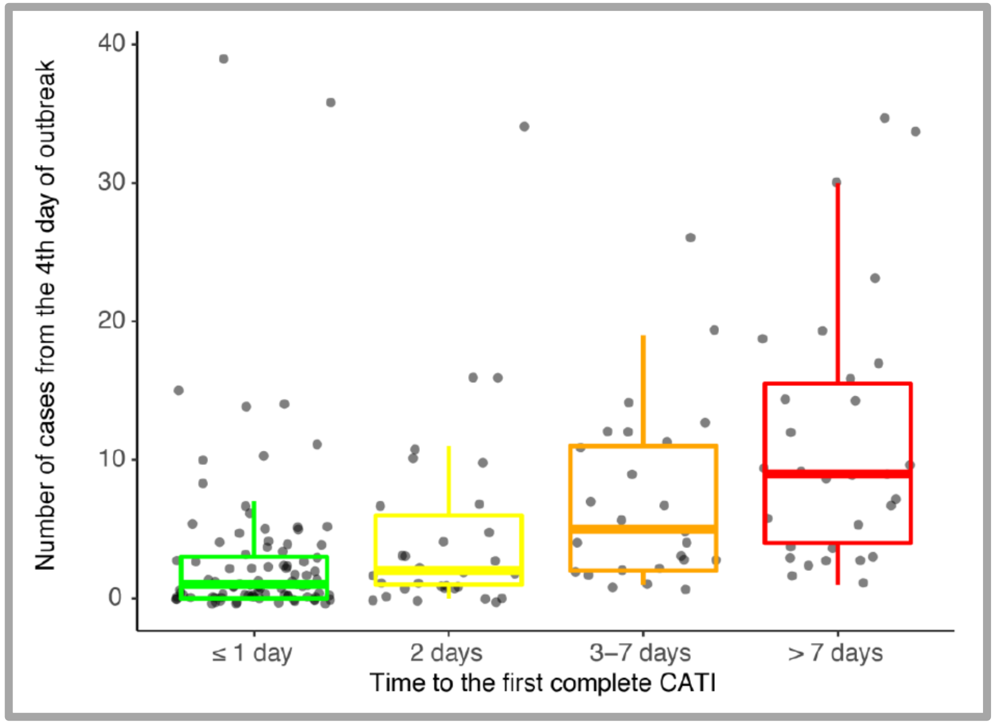
Source. GARWSP, Yemen (2019)

- Risk of large caseloads and increased transmission
- Capitalization of on-going efforts, linking active case investigation to response
- Improve response efforts through better targeting
- Shift from blanket WASH coverage
- Seasonality and impacts on transmission

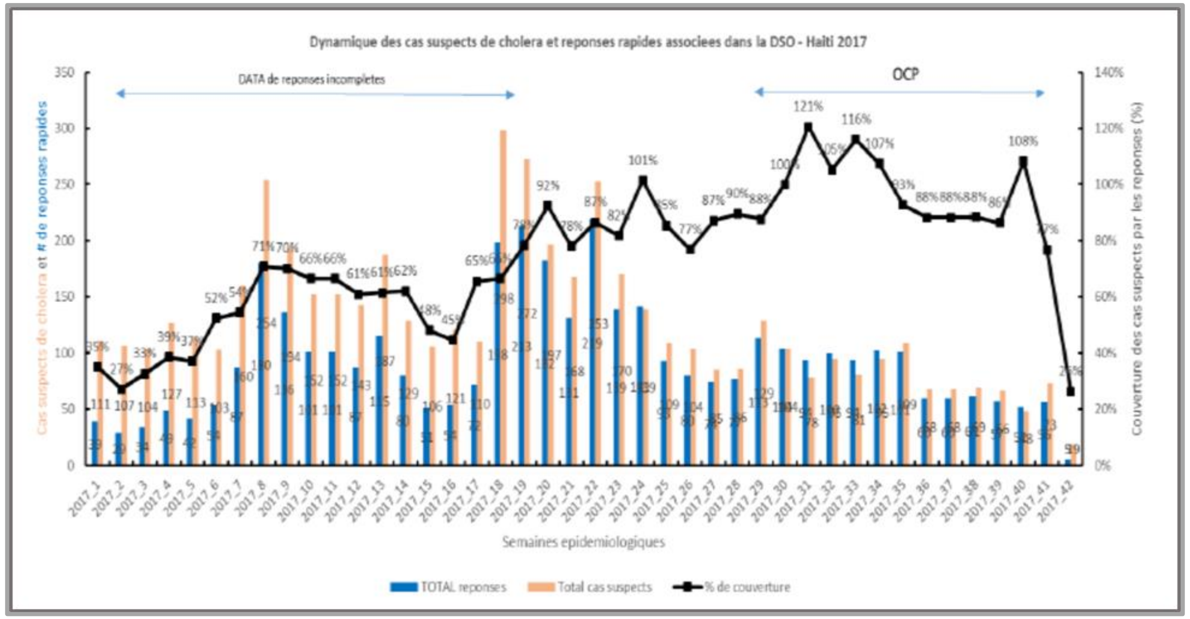
unicef CDC CENTERS FOR DISEASE CONTROL AND PREVENTION

	Haiti	Yemen	Zimbabwe
Team composition	Four members. 57 teams in 10 departments 'Mixed-teams', with multi-sectoral team members from government partner (MSPP's EMIRA) and NGOs (SI, ACTED and ACF). Total of 57 teams in 10 departments	Two members. Between 400 – 850 teams in 22 governorates. Non 'mixed-teams', with WASH only team members from government partner (GARWSP).	Four members. 8 teams. 'Mixed-teams', with multi-sectoral team members from government partner (Harare Health Division, Environmental-Health Officers) and NGOs (Goal and Oxfam)
Activation	1 suspected case = 1 alert = 1 response	'Cluster of cases': 20 cases or more in one geographical area over a week period (aimed to reach 25 per cent of cases)	1 suspected case = 1 alert = 1 response
Response time and coverage	In 2018, 85 per cent of suspected cases were responded to within 48 hours, and 75 per cent within 24 hours. 95 per cent response rate for suspected cases	In 2018, 3 per cent of suspected and confirmed cases were responded to within 24 hours; 43 per cent within 24 to 48 hours and 23 per cent within 48 to 72 hours. 32 per cent response rate for suspected cases and 83 per cent confirmed cases	In 2018, 73 per cent of suspected cases responded to within 48 hours
Response coverage	10 to 20 households per case	20 to 21 households per day	10 to 20 households per case
Scope of action to affected household and in the cordon sanitaire	• Immediate investigation and active case identification • Oral chemoprophylaxis • Household disinfection • Water quality monitoring • Hygiene promotion sessions • Cholera kit distribution	• Immediate investigation and active case identification • Household disinfection • Water quality monitoring • Hygiene promotion sessions • Cholera kit distribution	• Immediate investigation and active case identification • Household disinfection • Water quality monitoring • Hygiene promotion sessions • Cholera kit distribution
Scope of action in the community	Quick assessment of water and sanitation situation in affected areas 'Quick fixes' of existing WASH infrastructure Chlorination of water sources Intensified community engagement and hygiene awareness in public places, food markets, schools, churches, special gatherings, etc. Preventive interventions in areas with the presence of risk factors for active cholera transmission (e.g., high rainfall, prolonged drought, poor WASH conditions, mass gatherings)		
Costs	US$10,234 USD per team, per month, including salaries and incentives, car rental, fuel and maintenance, and materials and supplies, and operational and administrative costs for UNICEF	US$2,400 for urban teams to US$ 3,000 for rural teams, per month, including salaries and incentives, and car rental, fuel and maintenance, and operational and administrative costs for GARWSP, materials and supplies	US$2,600 to US$5,600 USD including car rental, fuel and maintenance (as needed)

Haiti: Effectiveness of RRTs

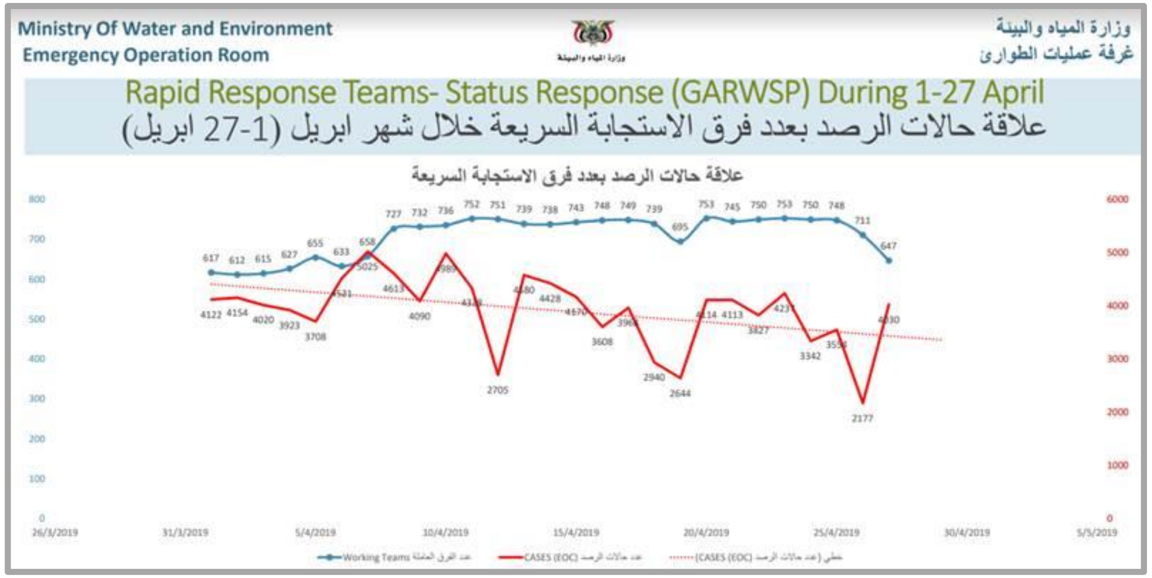


Source. Michel, E. et. al. (2018)

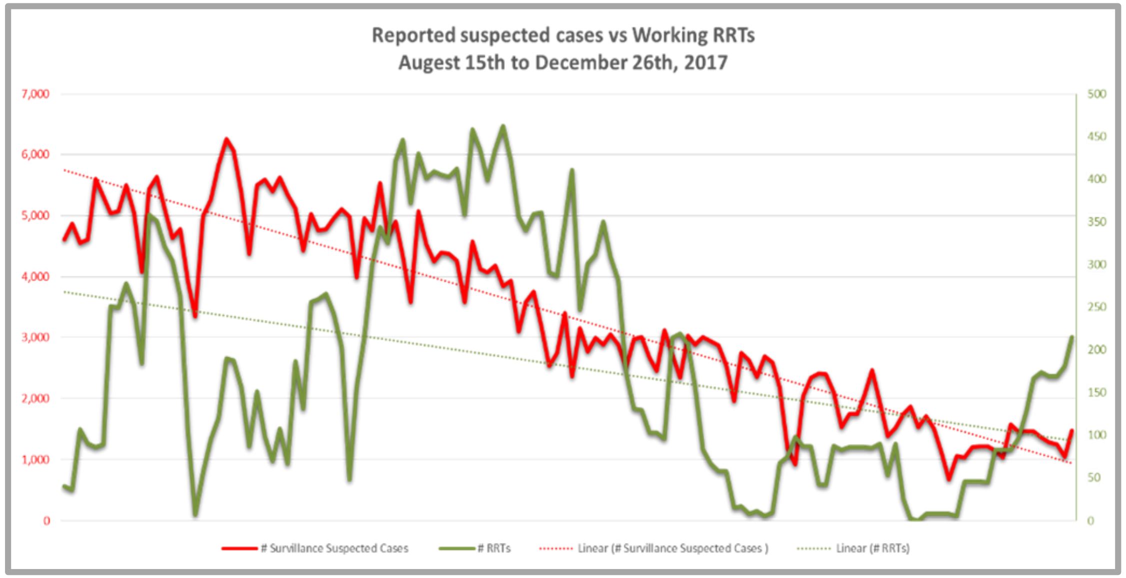


Source. UNICEF (2017)

Yemen: Performance of RRTs



Source. MoWE (2019)



Source. UNICEF (2017)

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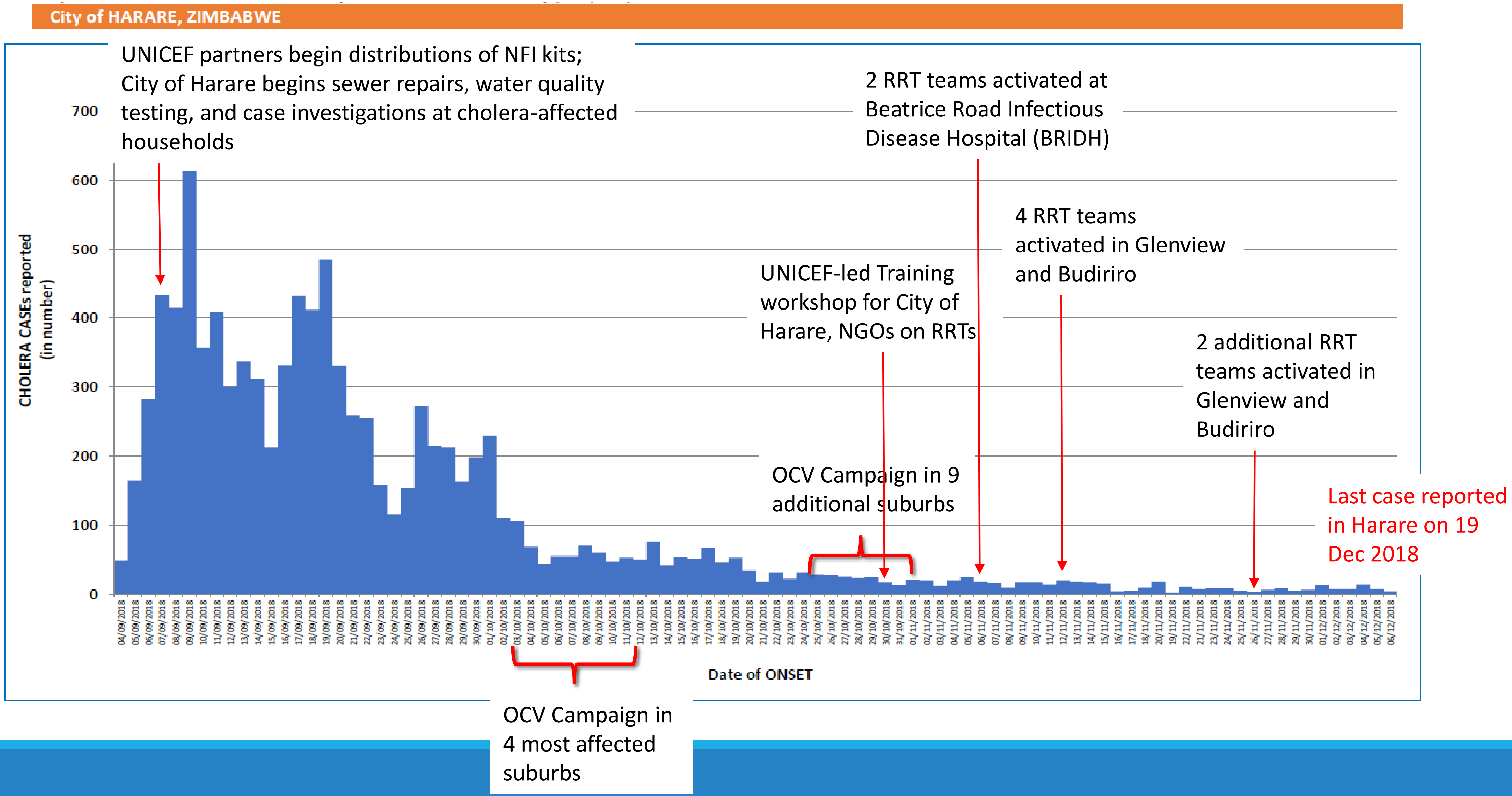
Zimbabwe: Case Study on Performance of RRTs



Zimbabwe: Monitoring Framework

- Location and number of cases → **Assignment form**
- Management of supplies → **Supply form**
- Characteristic of household case → **Case investigation form**
  - ✓ *Identify potential risk factors (e.g., water source, sanitation facility, hygiene practices, and contacts)*
- Characteristics of cordon sanitaire → **Household barrier form**
  - ✓ *How many households visited? What package is delivered?*
- Uptake of intervention → **Post Intervention Monitoring (PIM)**

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Zimbabwe: Performance of RRTs

Summary of Cholera and Typhoid Response

Cumulative total from November 20, 2018 to May 5, 2019		
	Cholera	Typhoid
Total number of suspect cases reported and assigned	227	1,358
Total number of suspect cases responded to, n (%)	178 (78%)	1,054 (78%)
Total number responded within 48 hours of presentation, n (%)	168 (94%)	872 (83%)
Mean number of households visited per case (i.e. “cordon sanitaire” size)	14	12
Total number of households that received materials	2,258	12,470
Number of responses which included investigation of community drinking water sources, n (%)	167 (94%)	1017 (96%)
- Number of boreholes	33 (20%)	310 (30%)
- Number of municipal taps	100 (60%)	583 (57%)
- Number of shallow wells and surface water sources	31 (19%)	99 (10%)

Zimbabwe: PIM of RRTs

Free Residual Chlorine

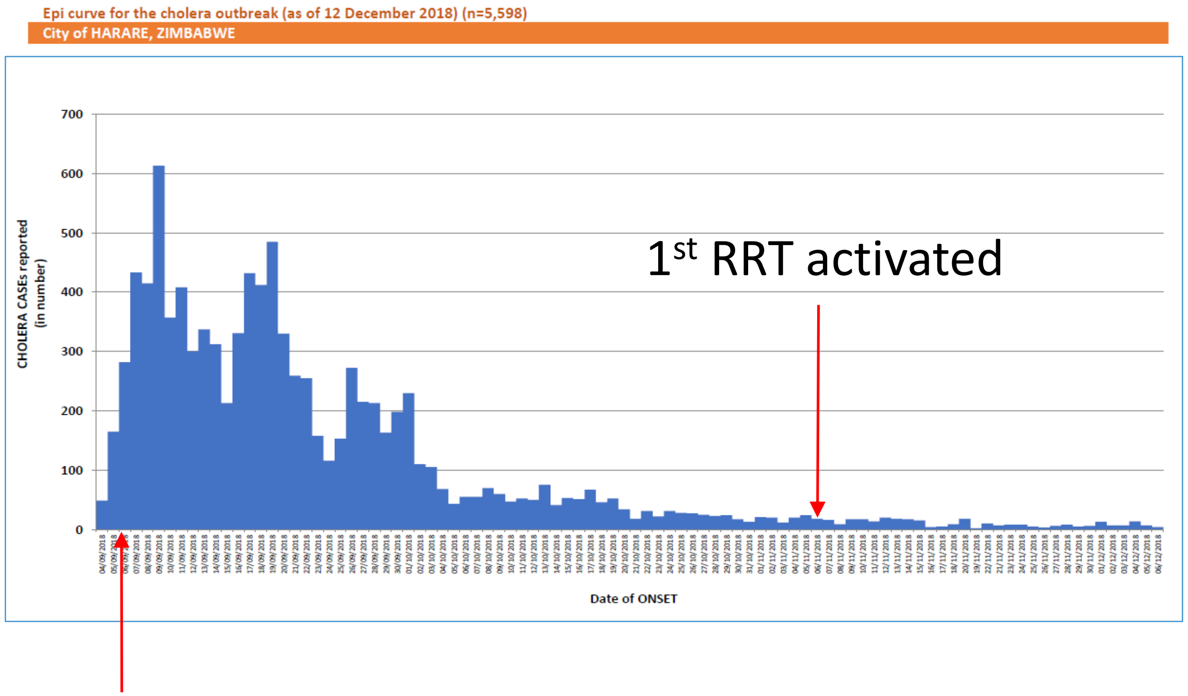
Cumulative total from November 20, 2018 to May 5, 2019 (cholera and typhoid combined)	RRT Visit	1st Round PIM Dec 2018	2nd Visit PIM Feb-Mar 2019
Total number of HHs with stored drinking water	1,137	147	177
Total number of HH stored water with FRC ≥ 0.2 mg/L, n (%)	136 (12%)	98 (67%)	84 (47%)
Total number of chlorinated community water sources tested for FRC ◊	1,003	*	*
Total number of community water sources with FRC ≥ 0.2 mg/L, n (%) ◊	72 (7%)	*	*

◊ municipal taps and boreholes with inline chlorinators

*Only household municipal taps tested for FRC during PIM therefore not shown

Zimbabwe: Lessons Learned

- Earlier activation had the potential to decrease number of cases and end outbreak sooner
- Adapting local response to context and capitalizing on local capacities and resources is key
- Immediate establishment of monitoring system and data collection/reporting provides timely insights into RRT performance and WASH conditions
- GPS data could better assess spread of cholera and typhoid (spatially and temporally)



What is the potential impact of pre-training and activating teams here?

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Key advocacy messages for RRTs

- Early establishment and response is key
- Multi-sectoral approach capitalizes on the optimization of available capacities and resources
- Embedded in a comprehensive alert-response strategy is required
- Timely sharing of reliable epidemiological data and line list is essential
- Play a critical role in ‘slowing down’ transmission
- Importance of building upon or incorporation into existing public health programmes

Source. UNICEF, Yemen (2018)

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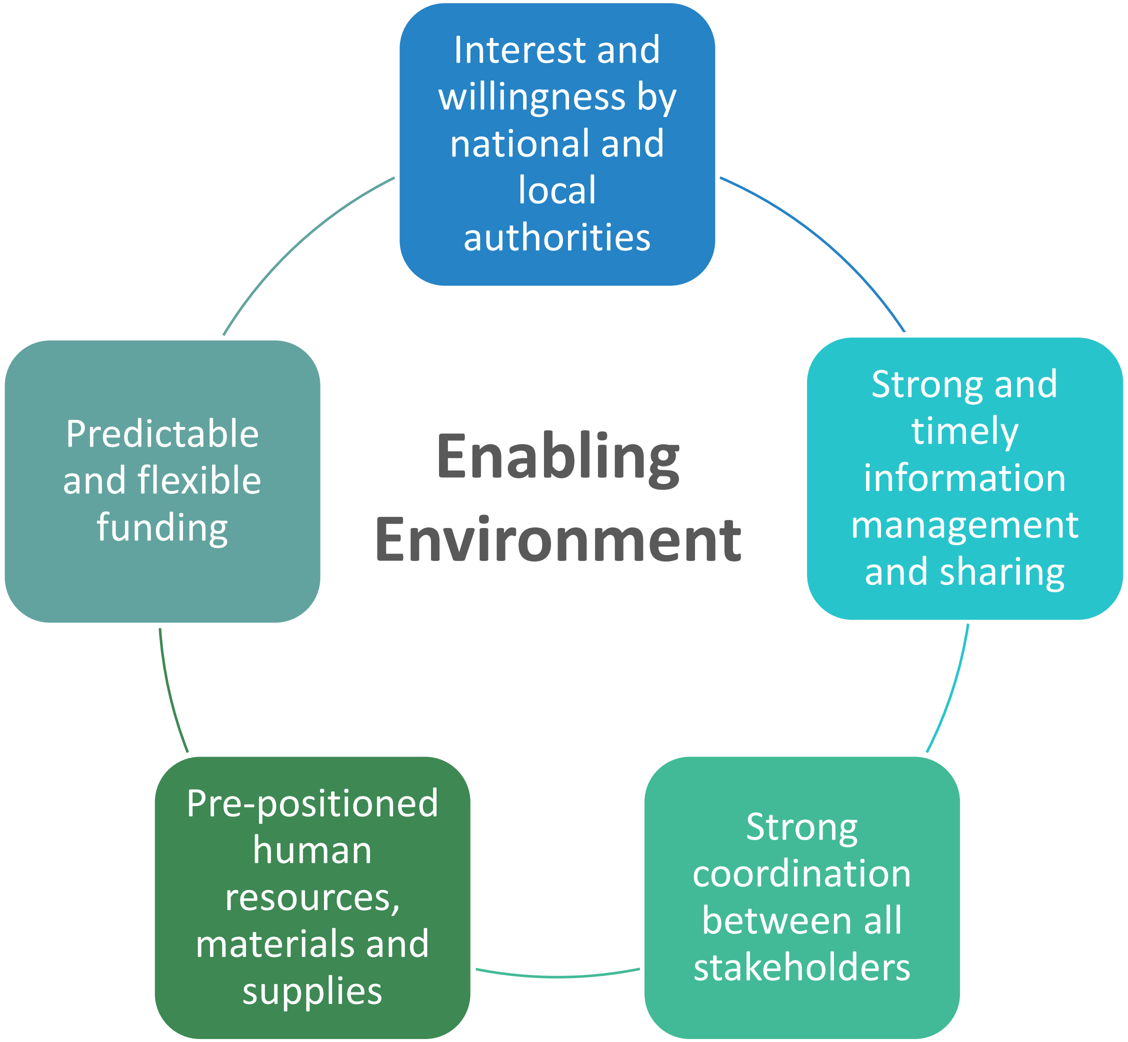
Replication of RRTs



Source. UNICEF (2019)

Next steps for RRTs

- Improved operation and performance aspects (i.e., pre-positioning, rainfall data)
- Cost efficiency
- Systematic monitoring and evaluation framework
- Standardized capitalization and programmatic learning
- Effectiveness and impact studies
- Sustainability and long-term measures

Source. UNICEF, Haiti (2018)

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THANK YOU
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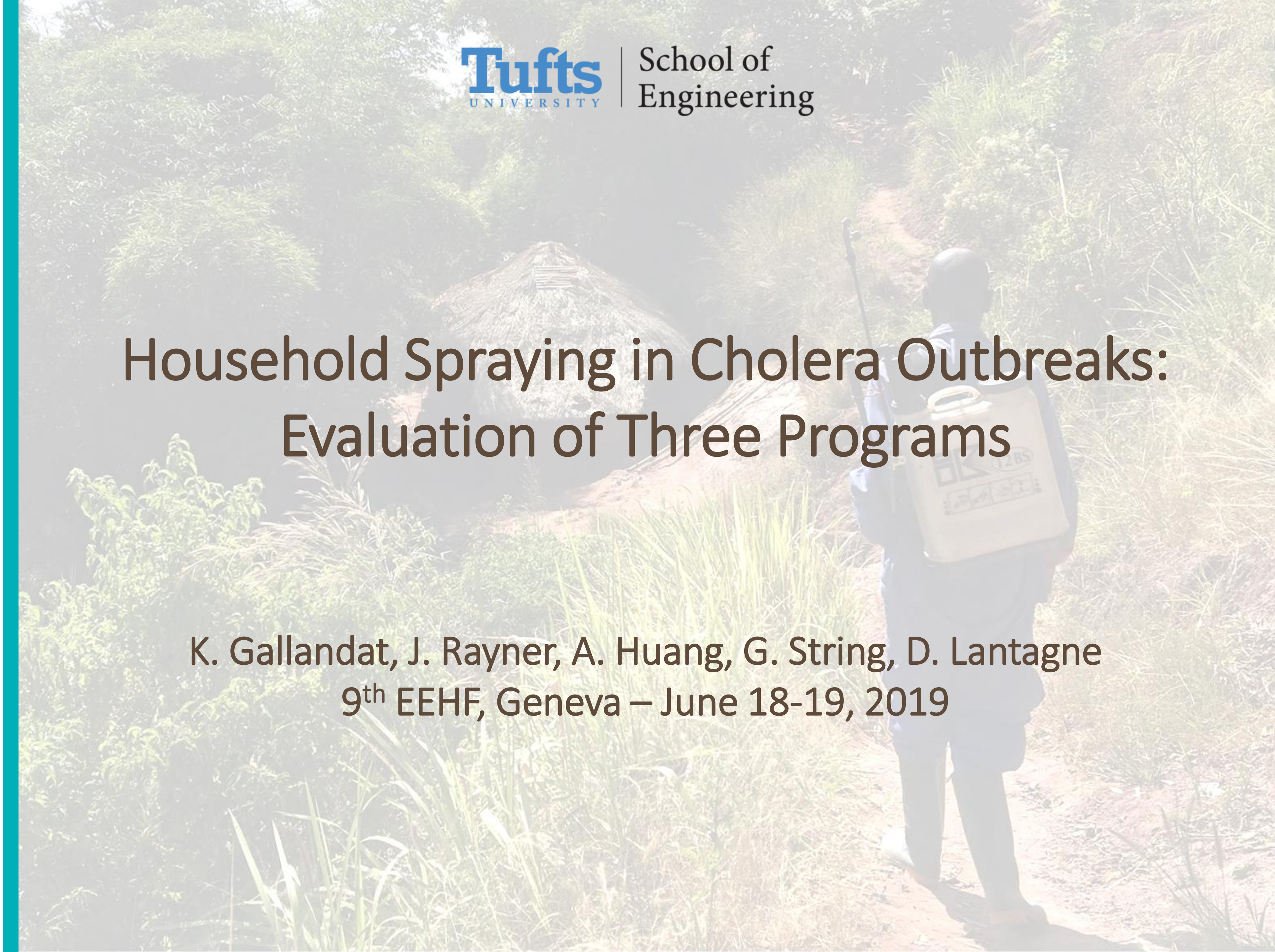
For more information please contact Centers for Disease Control and Prevention

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



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Household Spraying in Cholera Outbreaks: Evaluation of Three Programs

K. Gallandat, J. Rayner, A. Huang, G. String, D. Lantagne

9th EEHF, Geneva – June 18-19, 2019

Household Spraying

- Sprayers apply chlorine on surfaces in cholera-affected households
- “Not recommended” in 4 guidelines
  - No evidence for efficacy or effectiveness
  - Timeliness of the intervention?
  - Limited coverage (asymptomatic)
  - Stigmatization concerns
  - Prioritization of interventions
- But commonly implemented in outbreak response

Kalemie, DRC, June 2018

Objectives

a. Determine where *V. cholerae* is found in households

b. Evaluate the effectiveness of household spraying

c. Identify opportunities and challenges of the intervention

Evaluation Methods

- Chlorine solution testing (titration)
- Sampling of surfaces by swabbing
  - Before spraying
  - 30 minutes & 24 hours after spraying
  - Detection of *V. cholerae, E. coli,* total coliforms
- Key informant interview(s)
- Household surveys
- 3 programs evaluated
  - 4-5 HH in each evaluation
  - 1 more pending evaluation

Mbuji-Mayi, DRC, July 2018

Program Characteristics

	Program A	Program B	Program C
Environment	Urban (DRC)	(Semi-)urban (DRC)	Urban (Haiti)
Cholera context	Endemic	Epidemic	Endemic
Program start	2008	April 2018	2014
# Spraying agents	3 (+6 “back-up”)	9	11
Supervision	Local health auth.	NGO	NGO
Team base	CTC/hospital	CTC/CTU, ORP	NGO office
Coverage objectives	Case HH + 5 latrines	Case HH + 20 HH	Case HH + ≤30 HH
Chlorine type	Calcium hypochlorite (HTH)		
Target chlorine concentrations	0.2% for HH surfaces, 2.0% for latrines & soiled surfaces		

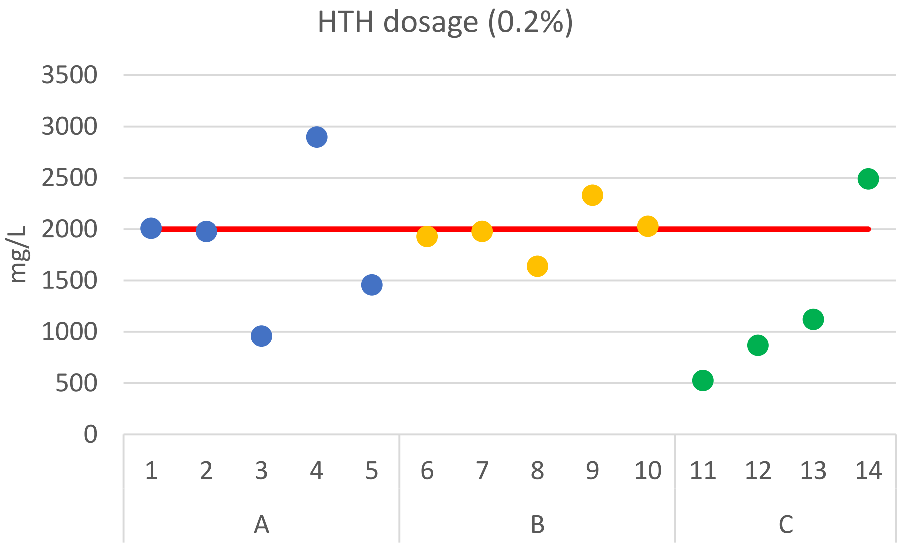
Chlorine Preparation

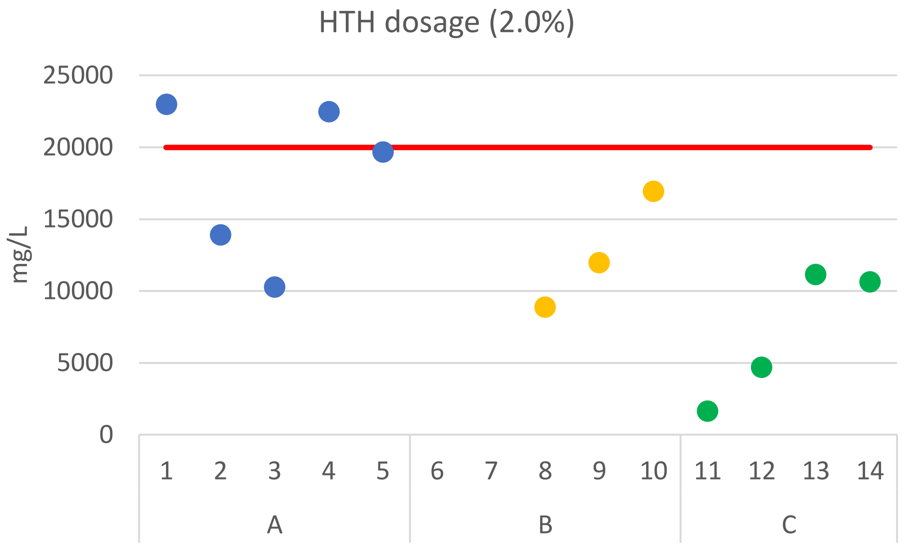
Mbuji-Mayi, DRC, July 2018

Kalemie, DRC, June 2018

Dosage of HTH powder with spoons in all programs
At the household for Program A, at the CTC/base for Programs B & C
Use of container / spraying equipment to estimate volumes

Chlorine Dosage

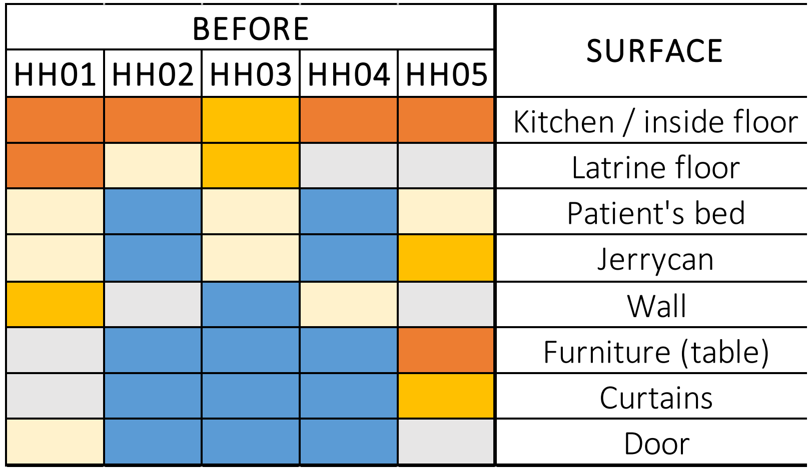




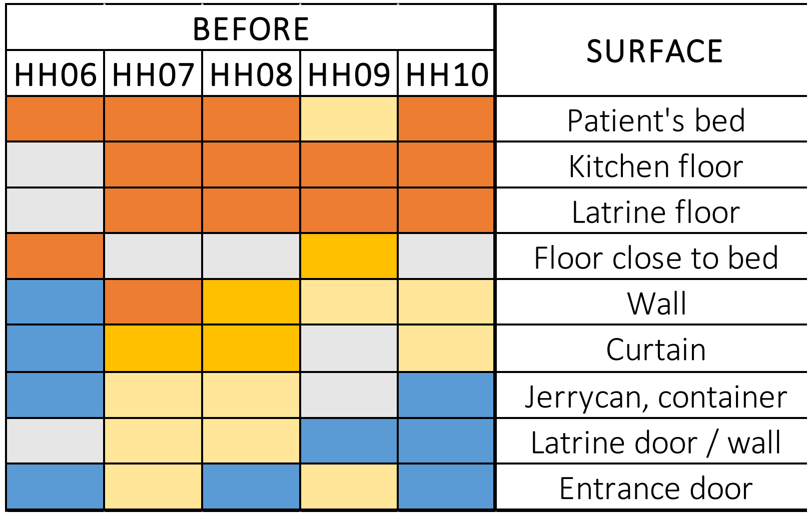
Dosage with spoons in all programs
Dosage more accurate at 0.2% compared to 2.0%,
and consistently lower than target in Program C

V. cholerae on Selected Household Surfaces

PROGRAM A



PROGRAM B



Systematic
5-10 L/HH
5-10 min/HH

(■) High: ≥5,000 CFU/100 cm^2

(■) Intermediate: 200-5,000 CFU/100 cm^2

(■) Low: <200 CFU/100 cm^2

(■) Not detected

Ad hoc
0.2 L/HH
2-5 min/HH

V. cholerae on Selected Household Surfaces

PROGRAM C

BEFORE				SURFACE
HH11	HH12	HH13	HH14	
High	High	High	High	Kitchen floor
High	High	High	High	Latrine / toilet floor
Intermediate		High	High	Floor close to bed
Low	Intermediate	Not detected	Not detected	Patient's bed
Intermediate	Low			Dining table
	Intermediate	Not detected		Chair
	Not detected	Low	Not detected	Jerrycan, container
Not detected	Not detected		Not detected	Inside wall
Not detected	Not detected	Not detected	Not detected	Curtain
	Not detected	Not detected		Latrine curtain / door

HH13-14: no suspected cholera case (AWD)

(■) High: ≥5,000 CFU/100 cm^2

(■) Intermediate: 200-5,000 CFU/100 cm^2

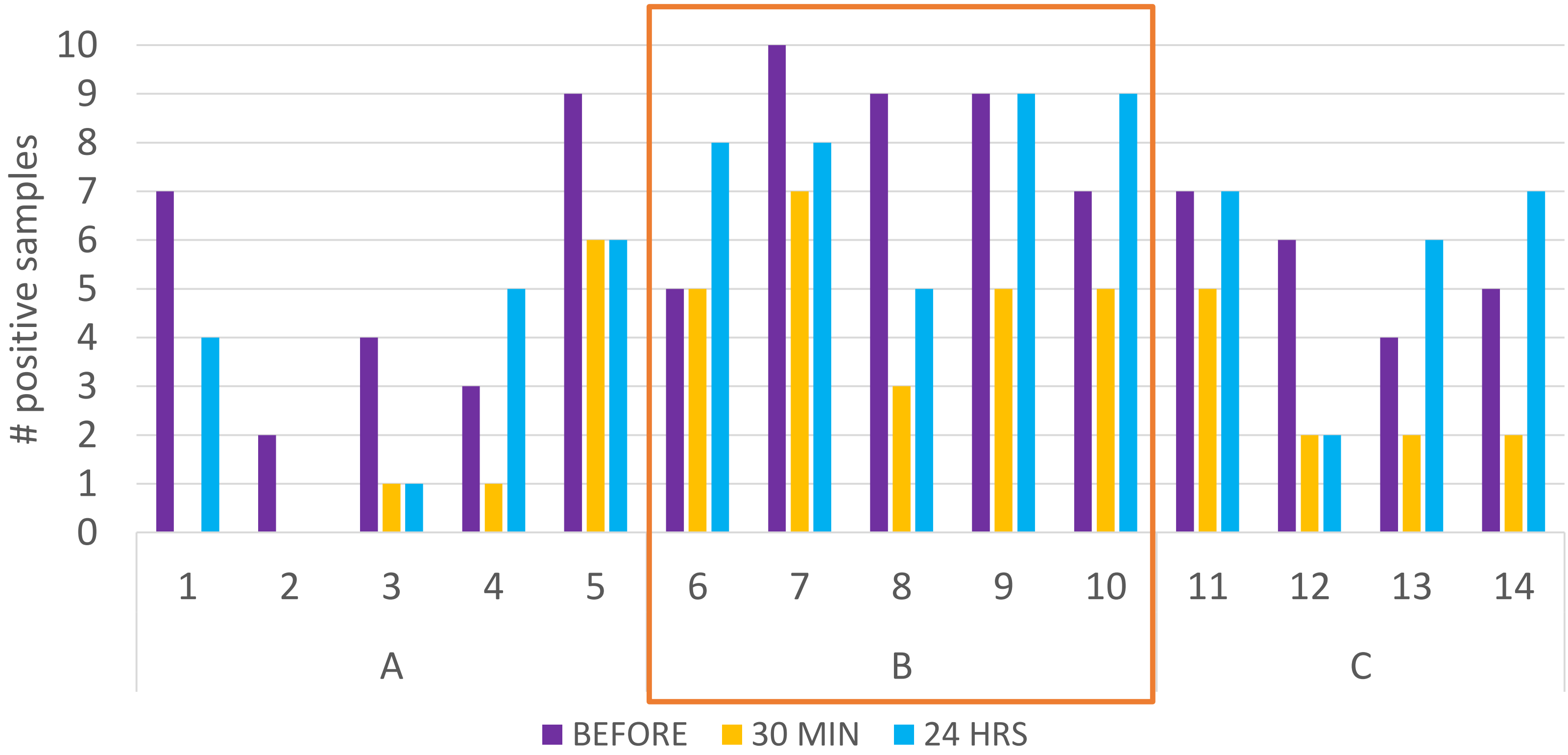
(■) Low: <200 CFU/100 cm^2

(■) Not detected

Ad hoc
2-5 L/HH
Time not recorded

Consistent inactivation of *V. cholerae* after spraying was seen in Program A only
Some recontamination was observed after 24 hours

Detection of *V. cholerae*



More HH surfaces initially contaminated in Program B
Reduction in # of contaminated after 30 minutes in 13/14 HH (93%)
Recontamination after 24 hours observed in 10/14 HH (71%)

Selected Survey Results

Intervention timing: long time to reach households

	Program A		Program B		Program C	
Mean (range) # days since cholera onset	3.4	(2-5)	3.2	(2-4)	4.5	(4-5)

Among survey participants …

- 50-80% found HH spraying "very useful"
- 40-100% appreciated a "clean house"
- 100% had nothing to report when asked what they did NOT like
  - Highlights the risk of bias; further qualitative research needed

Challenges & Opportunities from KII

Mbuji-Mayi, DRC, July 2018

- Timeliness
- Household identification *(all programs)*
  - ➢ Use cell phones / radios
  - ➢ Travel with patient relatives
- Resource-intensive *(all programs)*
  - ➢ Use as platform for sensitization, active case searching, outbreak monitoring (GPS)
- Mostly appreciated by beneficiaries *(all programs)*, with occasional refusals reportedly due to fear of stigmatization and religious beliefs *(programs A, C)*

Conclusions

Key results

- Spraying can reduce contamination on HH surfaces if implemented properly
- Intervention coverage is limited (asymptomatic & community cases)
- Challenge: identification of HH
- VBNC *V. cholerae* not detected in this work; their relevance remains unclear

Recommendations
(if HH spraying is implemented)

- Systematic procedure to ensure complete coverage
  - Spray until surface is wet
  - Kitchen area is critical (2.0%)
- Prioritize approaches that increase community coverage
- Use HH spraying opportunities for hygiene promotion
- Travel w/ patient's relative and give sprayers phones/radio

Acknowledgements

- **Partner organizations:** AIDES, Solidarites International
- **Interpretors:** François Mitima, Eddy Mbuyamba Kashala, Miché Payen
- **Study participants:** program staff & beneficiaries
- **Funding:** Research for Heatlh in Humanitarian Crises, Swiss National Science Foundation, PEO Foundation

Thank you

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Hygiene kit distribution during a cholera outbreak in Kasaï-Oriental, DRC: a process evaluation of implementation, participant response and context of programme delivery

Lauren D'Mello-Guyett*, Sharla Bonneville, Rob D'hondt, Maria Mashako, Alexandre Gorski, Robert Dreibelbis, Rafael Van Den Bergh, Peter Maes, Francesco Checchi & Oliver Cumming

LSHTM & MSF

Emergency Environmental Health Forum
18-19 June 2019
Geneva, Switzerland

CHOLERA AND HYGIENE KITS

Cholera risk is 100x greater within the household & within 200m of a case

Human-to-human transmission > environment-to-human transmission in outbreaks

Strong rationale for case-centred strategies and household level WASH interventions

Hygiene kits distributed to households have shown effect to reduce cholera transmission

Recommended in multiple agency guidelines

Oxfam The Sphere Project unicef MEDECINS SANS FRONTIERES ACTION CONTRE LA FAIM

Issues with scalability, transferability and use

1. Weil et al. Am J Trop Med Hyg 2014; 91: 738-42
2. Codeço et al 2001. BMC inf Dis
3. Sugimoto et al 2014. PLOS NTDs
4. George et al. 2017. Emerg Inf Dis
5. Mosely et al. Bull WHO 1968; 38:335-46
6. Glass et al. Am J Epidemiol 1982; 116: 959-70
7. Spira et al. Bull WHO 1985; 58: 731-40
8. Dizon et al. Bull WHO 1967; 37: 737-43
9. Mukandavire et al 2010. Micro Bio Spec
10. Finger et al. PLOS MED 2018; 15
11. Azman et al. 2018. J Inf Dis
12. Debes et al. 2016. Int J Epi

STUDY DESIGN: What is a process evaluation?

Medical Research Council says…*"Explain discrepancies between expected and observed outcomes, to understand how context influences outcomes and to provide insights to aid implementation"*

Inform judgements on:

- Connections between intervention and outcomes
  (internal validity aka did it work?)
- Connections between intervention and other contexts
  (external validity aka why did here and not work there?)
- Essential components
- Facilitators to effective implementation

1. UK Medical Research Council 2011
2. Carroll et al 2007. Implement Sci
3. Craig et al 2008. BMJ
4. Grant et al 2013. Trials
5. Greenland et al. 2017. Global Health
6. Hargreaves et al. 2016. Health Policy
7. Carroll et al. 2007. Implement Sci
8. Oxkaley et al 2006. BMJ
9. Bonnell et al 2006. BMJ

STUDY DESIGN: Process evaluation components

IMPLEMENTATION:

1. INTERVENTION DESCRIPTION
2. RECRUITMENT
3. DELIVERY FORMAT
4. NUMBER DELIVERED AND IMPLEMENTATION FIDELITY

POPULATION RESPONSE:

5. NUMBER RECEIVED
6. INTERVENTION REACH
7. ACCEPTABILITY
8. BARRIERS
9. MAINTAINED AND SUSTAINED USE
10. UNINTENDED CONSEQUENCES

CONTEXT:

11. CONTEXT (GEOGRAPHICAL, POLITICAL, EPIDEMIOLOGICAL, CULTURAL, SOCIO-ECONOMIC ETC.)
12. RESOURCES (FINANCIAL, HUMAN ETC.)
13. CONTAMINATION AND OTHER INTERVENTIONS

STUDY POPULATION, DATA COLLECTION and DATA ANALYSIS

Study population and data collection included:

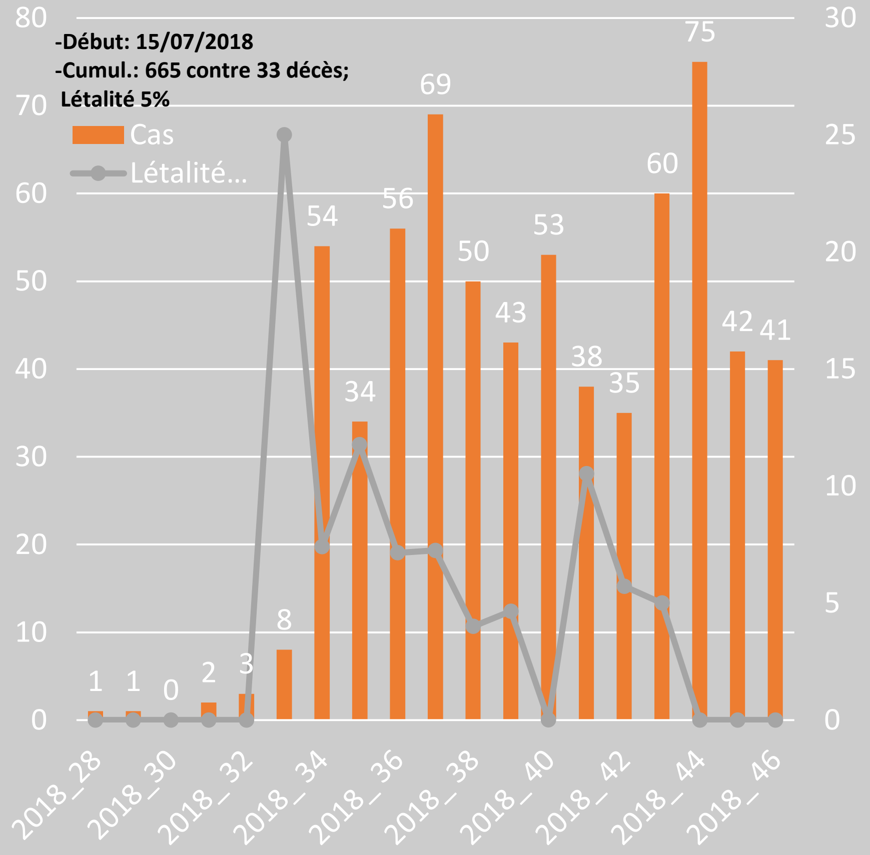
- 27 interviews with hygiene kit recipients
- 17 interviews with implementers (MSF, government & other NGOs)
- 5 structured observations of implementers
- Review of Activity records (freight manifests, purchase orders, epi surveillance etc)
- Review of intervention reports and budgets

Data analysis:

- Quantitative
- Qualitative

STUDY SITE: Kasansa, Kasaï-Oriental, DRC, 2018

- DRC is a hotspot for cholera with ~189,000 cases annually
- Ongoing outbreak in Kasaï-Oriental since 2017 (with no previous outbreak in for 5-10 years)
- In 2018 between Week 28-46, 665 suspected cases and 33 deaths
  - CFR 5% and Attack Rate 0.28%



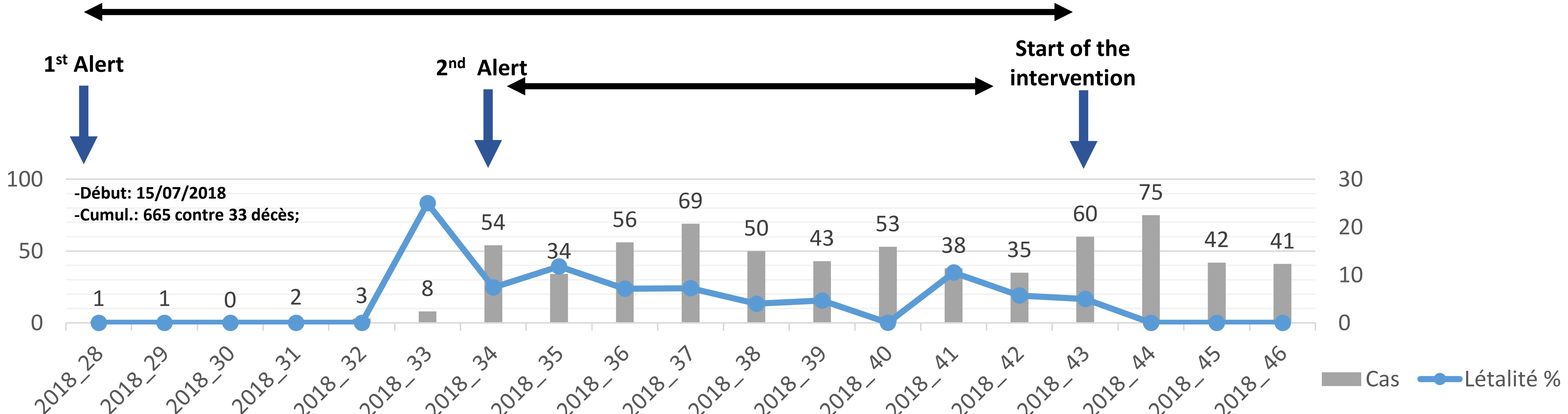
RESULTS: Implementation

Intervention description:

- Support to 2 CTUs and 5 ORPs
- Ambulance referral
- Hygiene kit distribution

Timeline:

- Week 28: 1st Alert received for 1 confirmed case
- Week 34: 2nd Alert received for 68 suspected cases
- Week 43: MSF response
  - 16 weeks after initial alert / 10 weeks after SOS alert



RESULTS: Implementation

Recruitment:

- Population admitted to CTUs and PSROs
  - (Majority of admissions at PSROs)
- Community-based surveillance and case reporting
- Ambulance service for severe case referral

Delivery format:

- Kits delivered by CHWs at CTUs only :
  - Content of sessions not specific
  - Didactic messages and poor engagement and participation
- Other issues:
  - Late distribution and missing HK components
  - Difficult for households to transport home (10-100km distances)

RESULTS: Implementation

Dose delivered and implementation fidelity

- 250 hygiene kits planned
  - 165 arrived in Kasansa from Kinshasa
    - 79 distributed to cholera case households at CTUs
    - 86 given to local government when intervention team left

Reasons for limited implementation:

- Reduction of transmission not a priority by implementers
- Supply chain delays
- Limited training of CHWs and timing of HK delivery
- Missed opportunity to not distribute from PSROs
- Short intervention time period

CONCLUSIONS

- Hygiene kits could be effective if implemented well & if used by the population
- Delivery, population interaction and therefore effectiveness of hygiene kit use is affected by context (organisational, geographical, sociocultural and other factors)
- Issues with implementation included: organisation priorities, supply chain, training and delivery
- Process evaluations are easy, simple and replicable by academics and NGOs
- Process evaluations are a useful tool that can aid implementation of effective and efficient WASH responses

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MEDECINS SANS FRONTIERES
DOCTORS WITHOUT BORDERS

Thank you and questions

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VIRWATEST AND FAIRCAP: TOWARDS PREVENTING WATERBORNE VIRAL OUTBREAKS IN HUMANITARIAN CONTEXTS

David Aguado[1], Eva Fores[1], Marta Rusiñol[1], Laura Guerrero-Latorre[1], Mauricio Córdova[2], Rosina Girones[1] and **Sílvia Bofill-Mas[1]**

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

[2] FAIRCAP (faircap.org); info@faircap.org

UNIVERSITAT DE BARCELONA

Laboratory of Viruses Contaminants of Water and Food

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

FAIRCAP

Feces, urine and sewage are complex matrices which contains a **large variety of pathogenic and commensal viruses, bacteria and protozoa** excreted from one to thousands of inhabitants.

FECAL-ORAL TRANSMISSION

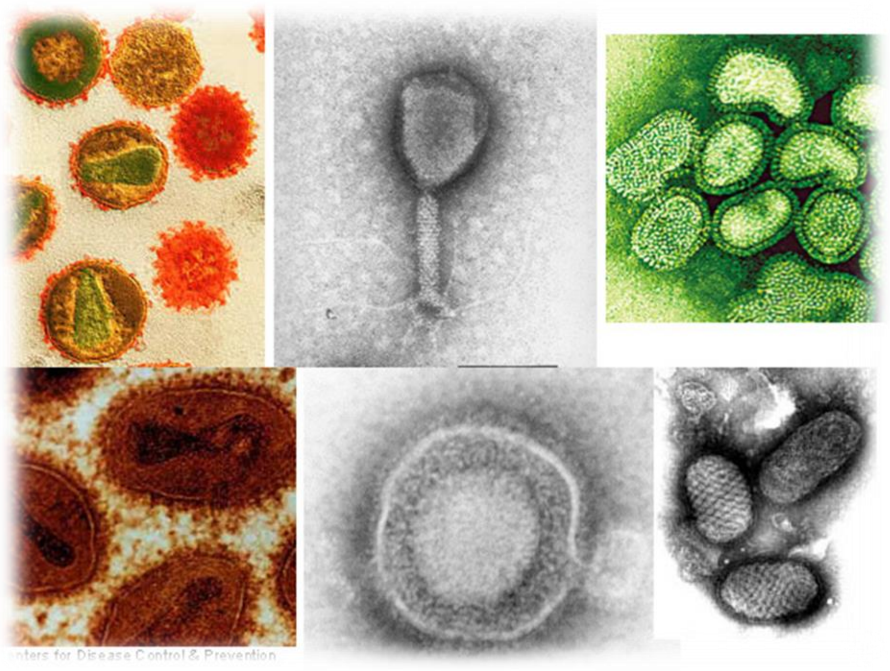
Campylobacter spp.
E. coli spp.
Francisella tularensis
Salmonella spp.
Shigella spp.
Micobacterium spp.
Vibrio cholerae

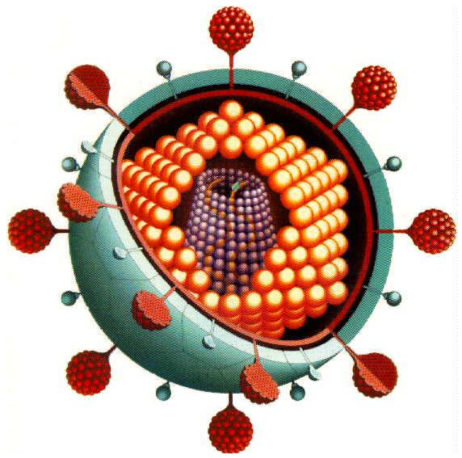
Adenoviruses
Astroviruses
Enteroviruses
Hepatitis A virus
Hepatitis E virus
Noroviruses
Rotaviruses
Sapoviruses

Cryptosporidium spp.
Cyclospora cayetanensis
Dracunculus medinensis
Entamoeba histolytica
Giardia intestinalis
Toxoplasma gondii

Ascaris lumbricoides
Trichuris Trichura
Strongyloides
Ancylostoma
Taenia solium
Echinocus
Hymenolepis nana

- Bacteria
- Protozoa
- Virus
- Helmints



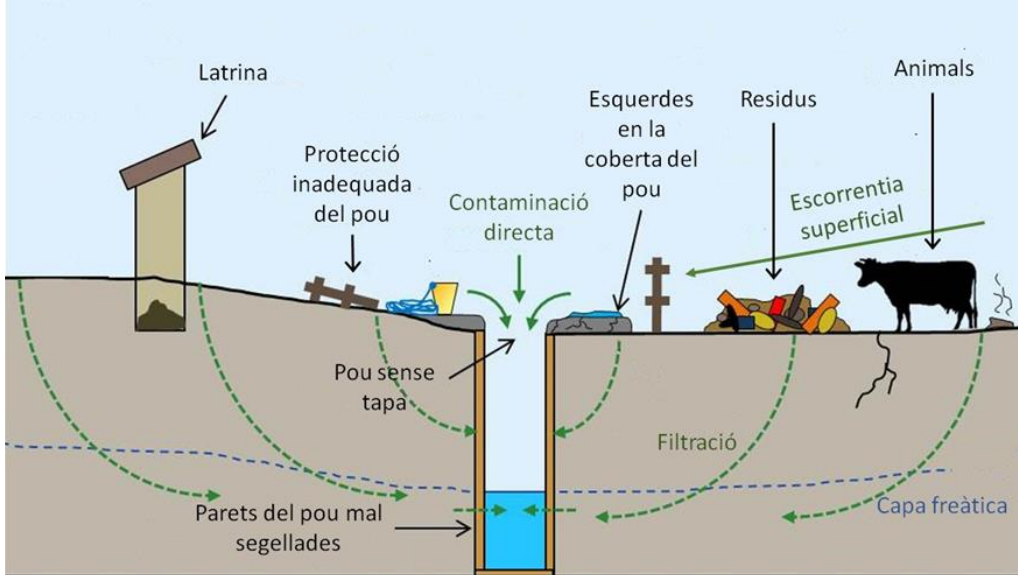


Viruses are intracellular parasites, outside the cell they may remain but not replicate. In the environment they are highly stable and may be transmitted to new hosts. They are:

- Smaller than bacteria
- More resistant to inactivation
- Requires lower infectious doses
- Antibiotics are not useful against them

Water sources may be contaminated in the origin as well as during transportation or storage

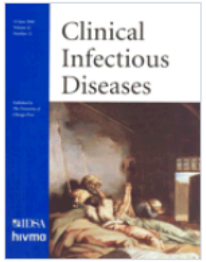
Viruses excreted in feces/urine may contaminate water, food and be transmitted by person-to-person contact or through fomites



Introduction | HEV | Previous work | VIRWATEST | FAIRCAP | Conclusions

Which viruses may b
transmitted by contami
water and/or food?

Human adenovirus
Rotavirus
Norovirus
Astrovirus
Hepatitis A virus
Hepatitis E virus
Enterovirus (poliovirus)
...



Volume 42, Issue 12
15 June 2006

High Mortality Associated with an Outbreak of Hepatitis E among Displaced Persons in Darfur, Sudan

FREE

Delia Boccia, Jean-Paul Guthmann, Hilde Klovstad, Nuha Hamid, Mercedes Tatay, Iza Ciglenecki, Jacques-Yves Nizou, Elisabeth Nicand, Philippe Jean Guerin

Clinical Infectious Diseases, Volume 42, Issue 12, 15 June 2006, Pages 1679–1684, https://doi.org/10.1086/504322
Published: 15 June 2006 **Article history** ▾

What diseases might
they cause?

Gastroenteritis
Hepatitis
Meningitis
Neurological disease
Respiratory disease
Conjuntivitis
...

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EID Journal > Volume 19 > Number 6—June 2013 > Main Article

Volume 19, Number 6—June 2013

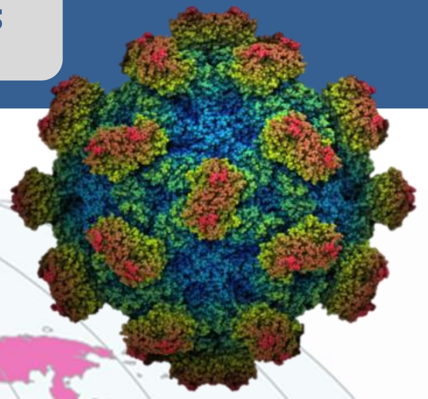
Letter

Hepatitis E Outbreak, Dadaab Refugee Camp, Kenya, 2012

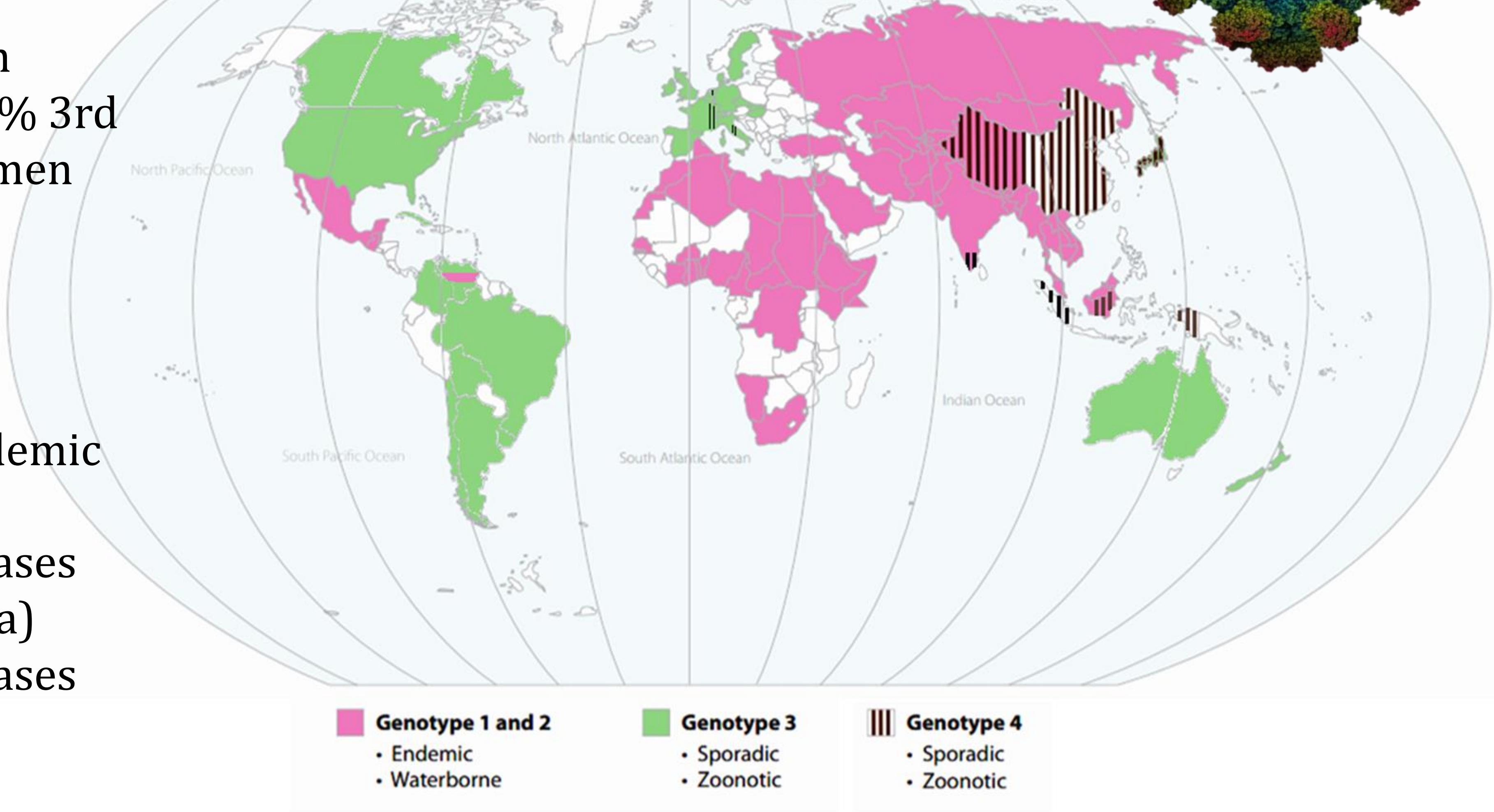
Cite This Article

On This Pa
Letter
Cite This Art
Figures

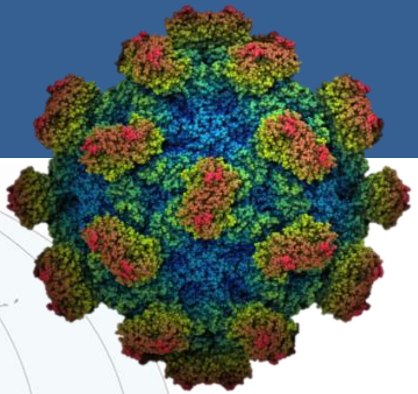
To the Editor: Hepatitis E virus (HEV) is transmitted through the fecal-oral route and is a common cause of viral hepatitis in developing countries. HEV outbreaks have been documented among forcibly displaced persons living in camps in East Africa, but for >10 years, no cases were documented among Somali refugees (1,2). On August 15, 2012, the US Centers for Disease Control and Prevention (CDC) in Nairobi, Kenya, was notified of a cluster of acute jaundice syndrome (AJS) cases in refugee camps in



- Acute hepatitis
- 67-98% asymptomatic
- 4-8 weeks of incubation
- Mortality of 1% and 25% 3rd trimester pregnant women



- **Genotype 1 and 2:** epidemic outbreaks (Africa, Asia)
- **Genotype 3:** sporadic cases (EEUU, Europa, Australia)
- **Genotype 4:** sporadic cases (Asia)



Orthohepevirus A

Genotype 1

Genotype 2

Genotype 3

Genotype 4

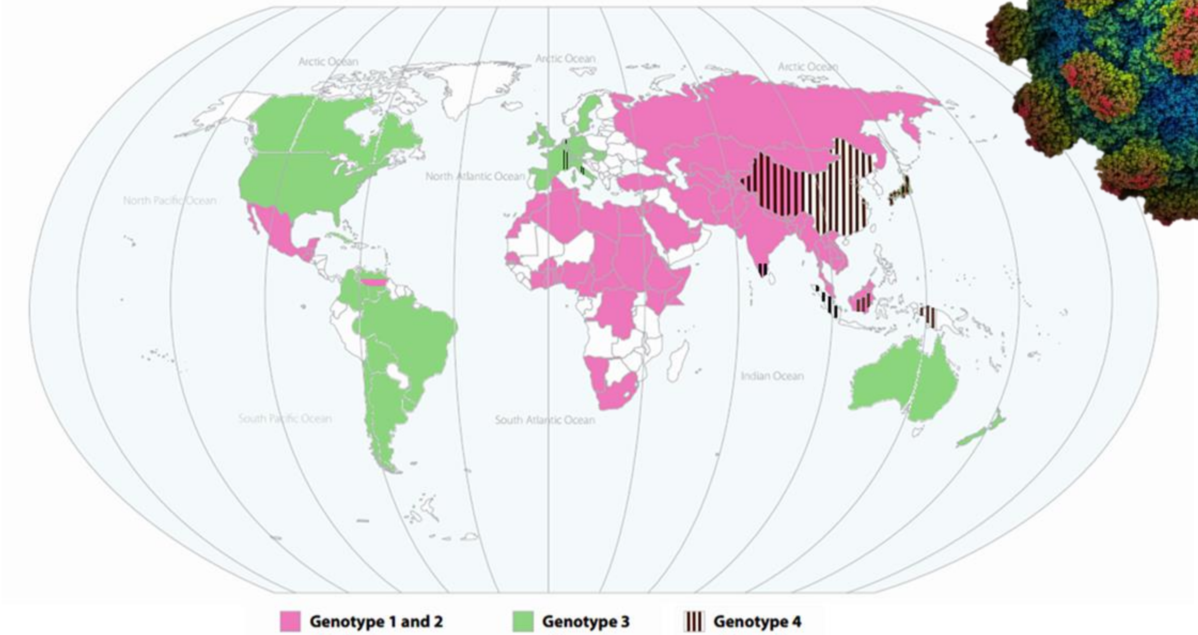
Genotype 5 i 6

Orthohepevirus B

Orthohepevirus C

Orthohepevirus D

Piscihepevirus A



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DOI: 10.1111/tbed.12962

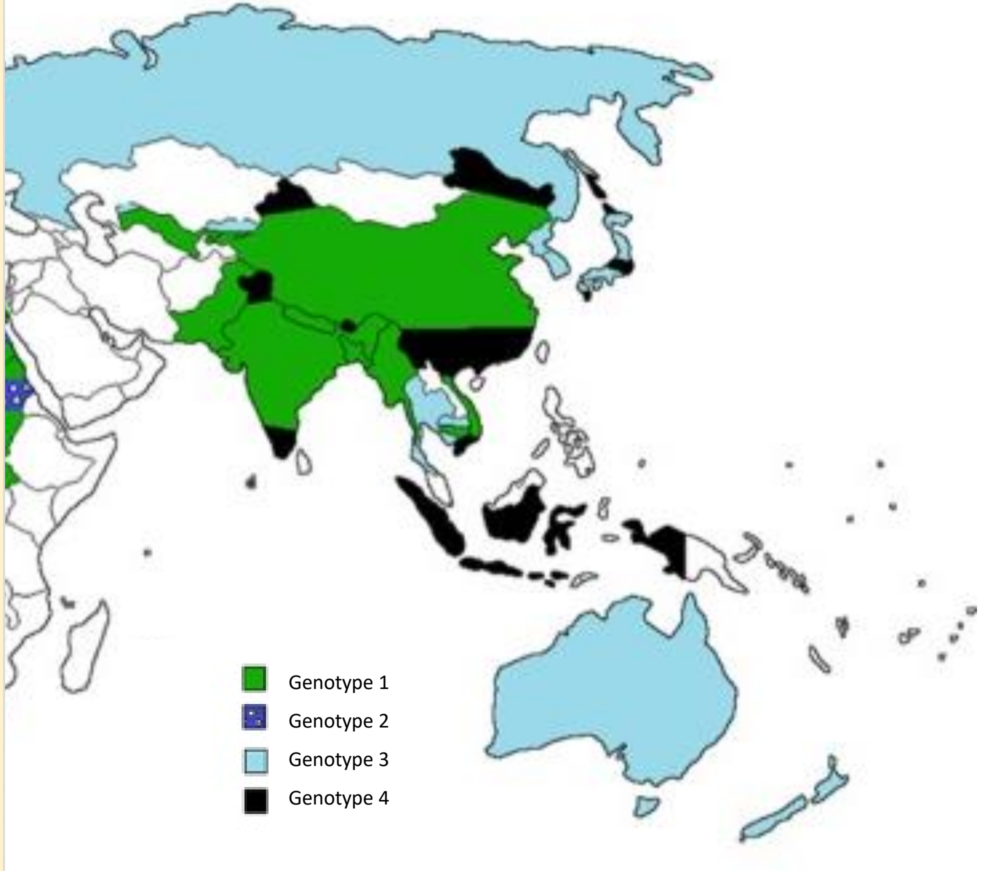
ORIGINAL ARTICLE

WILEY Transboundary and Emerging Diseases

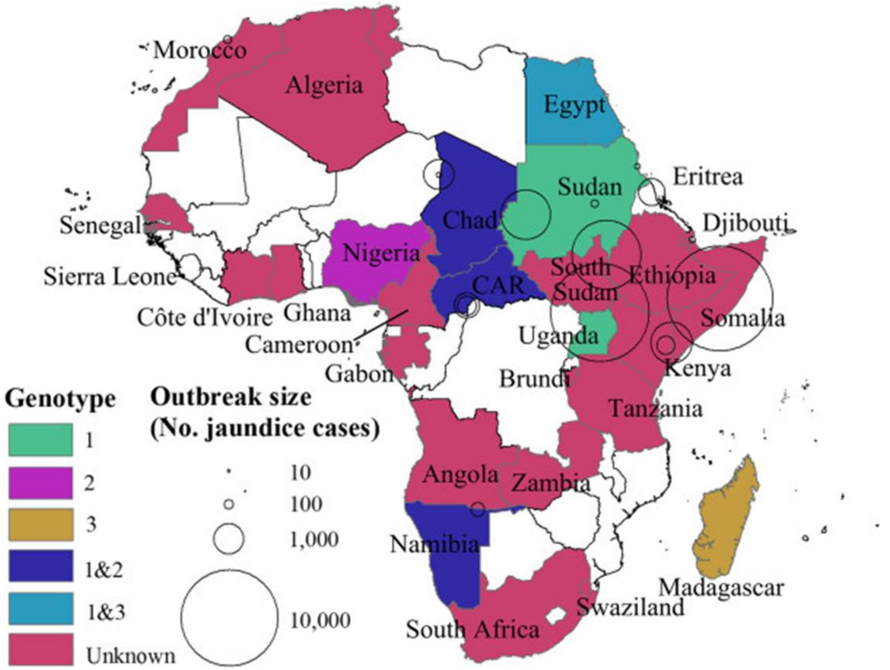
Hepatitis E virus infection in equines in Spain

Ignacio García-Bocanegra[1,*] | Antonio Rivero[2,*] | Javier Caballero-Gómez[1] | Pedro López-López[2] | David Cano-Terriza[1] | Mario Frías[2] | Saul Jiménez-Ruiz[1] | Maria A. Risalde[2] | Jose C. Gómez-Villamandos[3] | Antonio Rivero-Juarez[2]

Location		Year	Cases	Mortality	Reference
Asia		1955	29300	75	(Arankalle et al. 1994)
		1976	2572	6	(Arankalle et al. 1994)
		1978-9	20000	600	(Arankalle et al. 1994; Khuroo M. 1991)
		1979-80	6000	180	(Arankalle et al. 1994; Khuroo M. 1991)
		1980	865	7	(Arankalle et al. 1994)
		1981	1169	10	(Arankalle et al. 1994; Khuroo M. 1991)
		1981-2	15000	450	(Arankalle et al. 1994; Khuroo M. 1991)
		1982	1072	-	(Arankalle et al. 1994)
	India	1984	3005	-	(Arankalle et al. 1994)
		1985	1395	-	(Arankalle et al. 1994)
		1986	1015	-	(Arankalle et al. 1994)
		1987	2215	-	(Dilawari et al. 1994)
		1990	>3000	-	(Arankalle et al. 1994)
		1991	1442	-	(Naik et al. 1992)
		2005	429	3	(Sarguna et al. 2007)
		2008	23 915	315	(Vivek et al. 2010)
		2012	5100	36	(Joon et al. 2015)
	Bangladesh	2008-9	4751	17	(Gurley et al. 2014)
	Indonesia	1991	1688	17	(Corwin et al. 1995; Corwin et al. 1999)
	Myanmar	1976-7	20000	-	(Uchida et al. 1993)
		1973-4	10000	-	(Khuroo M. 1991)
	Nepal	1981-2	4337	304	(Khuroo M. 1991)
		1987	7405	-	(Shrestha 2006)
		2014	7000	14	(Shrestha et al. 2015)
	Pakistan	1993-4	3827	8	(Rab et al. 1997)
		2005	1200	-	(Baqir et al. 2012)
	Turkmenista	1985	16175	-	(Albetkova et al. 2007)
	Iraq	2005	102	-	(Al-Nasrawi et al. 2010)
	China	1986	119280	1062	(Wang et al. 1991)



Location		Year	Cases	Mortality	Reference
Africa	Botswana	1985	273	4	(Byskov et al. 1989)
	CAR	2002	222	4	(Goumba et al. 2011)
	Chad	2004	959	30	(Guerrero-Latorre et al. 2011)
	Djibouti	1993	111	-	(Coursaget et al. 1998)
	Etiopia	1988	423	-	(Tsega et al. 1991)
		2014-15	1117	21	(Browne et al. 2015)
	Kenya	1991	1765	63	(Mast et al. 1994)
		2012	223	4	(Ahmed et al. 2013)
	Namibia	1983	201	7	(Isaäcson et al. 2000)
		1995	600	3	(Maila et al. 2004)
	Somalia	1988-89	11413	346	(Bile et al. 1994)
	Sudan	2004	2621	45	(Boccia et al. 2006; Guthmann et al.
	Sud Sudan	2012-13	5080	101	(CDC 2013; Epicentre 2012)
	Uganda	2008	10535	160	(Teshale et al. 2010)
America	Mexico	1986-7	223	3	(Velazquez et al. 1990)



Outbreak characteristics in Africa:

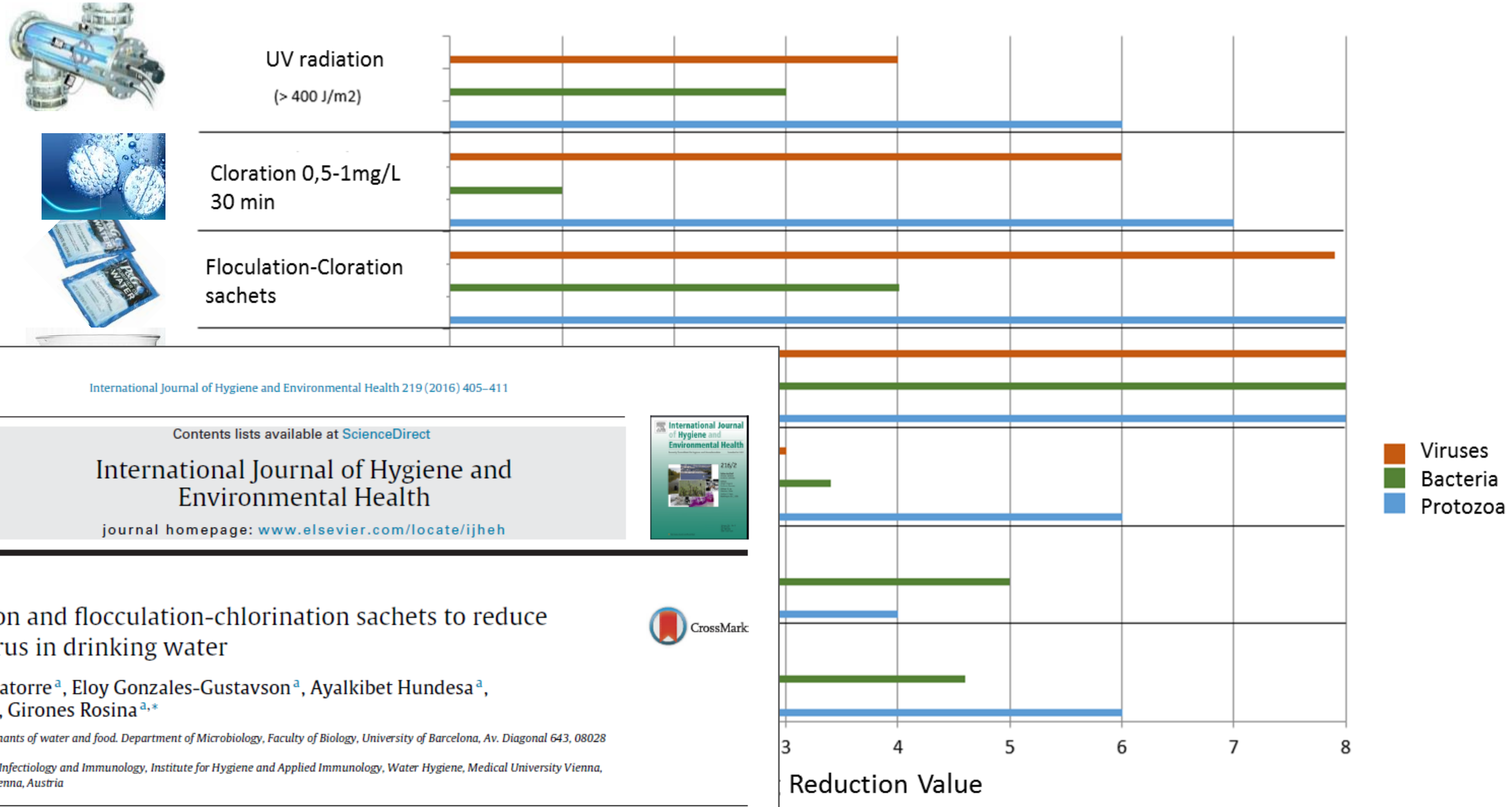
- Very crowded places
- High mortality rates: 1,8-17% and 12,5-41% for pregnants
- Waterborne infection
- Difficult to find HEV in water sources

Testing of viruses in water requires complex logistics!

Diagnosis of water quality at the point-of-use is useful to design adequate plans to prevent waterborne outbreaks incidence

Commercial solutions for water testing in the field, all related to Fecal Indicator Bacteria, do not guarantee absence of viral pathogens that survive longer time and remain infectious at lower doses than bacteria

Viruses are different of bacteria and those strategies used to inactivate bacteria may not be totally effective for eliminating viruses



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UV disinfection and flocculation-chlorination sachets to reduce hepatitis E virus in drinking water

Laura Guerrero-Latorre[a], Eloy Gonzales-Gustavson[a], Ayalkibet Hundesa[a], Regina Sommer[b], Girones Rosina[a,*]

[a] Laboratory of virus contaminants of water and food. Department of Microbiology, Faculty of Biology, University of Barcelona, Av. Diagonal 643, 08028 Barcelona, Catalonia, Spain
[b] Center for Pathophysiology, Infectiology and Immunology, Institute for Hygiene and Applied Immunology, Water Hygiene, Medical University Vienna, Kinderspitalgasse 15, 1095 Vienna, Austria

Laboratory of Viruses Contaminants of Water and Food

UNIVERSITAT DE BARCELONA

Development of methods for waterborne virus management in areas of low sanitary level and in ***humanitarian crisis scenarios***

Diagnosis of water quality at the point-of-use is useful to design adequate plans ***to prevent waterborne outbreaks incidence***

Develop and optimization of viral detection tools to be used at the point-of-use

- OXFAM, Identification of **sources of Hepatitis E** infections in Eastern Chad
- OXFAM, University of Barcelona, Implementation of **methods for viral detection in water** at the Laboratoire de Qualité de l'Eau et de l'Environnement, LAQUE, Université Quisqueya, Haiti

Optimize viral inactivation techniques

- HIF, ELHRA, **Water Disinfection** Protocols for **Hepatitis E** Virus (WADHE)"
- Development of improved low-cost ceramic **water filters for viral removal** in the Haitian context

PAST

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Develop viral detection tools to be used at the point-of-use

virwatest

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

Genius

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Laboratory of Viruses Contaminants of Water and Food

With the collaboration of:

OXFAM Intermón

Funded by:

HIF Humanitarian innovation fund | elrha

Optimize viral inactivation techniques

FAIRCAP

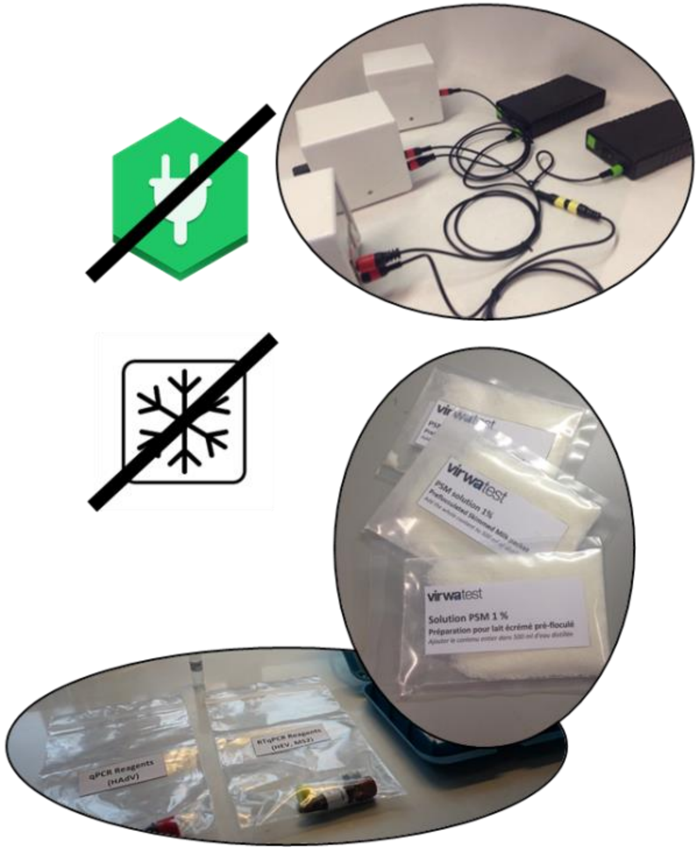
HIF Humanitarian innovation fund | elrha

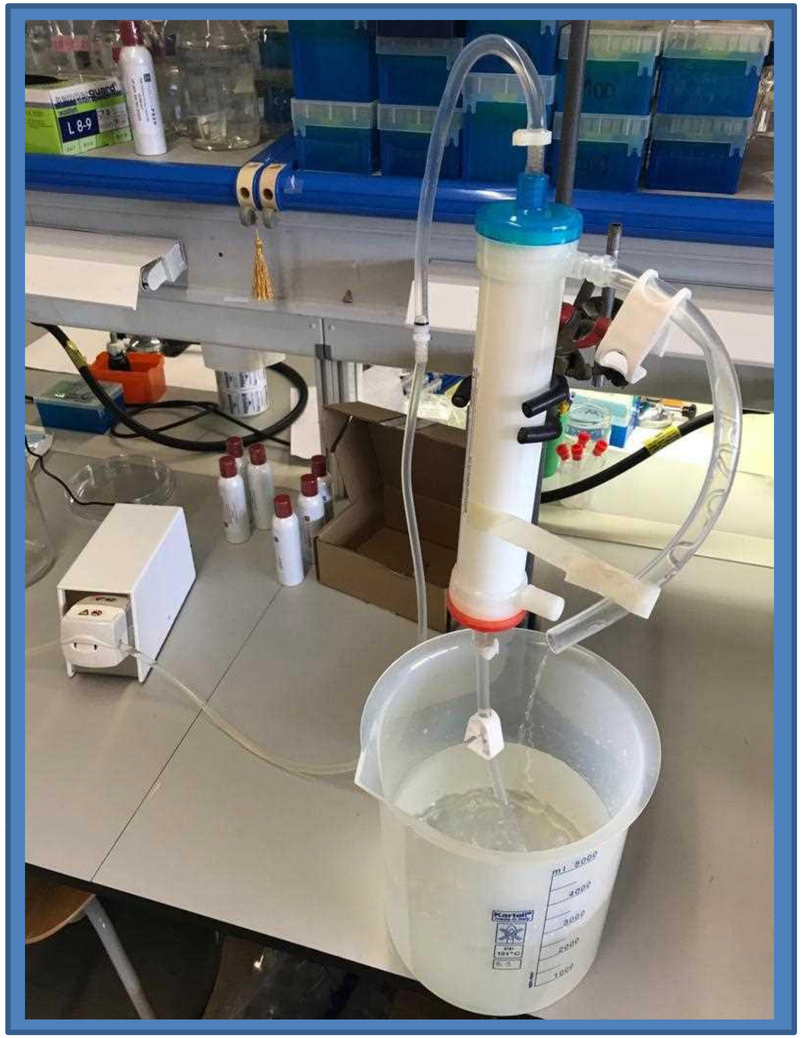
PRESENT

virwatest

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

❖ *What is VirWaTest?*





FAIRCAP

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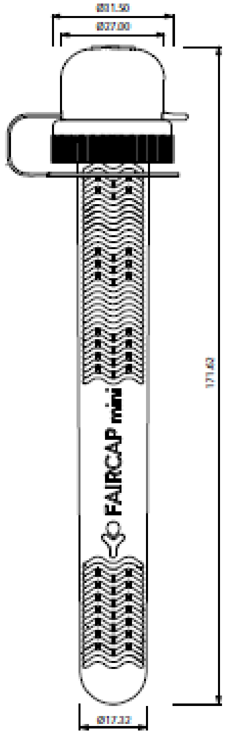
FAIRCAP MINI FEATURES



Measures In mm

Weight
Net weight 30 gr

Universal Fit
PCO 28 mm

Bacterial removal
Tested to remove 3.9 log or 99.986% of bacteria (e.Coli ATCC 25922) Bachema AG, Switzerland.

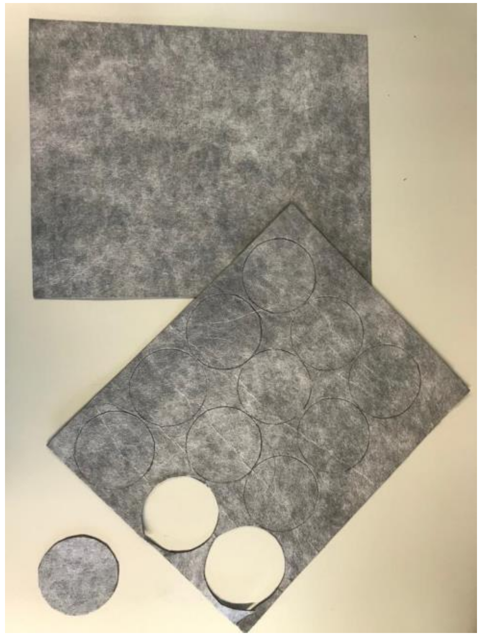
Useful Life
Aproximately 1,000 liters depending on the water source

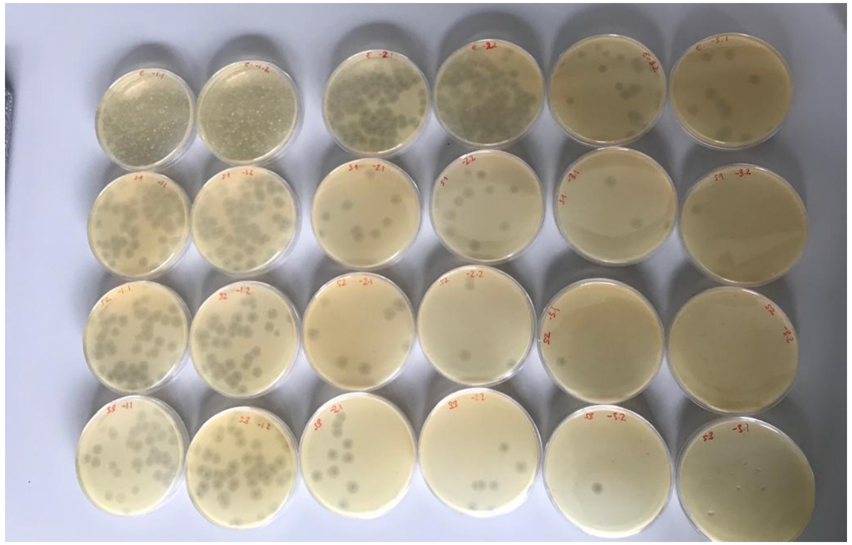
Filtration Media
0.1 nominal pore size microfiltration membrane.

The **Faircap Family Virus** water filter comes with a small manual water pump that can be fitted into a Jerry can lid or bucket and provides a high flow (2l/min) of clean drinking water, filtering 99% of viruses and
99,9999% of bacteria and larger pathogens.

At this moment, useful life of the prototype is being assayed

We are also testing activated carbon pre-filters for its effectiveness against bacteria and viruses





www.virwatest.org

www.faircap.org

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Family Vector Control Response Kit Study

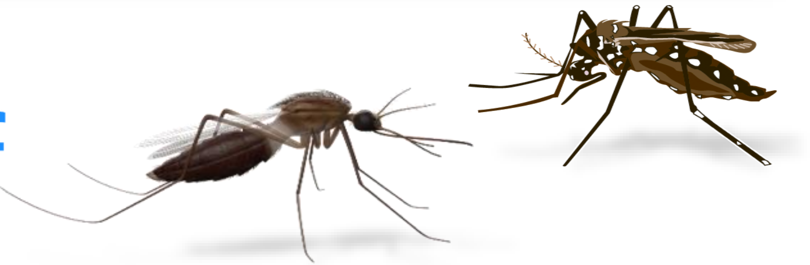
A trial evaluating the feasibility, acceptance, and potential impact of an innovative approach to vector control designed to help protect vulnerable people from vector borne diseases in crisis settings

Andrew Trevett[1], Tim Grieve[1], Richard Allan[2], Nfornuh Alenwi[2], and Eric Ochomo[3]
[1]UNICEF, [2]MENTOR Initiative, [3]KEMRI

THE MENTOR initiative

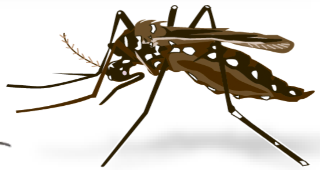
REDUCING DEATHS AND **SUFFERING**
FROM **TROPICAL DISEASES**

unicef



Rationale

- Indoor Residual Spraying, LLINs, larvicide and behaviour change are the current core tools for vector borne disease prevention
- Success is dependent on large scale centralised interventions
- Technical and operational challenges in conflict and natural disasters
- Prevention campaigns start up delays = weeks to months
- Mortality and morbidity rates highest in the first weeks



Study Purpose

Could a rapidly deployable vector control tool kit with pictogram instructions, be used effectively by households?

Would the use of such kits bridge the critical gap in protection whilst organisations establish other core disease control initiatives?

This study was conducted as a start to answer these questions and provide evidence that the concept of empowering hundreds of households to respond at first indication of disease transmission in a community was worth further validation at scale.

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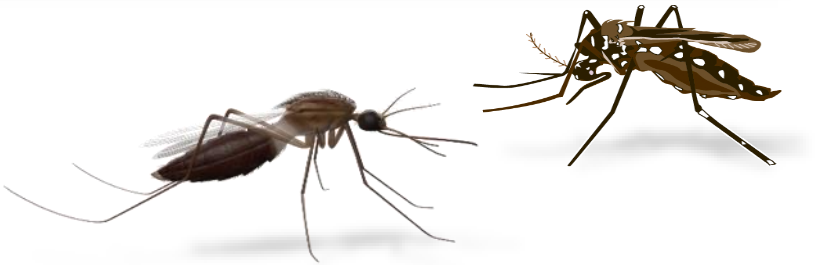

Research Aims

To evaluate 6 different evidence-based vector control kits provided to households at risk of mosquito borne diseases in Wajir town.

-> USER ACCEPTABILITY STUDY

- To assess the acceptability of different vector control kits among the study households
- To assess the ability of households to use the kit appropriately, using pictogram instructions

-> ENTEMOLOGICAL STUDY

- To evaluate the impact of the different vector control kits against mosquitoes at household level

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Research Arms – Kit Components

Core Products

Kits:
- Blind random distribution by health workers
- Each component will have pictorial instructions

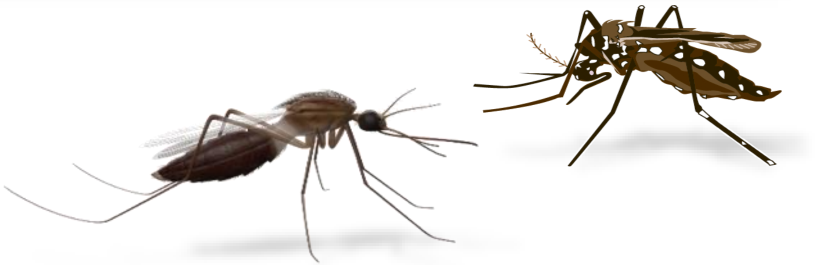
Ancillary Products

A little about the Spatial Repellent

Raid - Shield by SC Johnson (not commercially available) transfluthrin-based spatial repellent.

Laboratory and semi-field tests: 96% reduction in blood feeding success in female *Aedes* aegypti, and when hung near entry points Shield reduced mosquito entry by 88%.[3]

Transfluthrin treated eave ribbons effectively protected against indoor-biting and outdoor-biting Anopheles mosquitoes.[4]



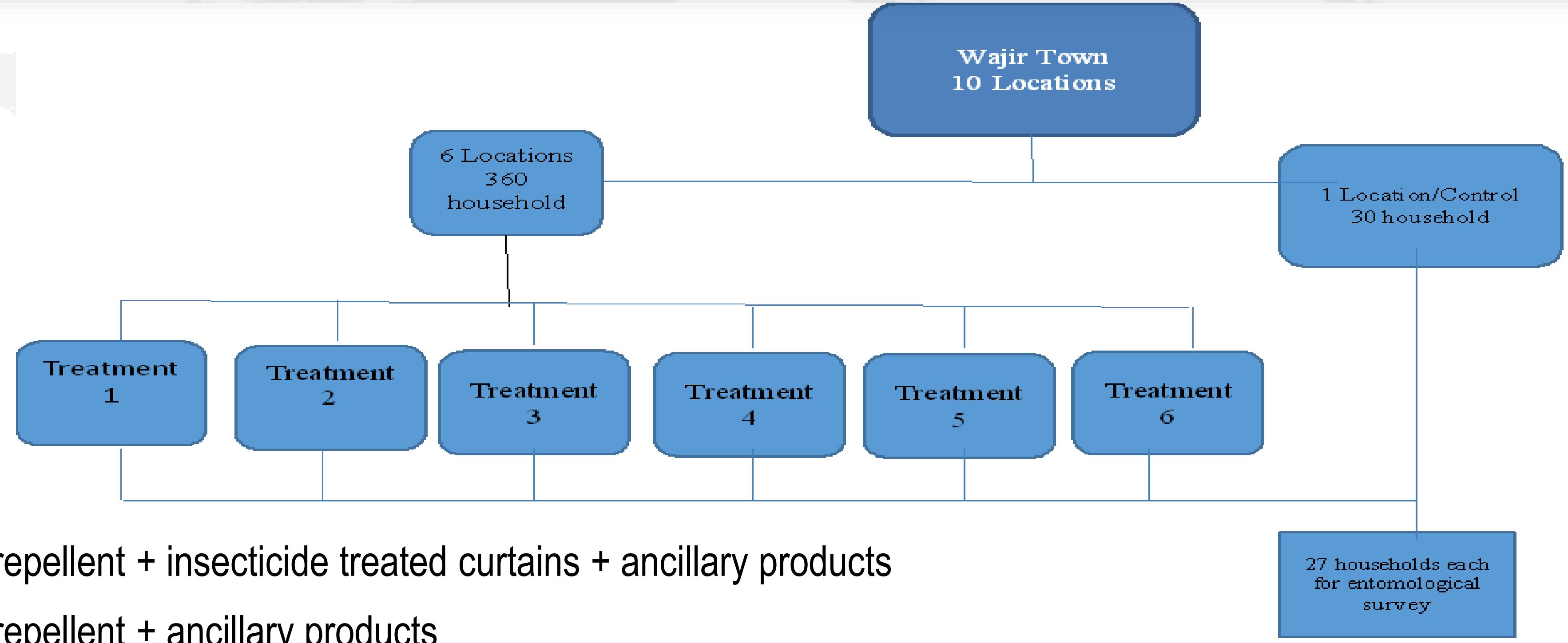
2017.

2018.

[3] McPhatter, L. P. *et al*.

[4] Mmbando, A. S. *et al*.

Study Clusters



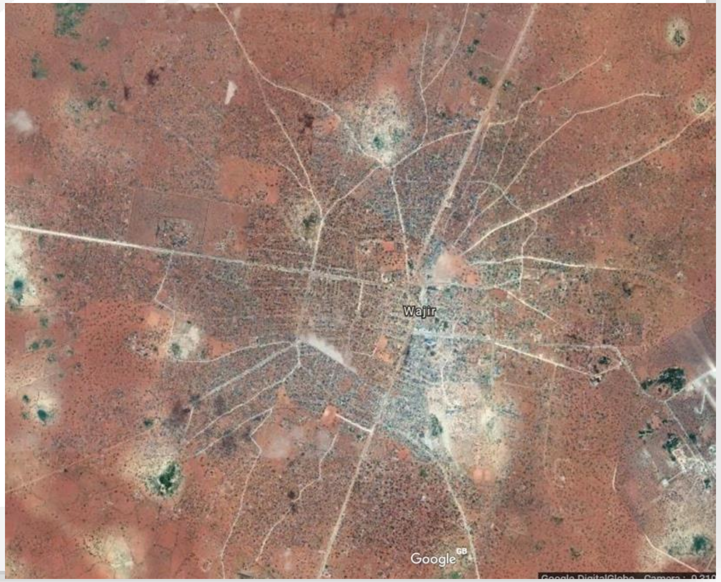
1. Spatial repellent + insecticide treated curtains + ancillary products
2. Spatial repellent + ancillary products
3. Aerosol spray can + insecticide treated curtains + ancillary products
4. Aerosol spray can + ancillary products
5. Repellent coil + insecticide treated curtains + ancillary products
6. Repellent coil + ancillary products

Ancillary products: squeeze pump sprayers, larvicidal product, personal repellent, fly swatter

Wajir, Kenya

Wajir county population is **852,963** (approx.) **106,694** in Wajir Town.

- One of the least developed counties in Kenya
- 90% ethnic Somali population
- Al Shabaab groups operates in Wajir, insecure and conflict prone
- **61%** of adults in study have no formal education
- Worst health outcomes in the whole of SSA **(15% of children reaching 5th birthday)**
- Centre of climate change in Africa, since El Nino 1997.



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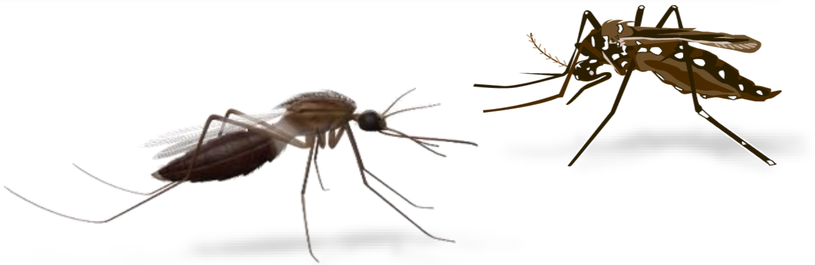

Wajir, Kenya

- Prolonged droughts followed by above average rainfall – leads to rapid flooding and provides ideal conditions for the rapid expansion of mosquito populations.
- Country prone to seasonal flooding during 2 rainy seasons – ‘short’ rains between October to December, and the ‘long’ rains from March to May each year.
- ~25,000 Malaria cases a year [1] low immunity to disease
- High mortality malaria epidemics in 97/8, 2001/2, 2006/7, 2008/9
- Dengue epidemics 2015 and 17,
- RVF epidemics in 1997, 2008 & 2017 [2]

[1] Kenya Health Information System. https:/hiskenya.org

[2] Gardaworld. Dengue fever in Mombasa and majir counties (2018).

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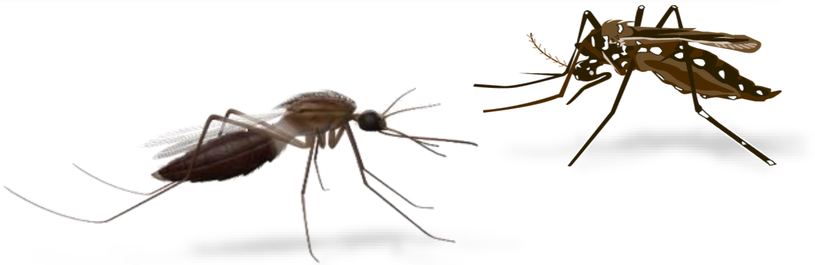

Malaria and Rift Valley Fever Epidemic Cycle

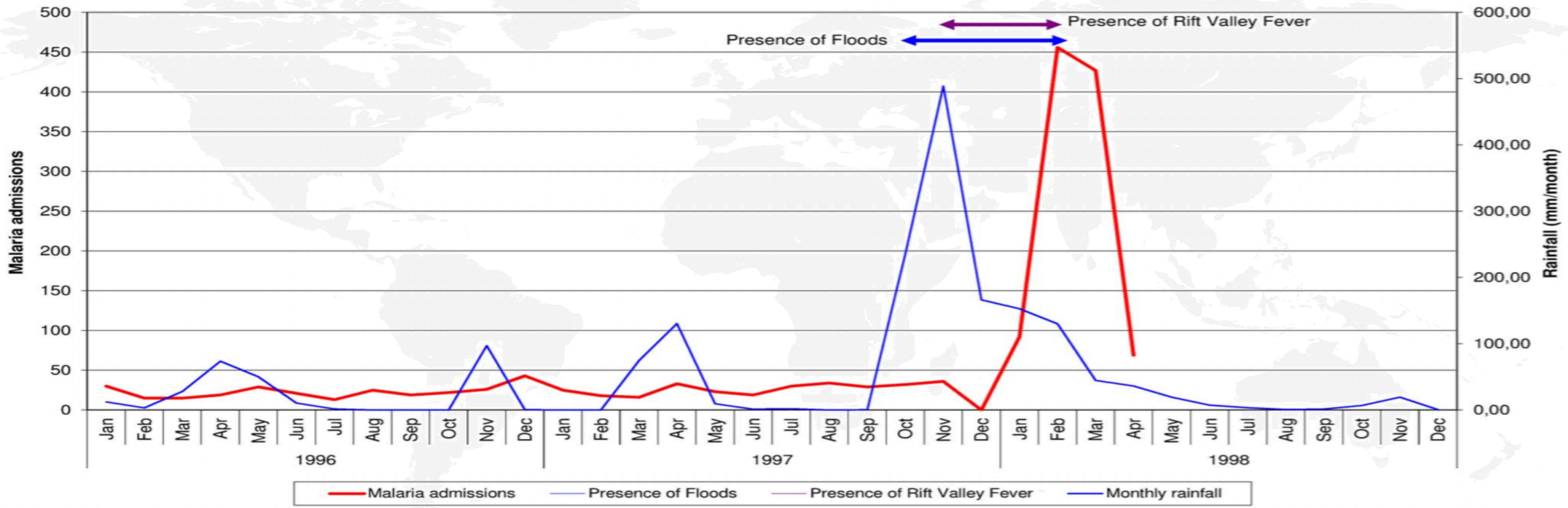

Figure 1. Monthly rainfall, presence of floods and Rift Valley Fever and malaria admissions to Wajir Hospital: January 1996–December 1998.

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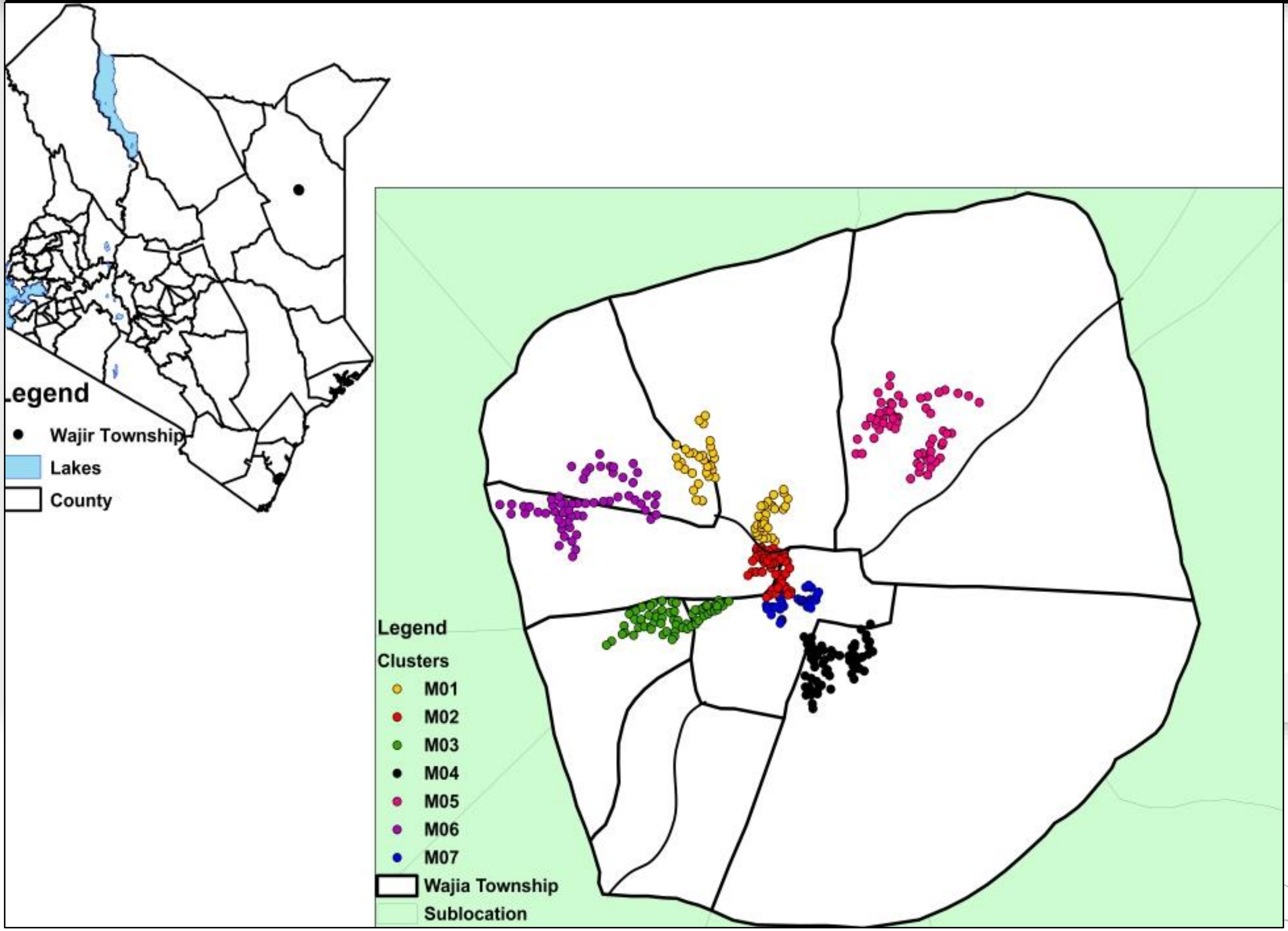
Study Clusters



Ensured each household have common:

- socio economical status
- education level
- housing structure
- environmental conditions.

Study Implementation

	Week								
Activity	1	2	3	4	5	6	7	8	9
Sensitisation									
Household Recruitment									
Entomological Monitoring									
Kit Distribution									
Household Surveys									
Data Collection									

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User Acceptability Study

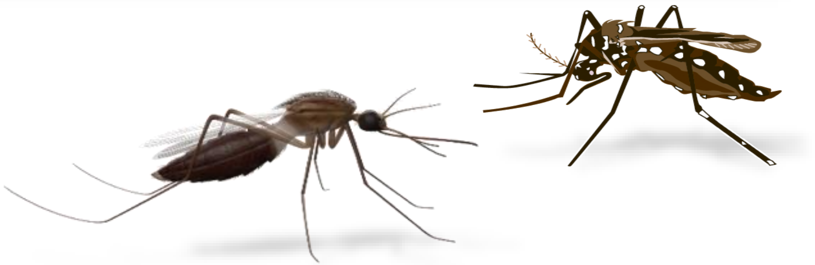
In each of the six clusters…

Observational

10 households were randomly selected for observational study of household members on the use of products – from kit opening until each product had been opened and attempted to use.

Household Interview

Remaining 50 households in the treatment arm were assigned to have in-depth interviews (questionnaire) one day after households received and used the kit, to evaluate understanding and impression of the kit components.



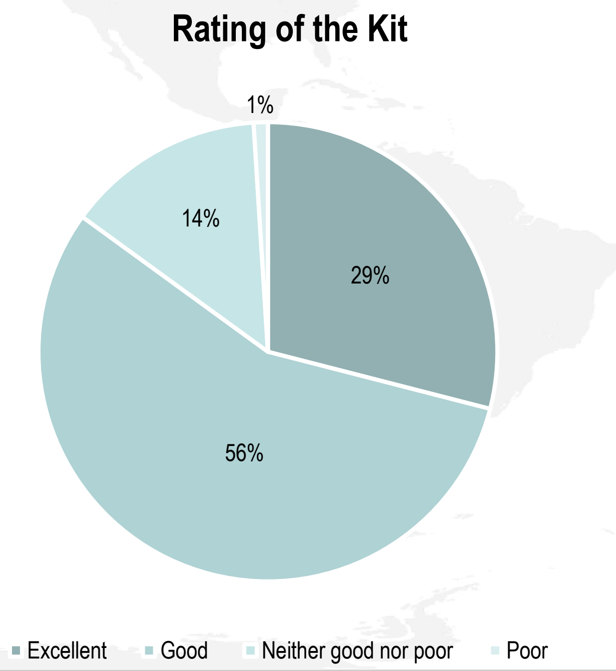
Results – User acceptability – HH Observations

- Kits opened in first 30 minutes (97%)
- Products opened 6am-10am, 10am – 2pm
- Tried to use products before 2pm (80%)
- Majority of products used in Bedroom, AMF used outside
- All products used well as per directions for use (DFU) (70-95%)
- For each product, majority was used by maternal figure of the house

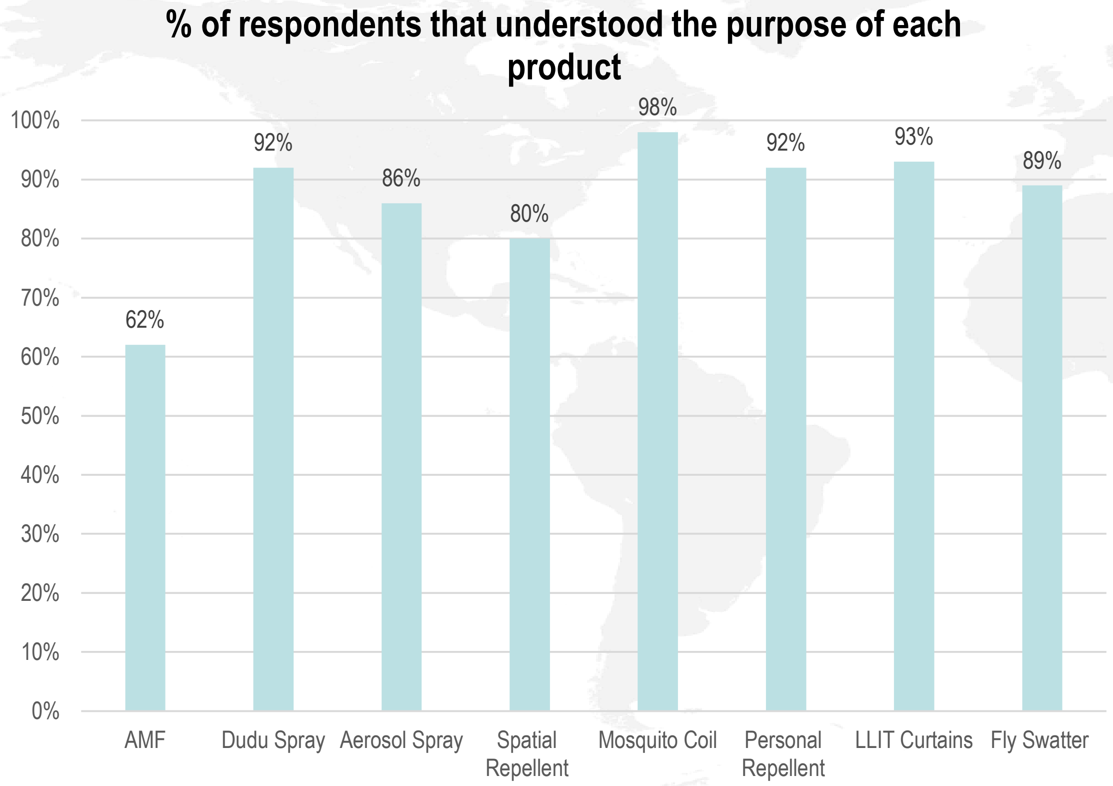
Results – User acceptability – Survey

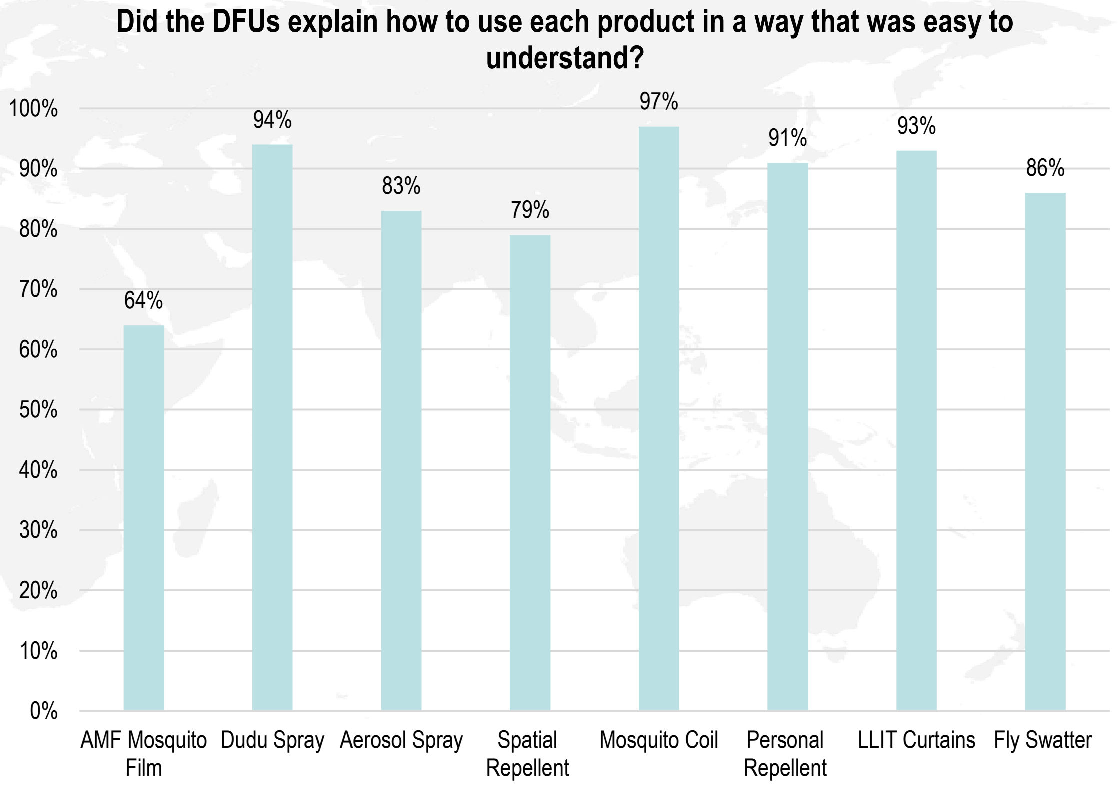
Understanding the purpose of the whole kit

Overall, 94% of the respondents reported that they understood the purpose of the whole kit.



Results – User acceptability – Survey





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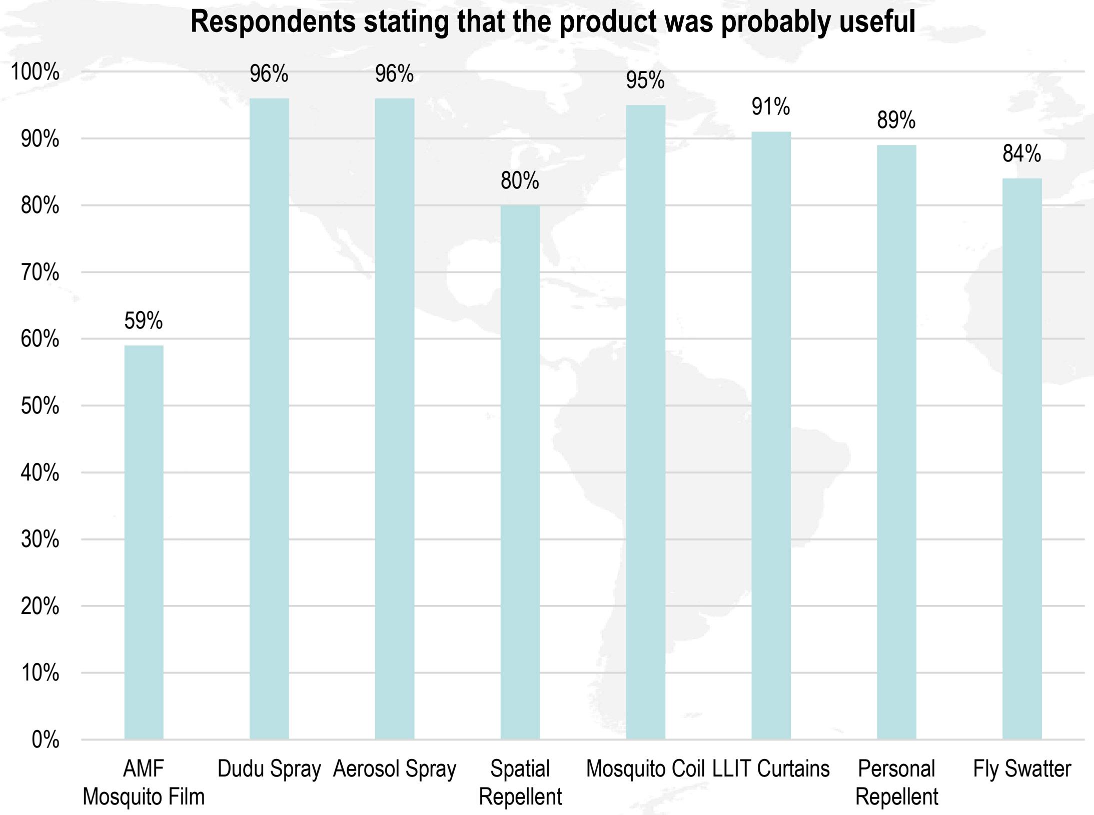
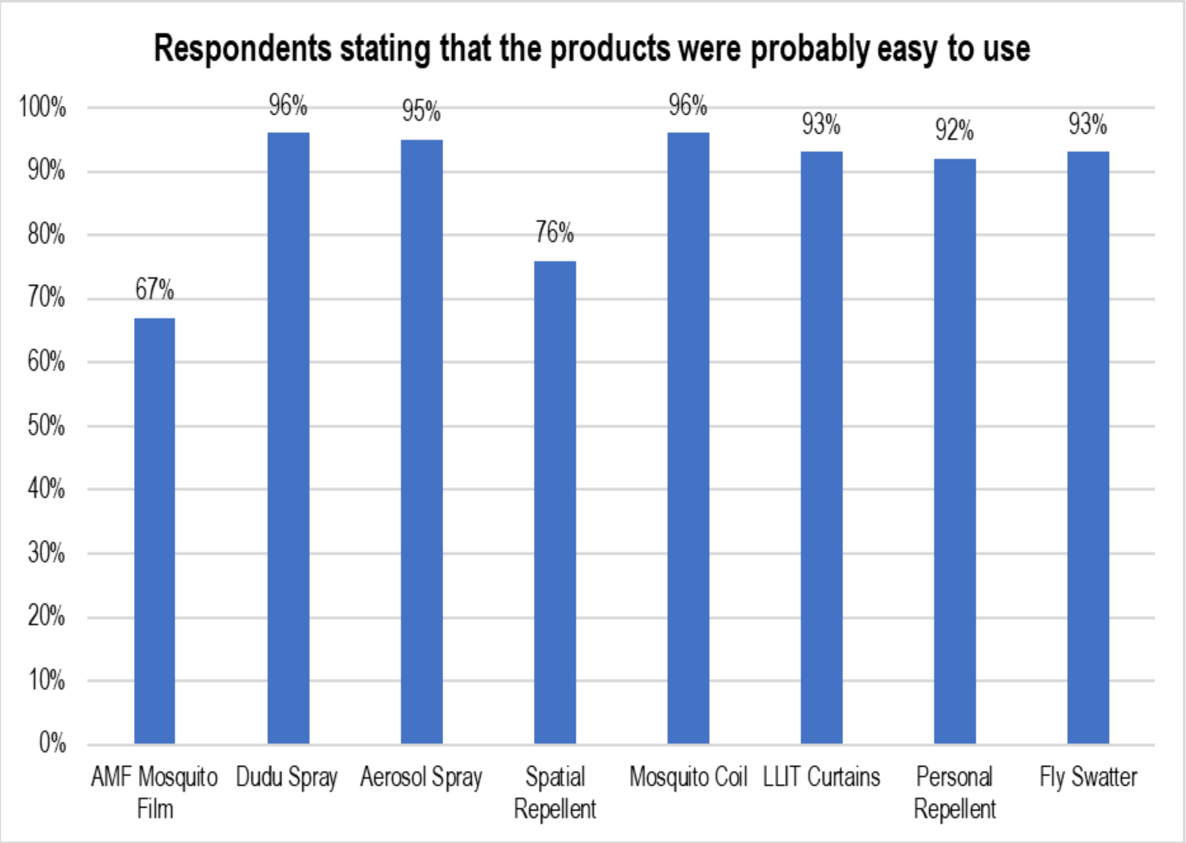
Results – User acceptability – Survey





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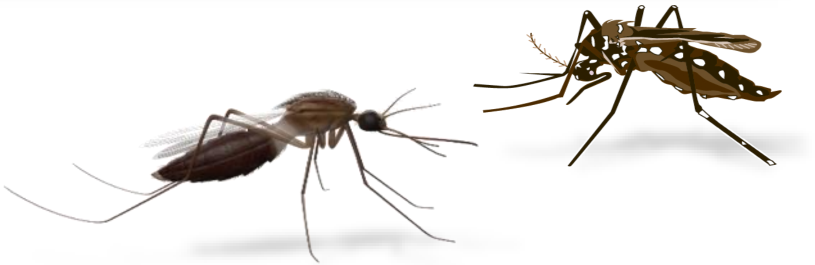
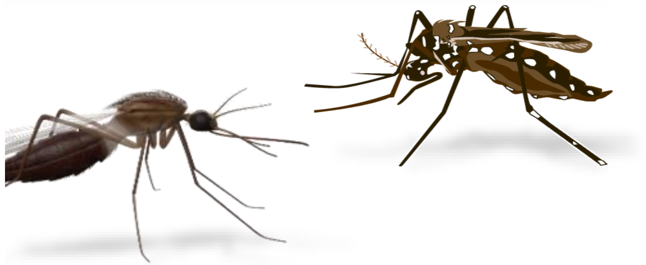


Entomological Study

Carried out in 3 households from each research arm of the acceptability study.

(**18 households in total**) measuring:

- Number and species of mosquitoes entering the house at night
- Number of and species of mosquitoes exiting the house in the morning
- Number of mosquitoes found still resting in the house in the early morning
- Blood feeding success
- Immediate and delayed mortality



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Entomological Study – PSC

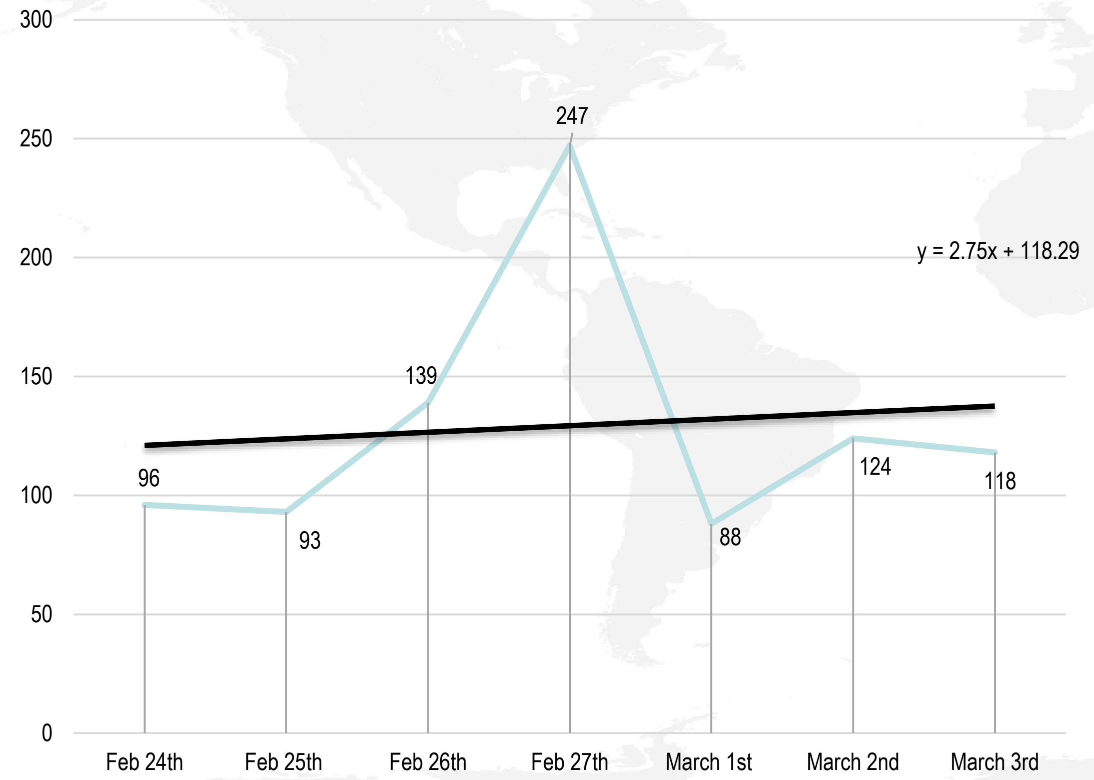
Pyrethrum Spray Collection (PSC): floor covered with white sheets and mosquito escape routes sealed; room sprayed for 30-45 seconds with SUPAKill and then 10 min after spraying, mosquitoes knocked down were collected and sorted by species, sex, abdominal status

CDC Light Traps: suspended ~1.5 meters above the floor and ~50 cm away from humans sleeping under mosquito nets; attracts mosquitoes hunting for a blood meal; occupants switch trap on at sunset and off at sunrise where researchers then collected mosquitoes

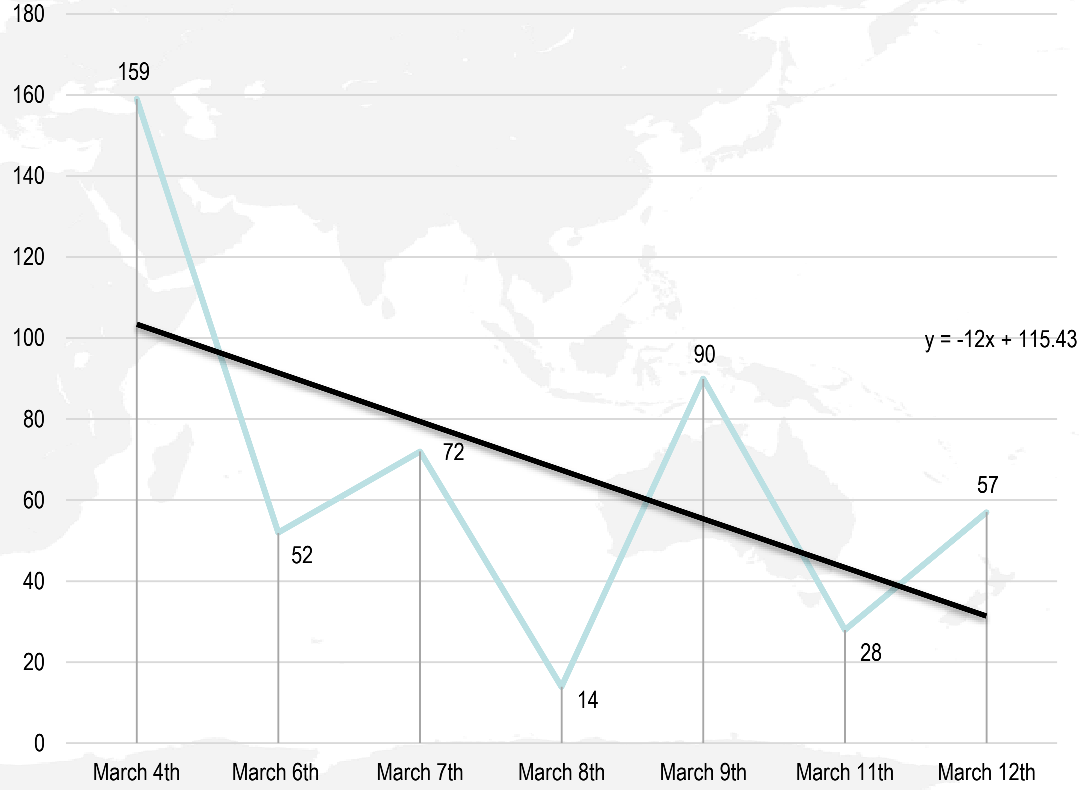
Window Exit Trap: Muirhead-Thomson design; used to collect exiting mosquitoes from houses then collected by research team daily in morning; live mosquitoes brought back to MENTOR base for scoring 24 hours mortality

Combined Entomological Results

M03, M04, M05, M06 Combined WET, CDC LT, PSC Mosquito Numbers Pre-Distribution



M03, M04, M05, M06 Combined WET, CDC LT, PSC Mosquito Numbers Post-Distribution



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Results – Entomological Study – PSC

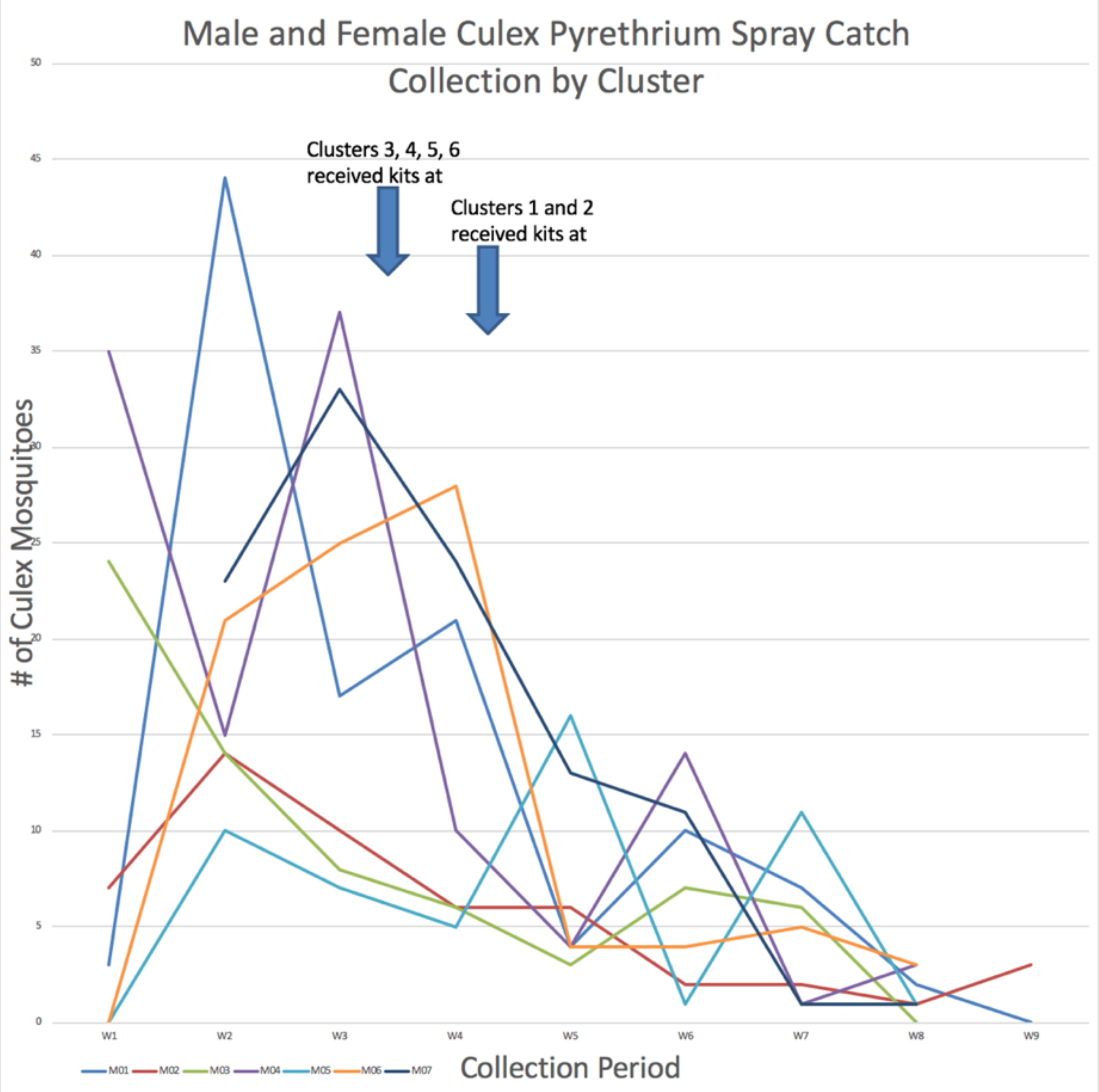
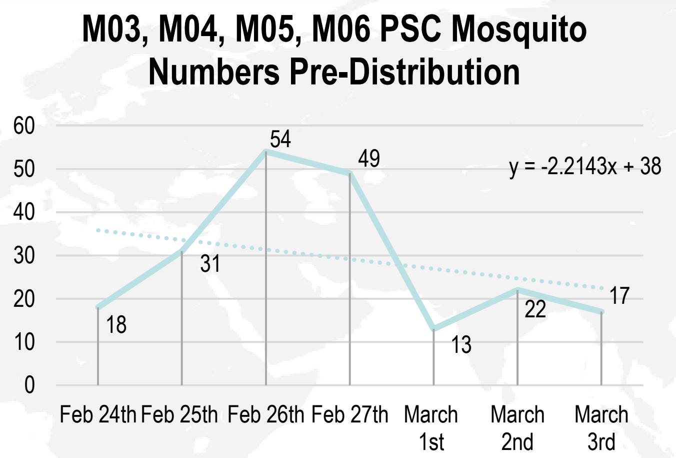
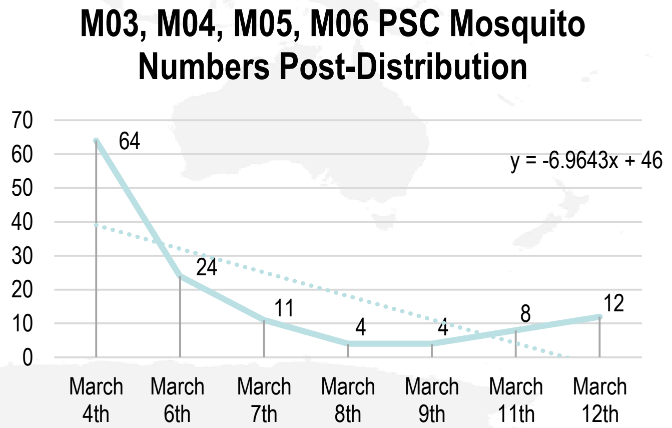
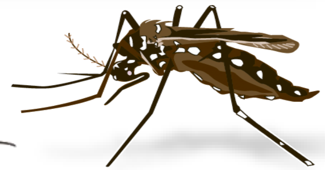


Figure 5: Male and Female Culex Pyrethrium Spray Catch Collection by Cluster and by Kit Distribution Day.







Results – Entomological Study – CDC Light Trap

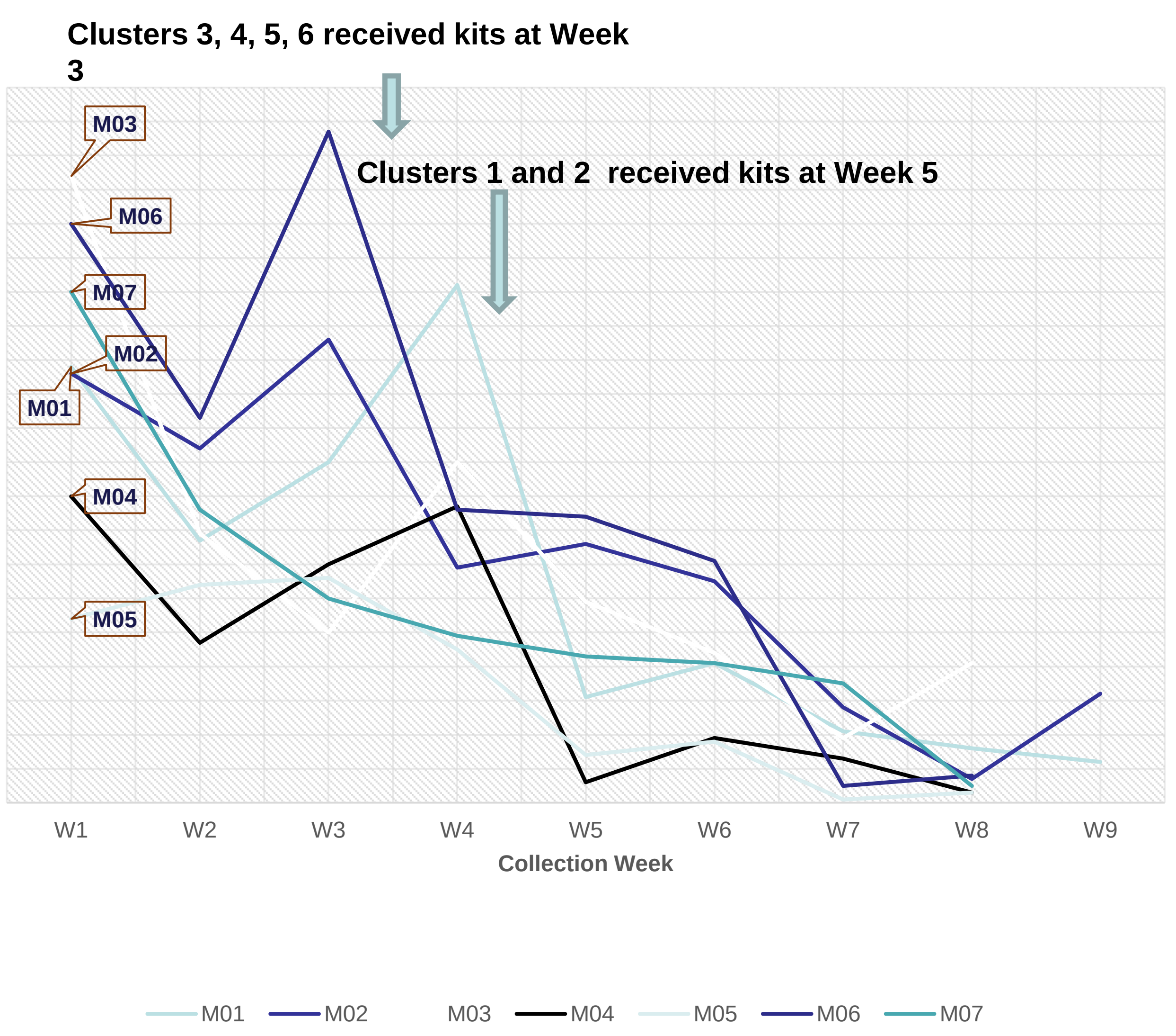
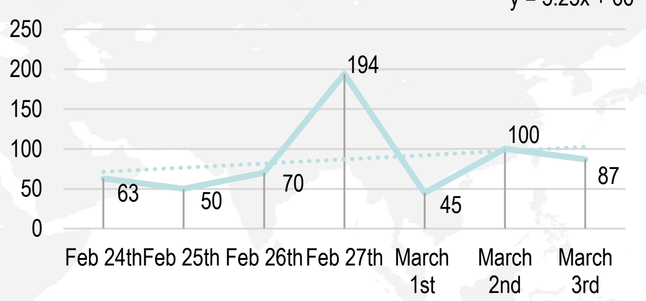
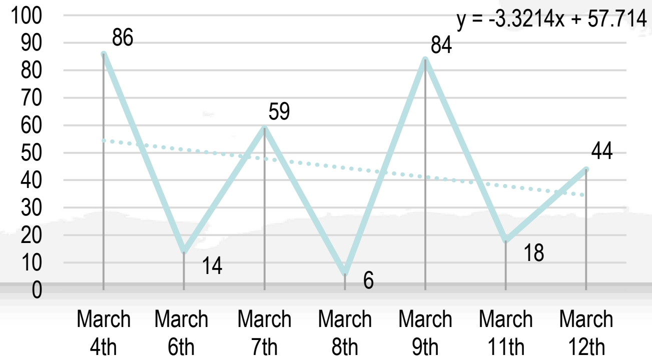
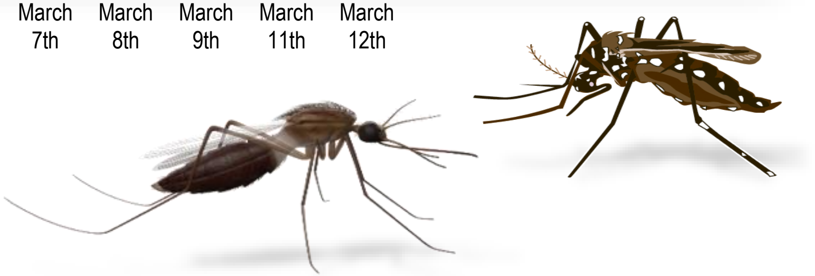


Figure 6: Male and Female Culex Mosquitoes in Light Traps, by Cluster and by Kit Distribution Day







Results – Entomological Study – WET

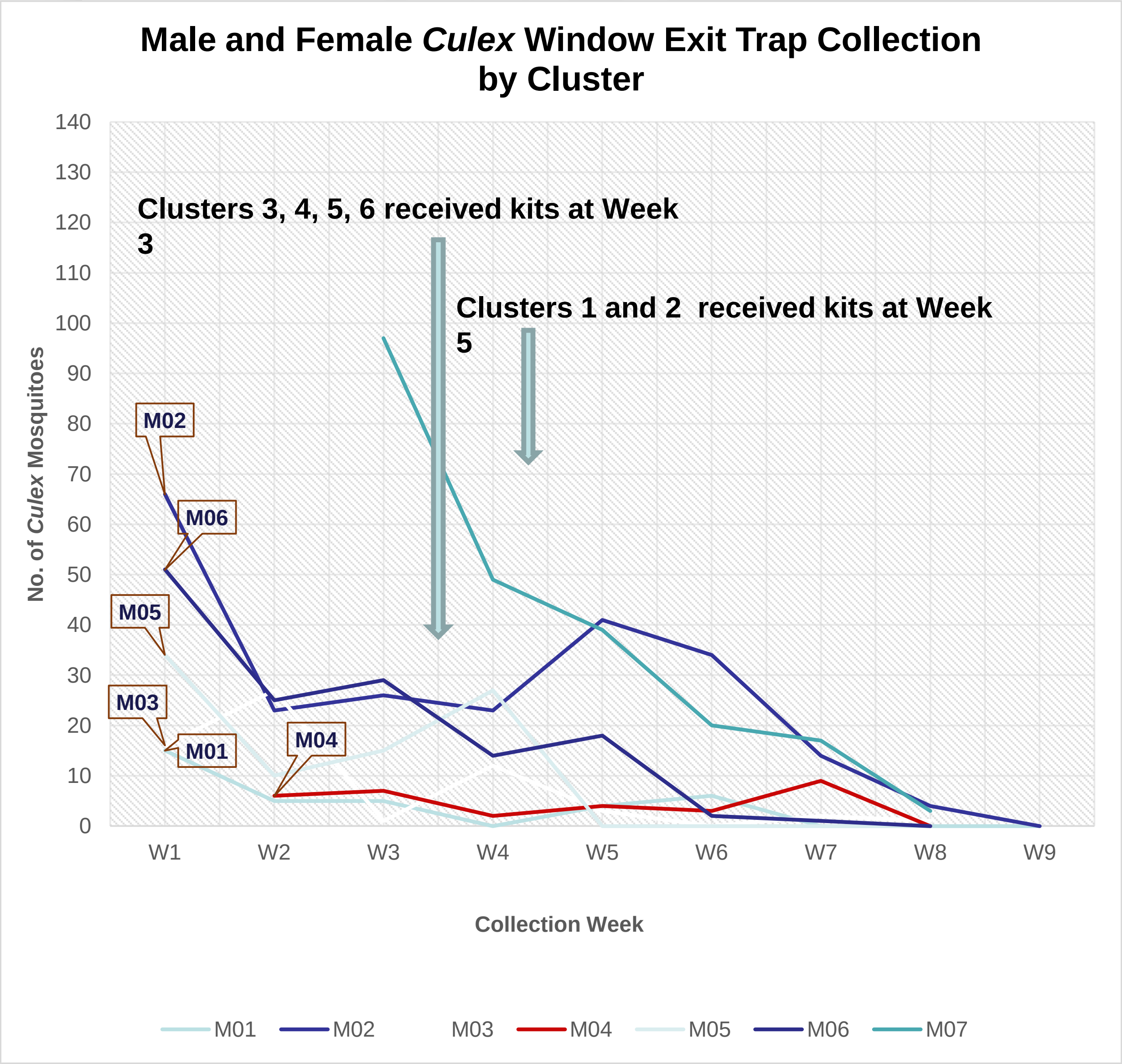
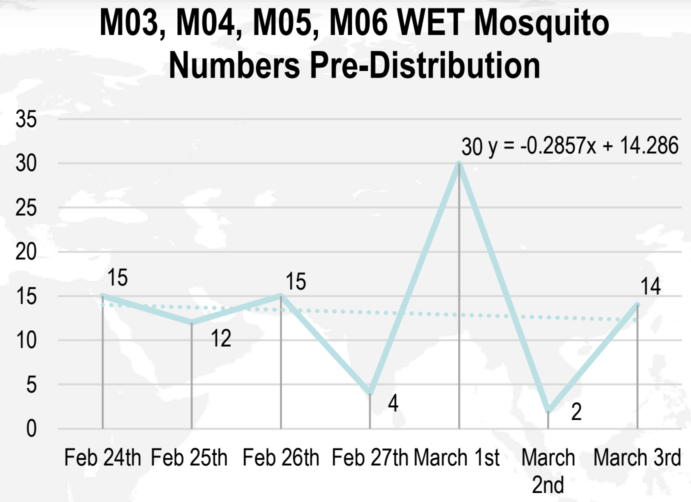
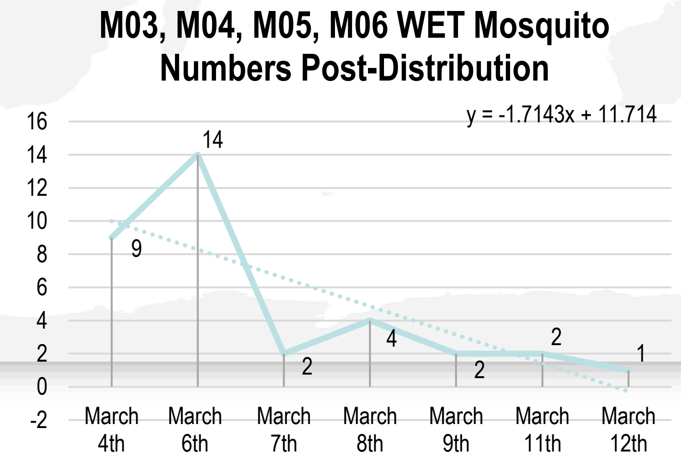


Figure 7: Number of Male and Female Culex Collected in Window Exit Traps, by Cluster and by Kit Distribution Day.





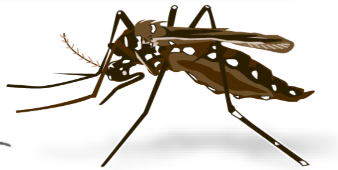
Conclusions

- DFU and purpose of the Kits was generally well understood, and Kits were used effectively
- Cluster 1, 4, 6 Kits achieved highly significant falls in mosquito numbers
- Spatial Repellent (Shield), Aerosol spray can, Mosquito repellent coils were key tools that made difference
- Kits reduced mosquito numbers and sustain control for 1-2 weeks, sometimes longer
- Further studies needed to compare longer lasting tools (singularly and as kits) to confirm results, because the initial kits results are very encouraging.







Indoor household use of **Attractive Toxic Sugar Baits** on malaria vectors Democratic Republic of Congo

Séverin N´Do, **Maite Guardiola-Claramonte**, Marta Maia, Estrella Lasry, Janvier Bandibabone Balikubiri, Claude Habamungu Cidakurwa, Bantuzeko Chimanuka, Rachit Shah, Ana Santos, Liliana Palacios, William Robertson, Silvia Moriana, Christophe Boëte

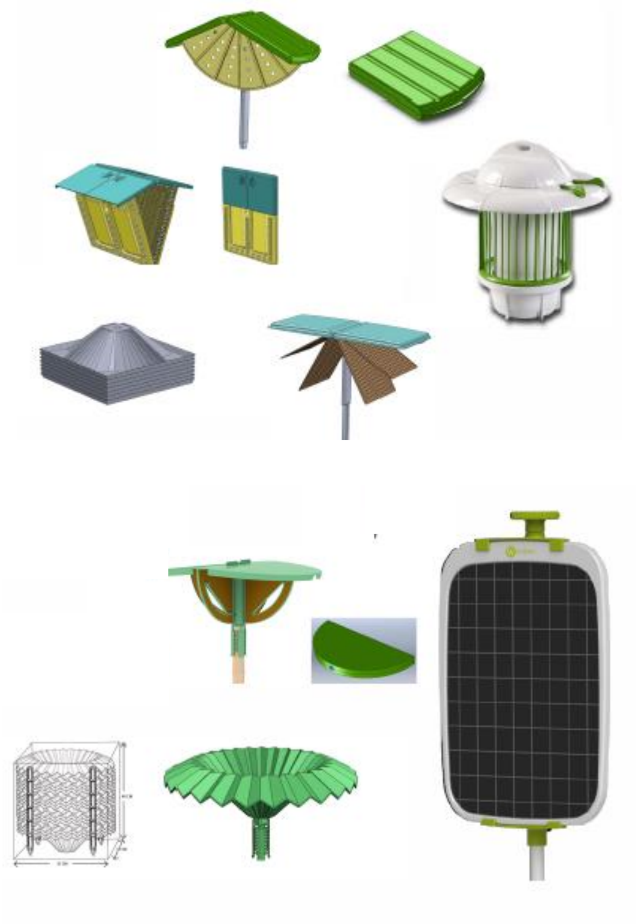
MEDECINS SANS FRONTIERES

Maite GUARDIOLA

Water and Sanitation Advisor, MSF

EEHF, 19th June, 2019

Attractive Toxic Sugar baits - ATSB



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ATSB should

Decrease the density of An. mosquitoes

Shorten their life span

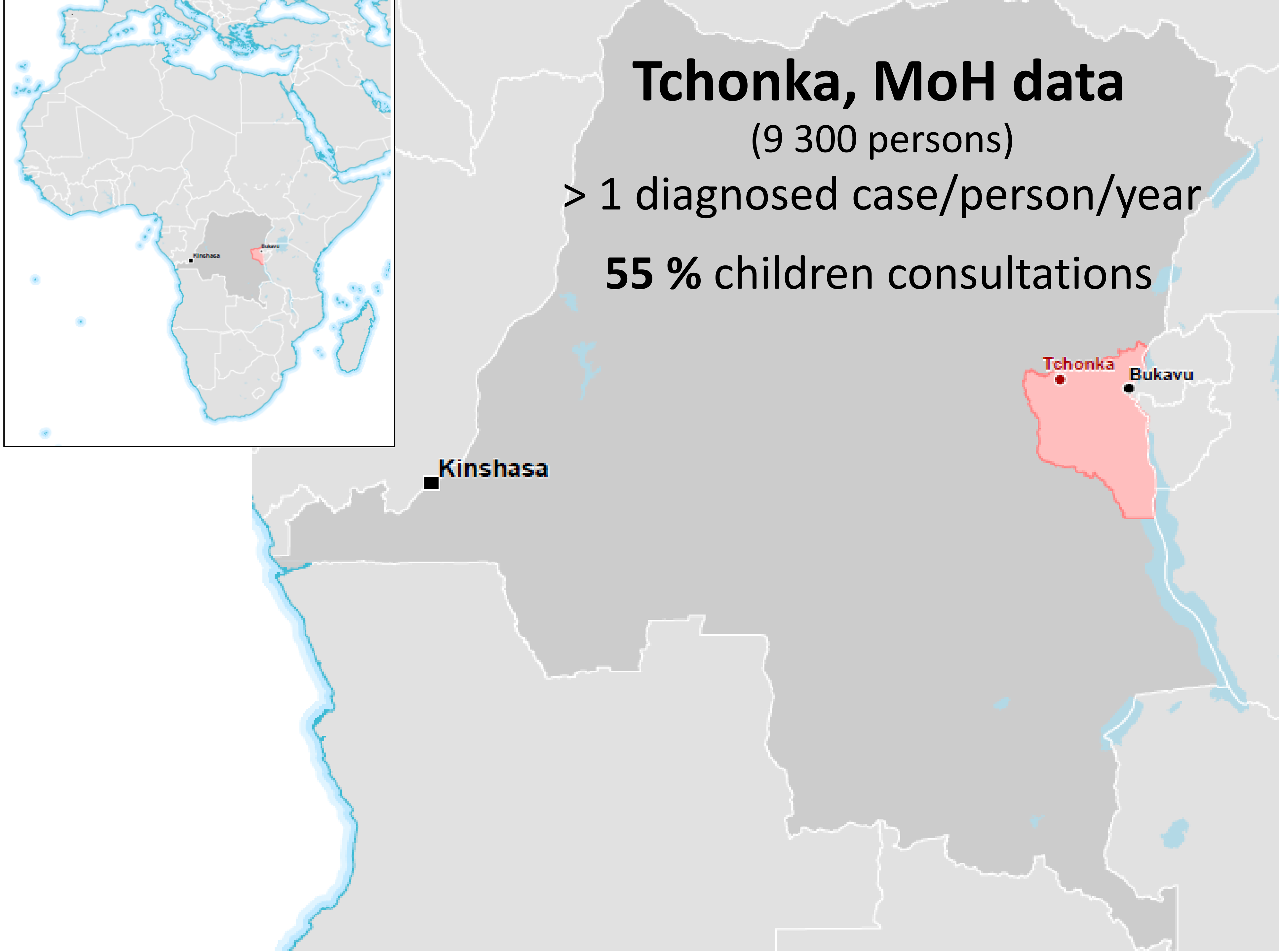
Not an epi study …

Tchonka, MoH data

(9 300 persons)

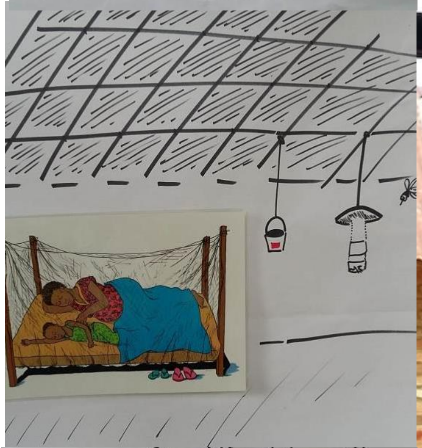
> 1 diagnosed case/person/year

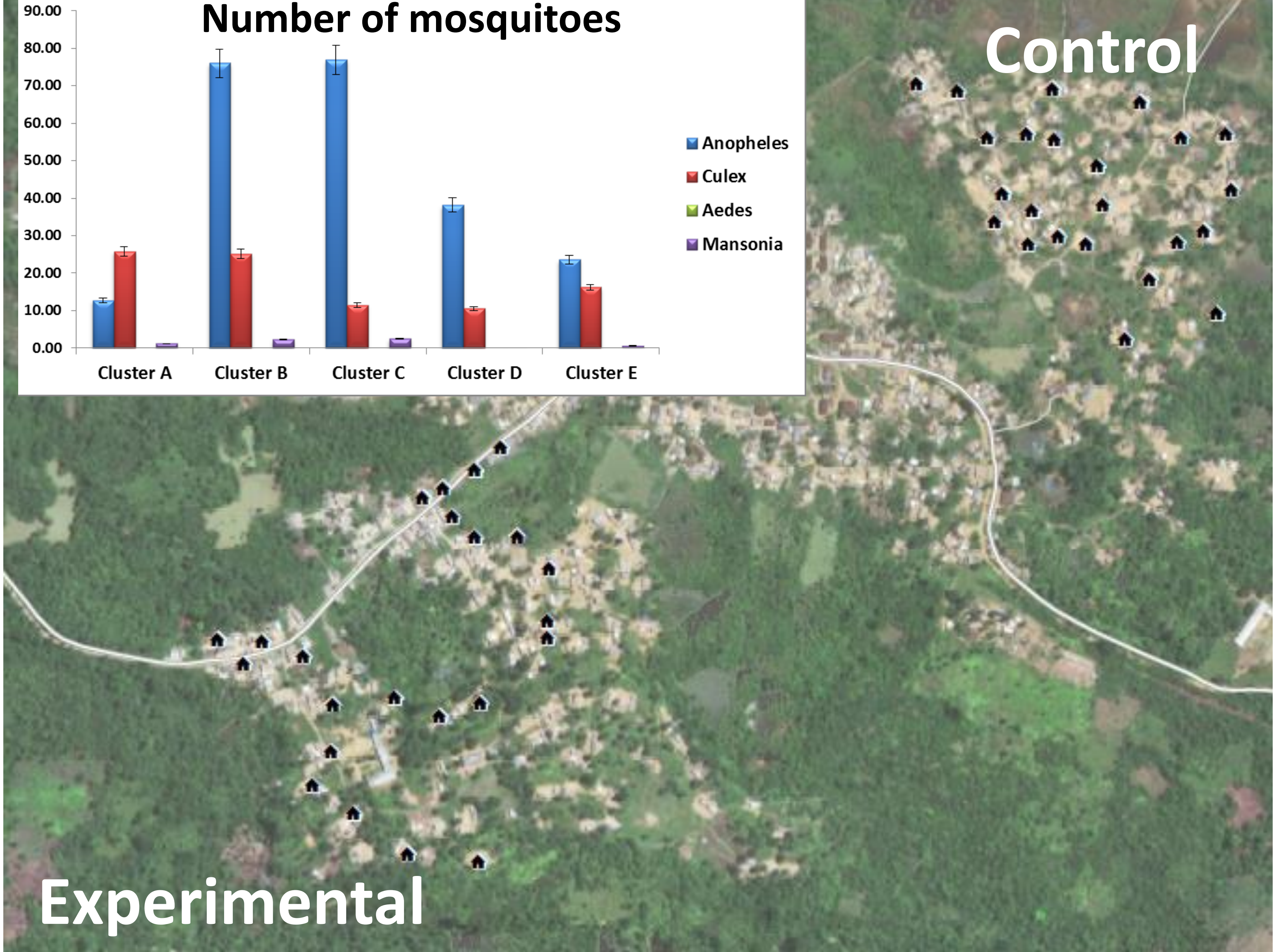
55 % children consultations

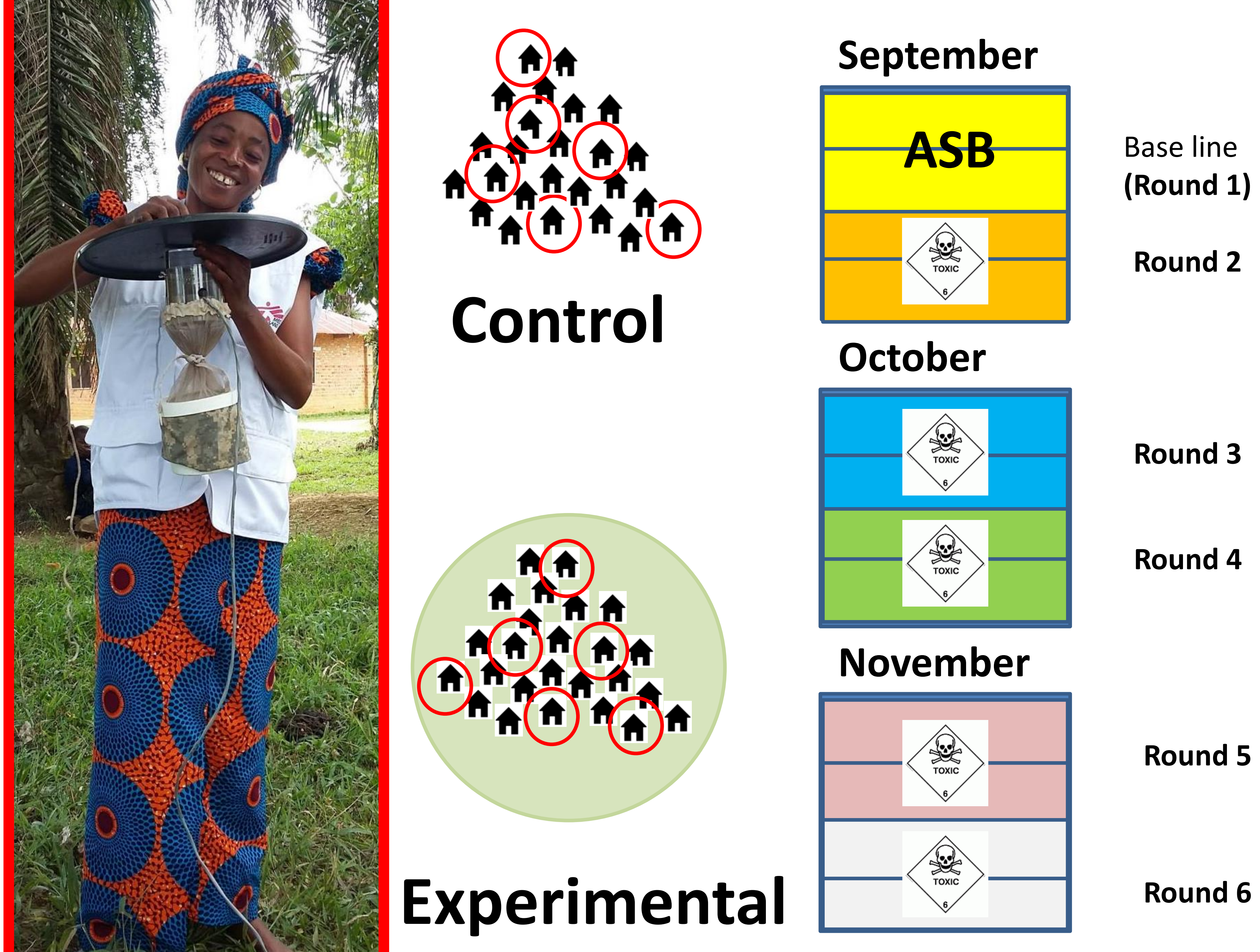


Maite Guardiola - MSF - **Indoor household use of Attractive Toxic Sugar Baits on malaria vectors. Democratic Republic of Congo**


Households selection

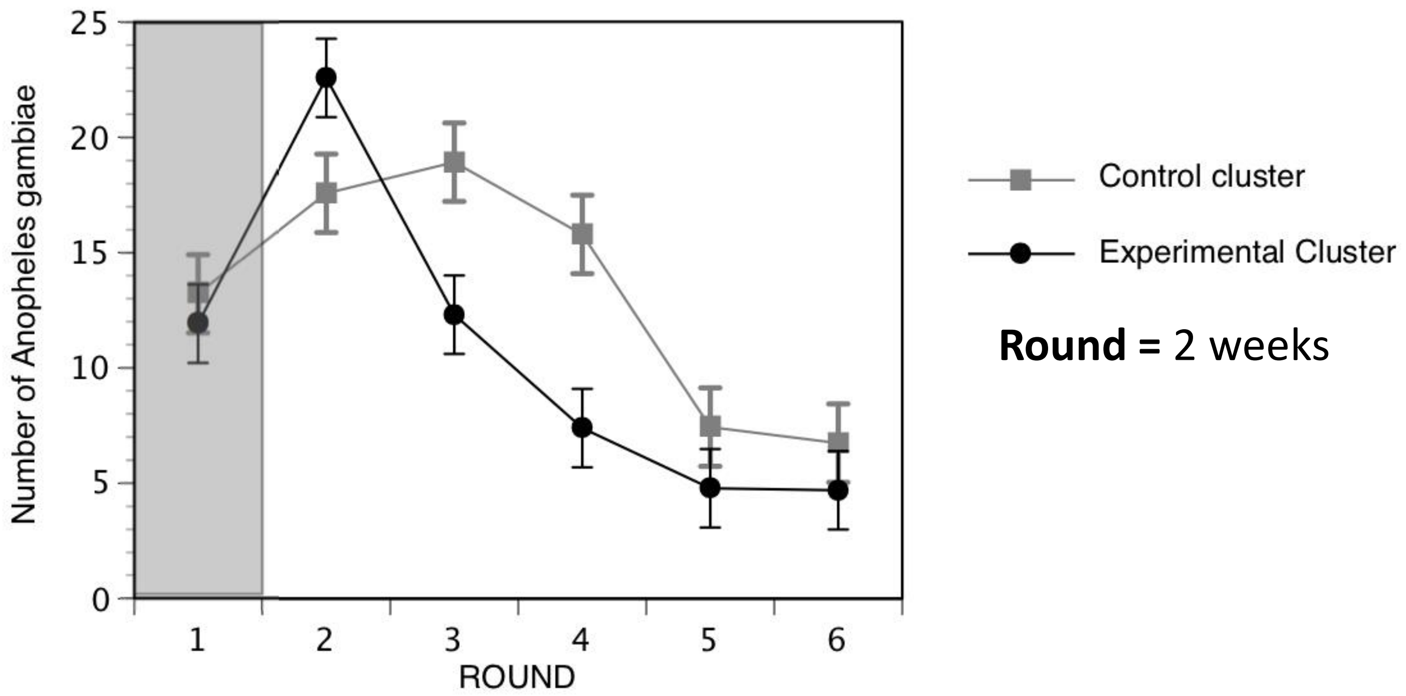

Number of mosquitoes
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Cluster A
Cluster B
Cluster C
Cluster D
Cluster E
Anopheles
Culex
Aedes
Mansonia
Control
Experimental


Control
Experimental
September
ASB
Base line
(Round 1)
TOXIC
Round 2
October
Round 3
Round 4
November
Round 5
Round 6

Maite Guardiola - MSF - **Indoor household use of Attractive Toxic Sugar Baits on malaria vectors. Democratic Republic of Congo**

R E S U L T S

An. gambiae s.s. collected with CDC light traps



Round = 2 weeks

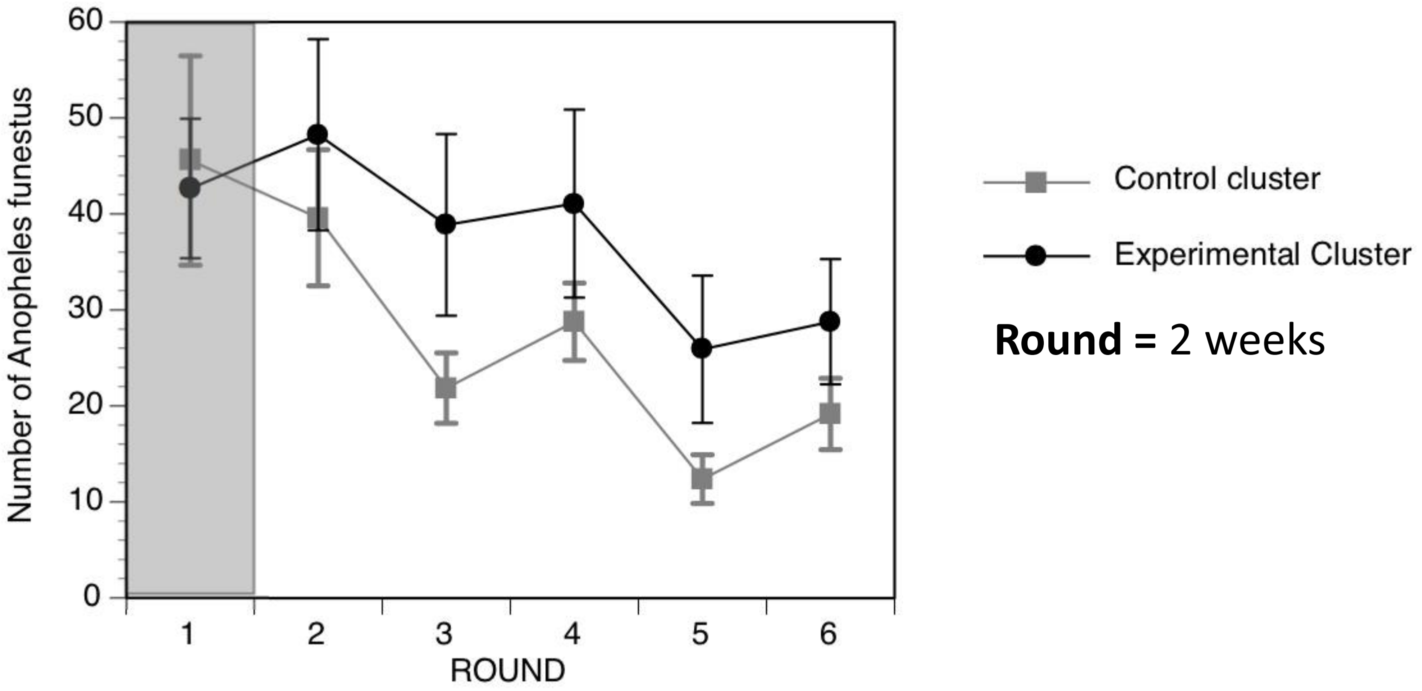
Net reduction of 18% in the experimental

Experimental: 64% (IRR:0.36, 95% CI 0.20-0.73), p = 0.001

Control: 46% (IRR: 0.54, 95% CI 0.36 – 0.77), p = 0.004

R E S U L T S

An. funestus s.s. collected with CDC light traps



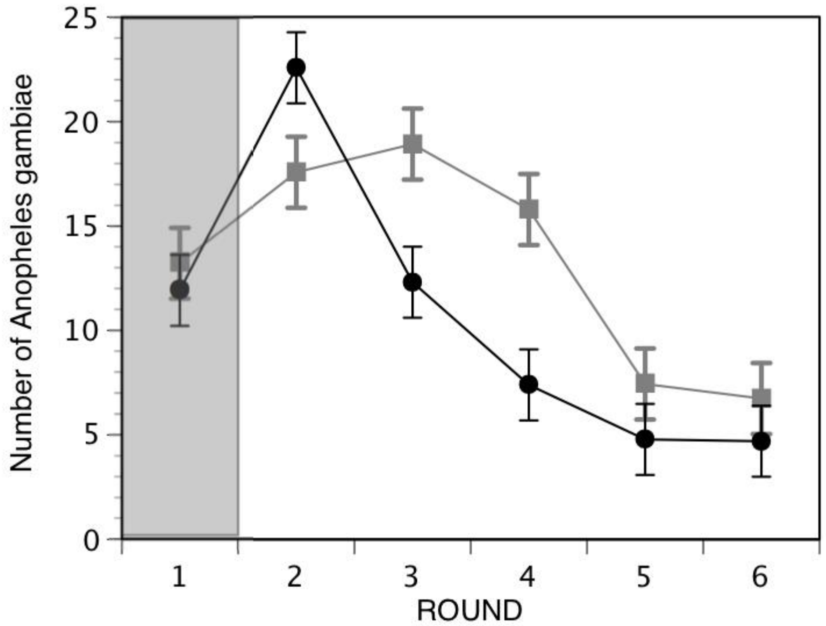
Round = 2 weeks

Reduction in the Control arm, but not significant

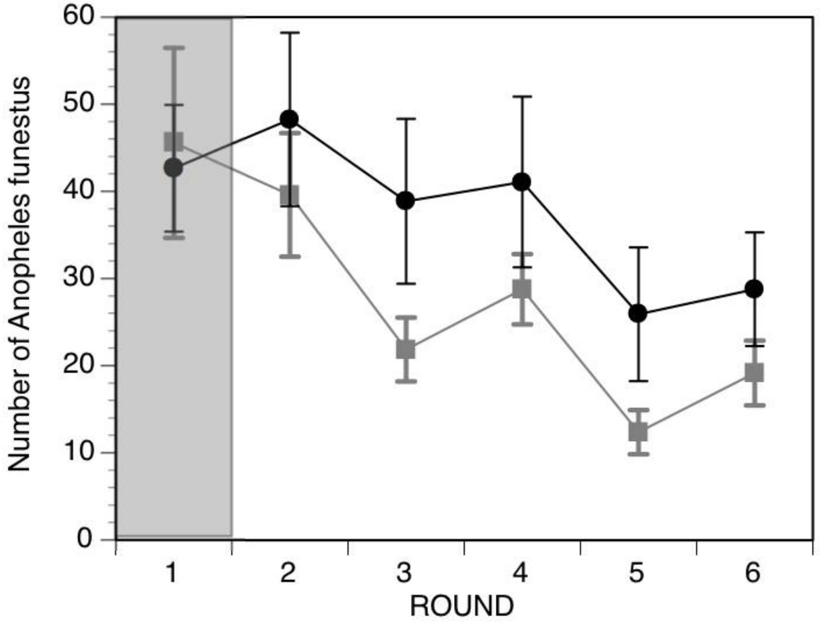
Experimental: 37% (IRR:0.63, 95% CI 0.38 - 1.05), p = 0.08

Control: 57% (IRR: 0.43, 95% CI 0.21 – 0.89), p = 0.02

RESULTS



An. gambiae



An. funestus

Control cluster

Experimental Cluster

Conclusions

Great community acceptance despite the overall limited impact

ATSB (focusing on resting behaviour) **reduces significantly the number of An. *gambiae*** s.s. despite the lush environment

No impact in *An. funestus s.s.* or *Culex* population

… more to come

<u>**Field Team**</u> *(from left to right)*

Appoline BWANDA

Severin N’DO*

Janvier BANDIBABONE

Eveline SIBAZURI

Claude HABAMUNGU

*MSF Field entomologist project coordinator

Many thanks to:

MSF Teams
Dr Maite GUARDIOLA
Dr Estrella LASRY
Dr Ana SANTOS
Rachit SHAH
Dr. Christophe BOETE
Silvia MORIANA
William ROBERTSON

MSF – **GIS** Community
Equipe MSF – Cell 3
Equipe MSF de Lulingu et Bukavu
Malaria and Watsan working groups

External Researchers
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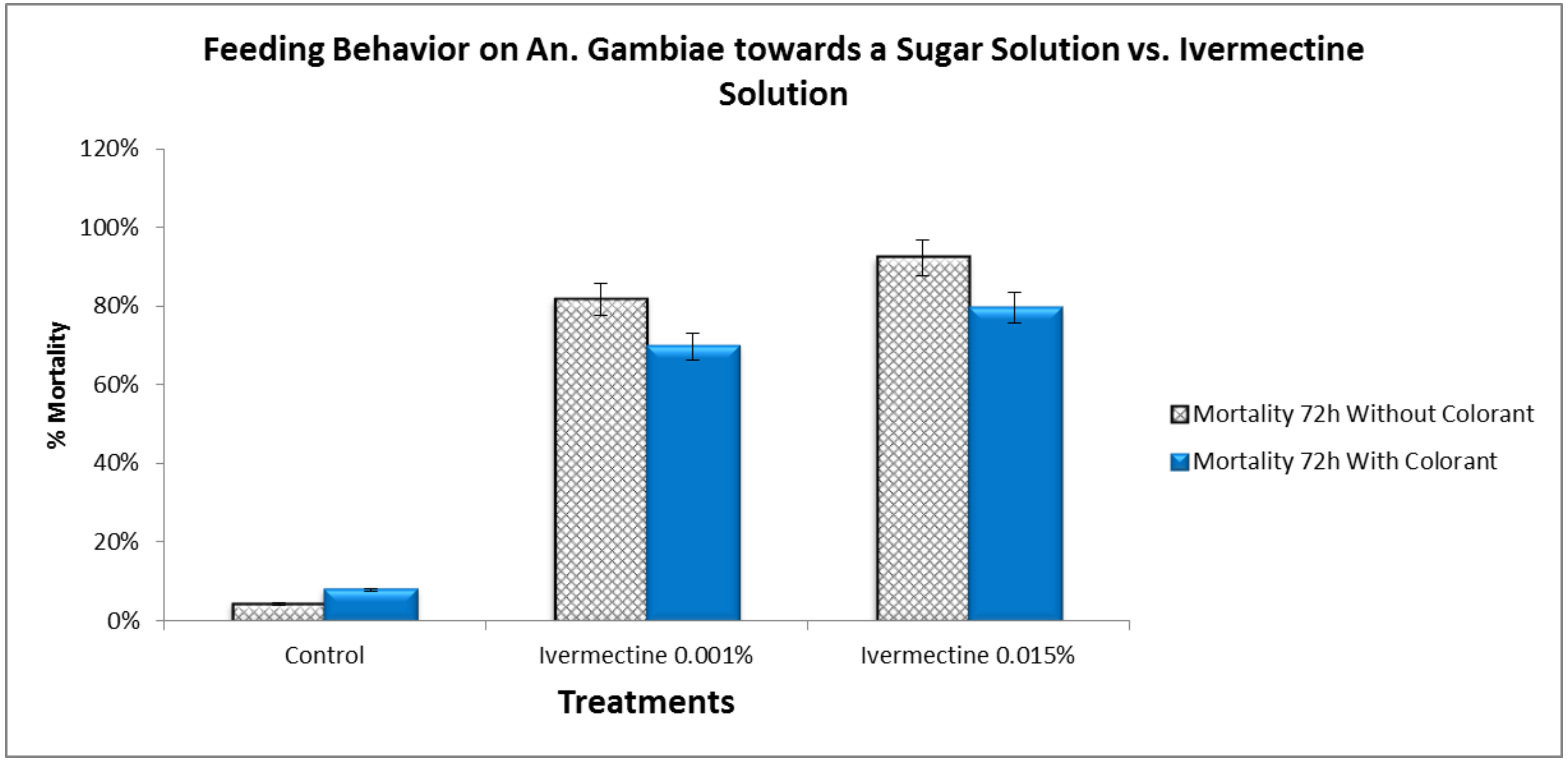
Dr Marta MAIA (KEMRI-Kilifi, Kenya)

In Congo
Ministère de la Santé, Kinshasha
Ministère provincial de la Santé, Sud Kivu
Comité national Ethique de la Santé
Ministère provincial de l’Environment
Le Chef de Division de la Santé à Bukavu
Les Services Etatiques de la Province du Sud-Kivu

Extra slides …

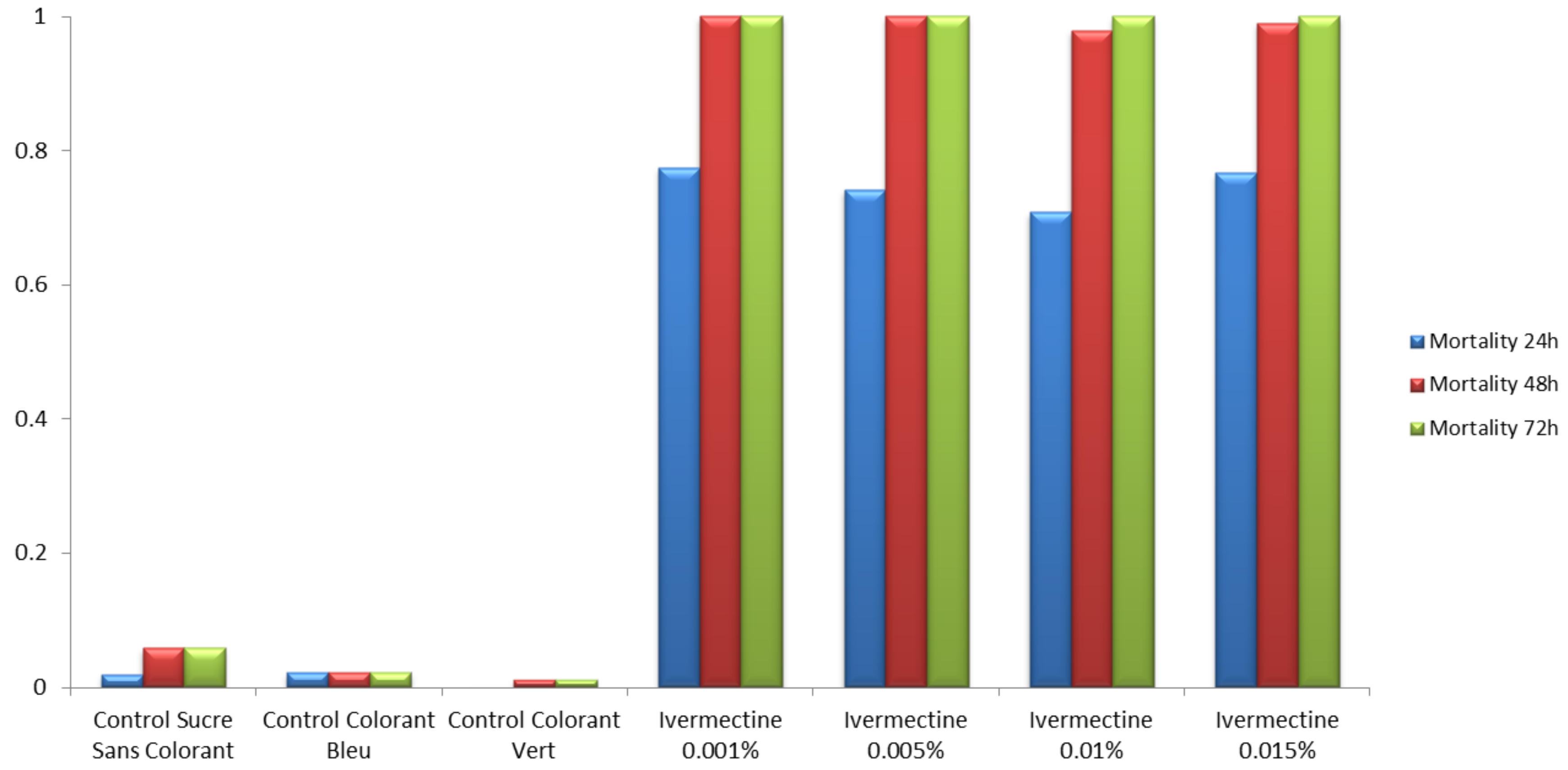
Ivermectine

Do the *An. gambiae* feel the ivermectine?



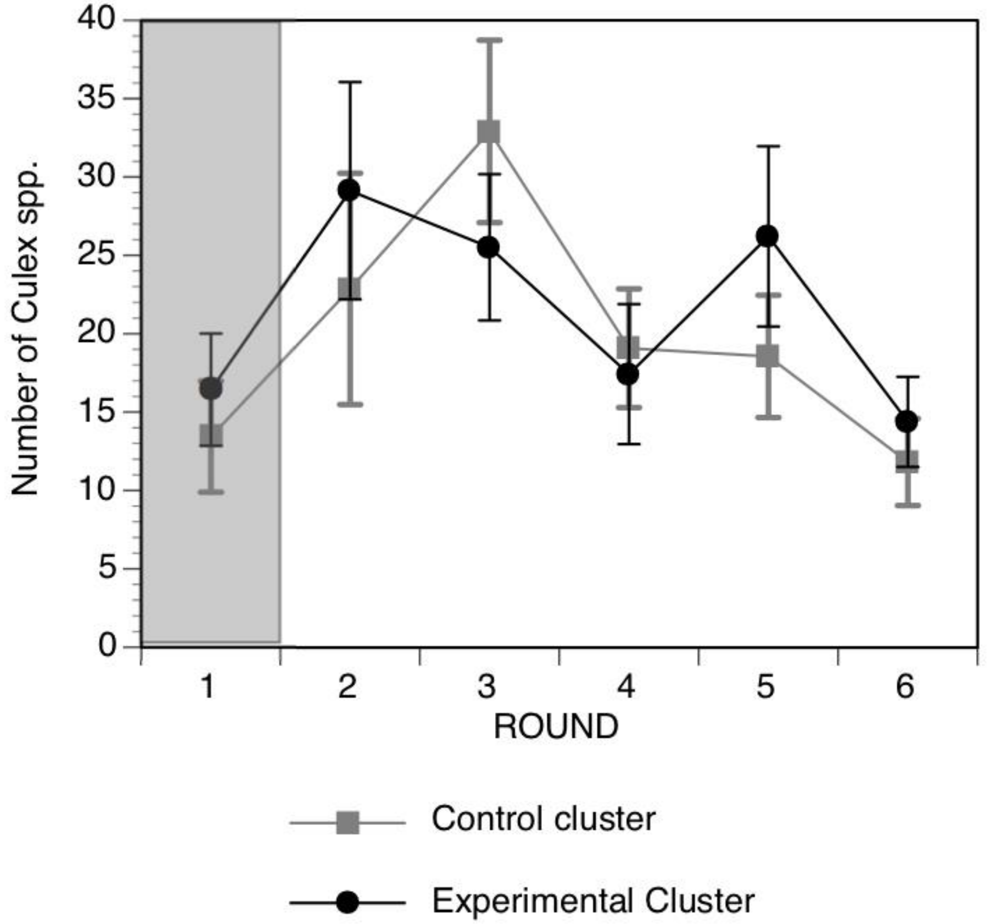
Ivermectine concentration

An. funestus s.s.



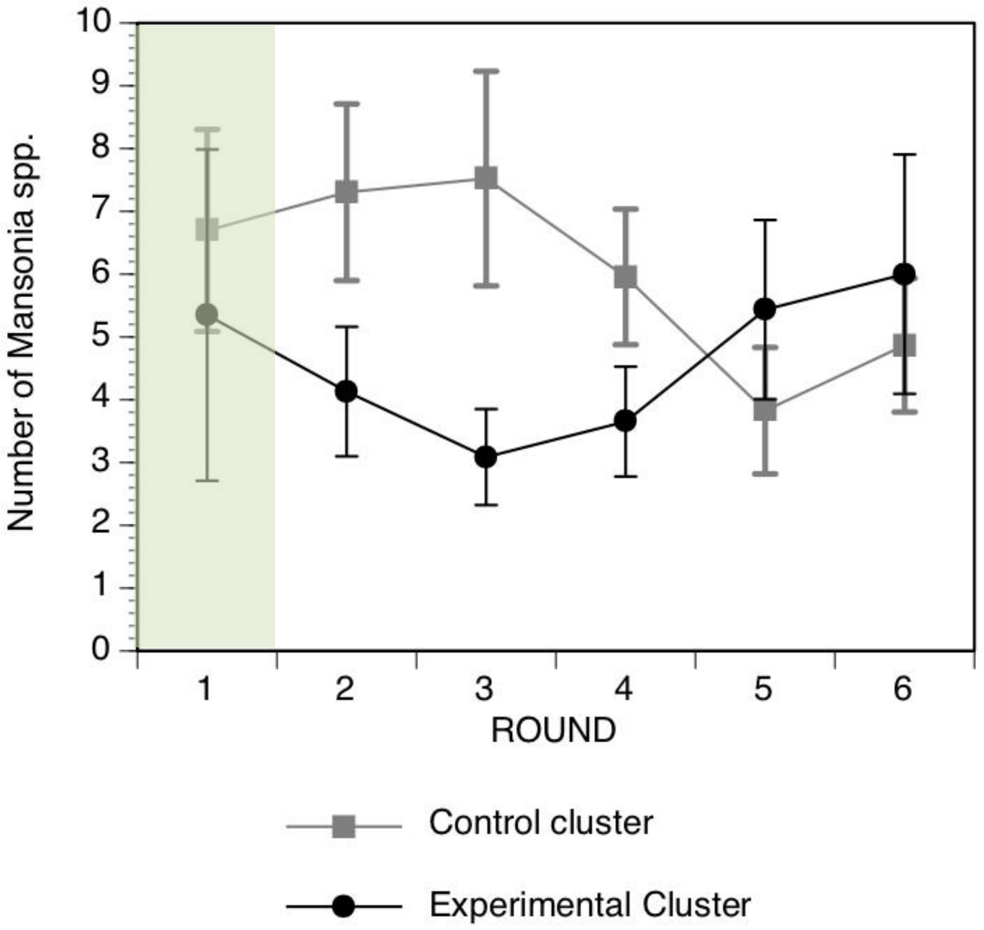
RESULTS

Culex spp. collected with CDC light traps

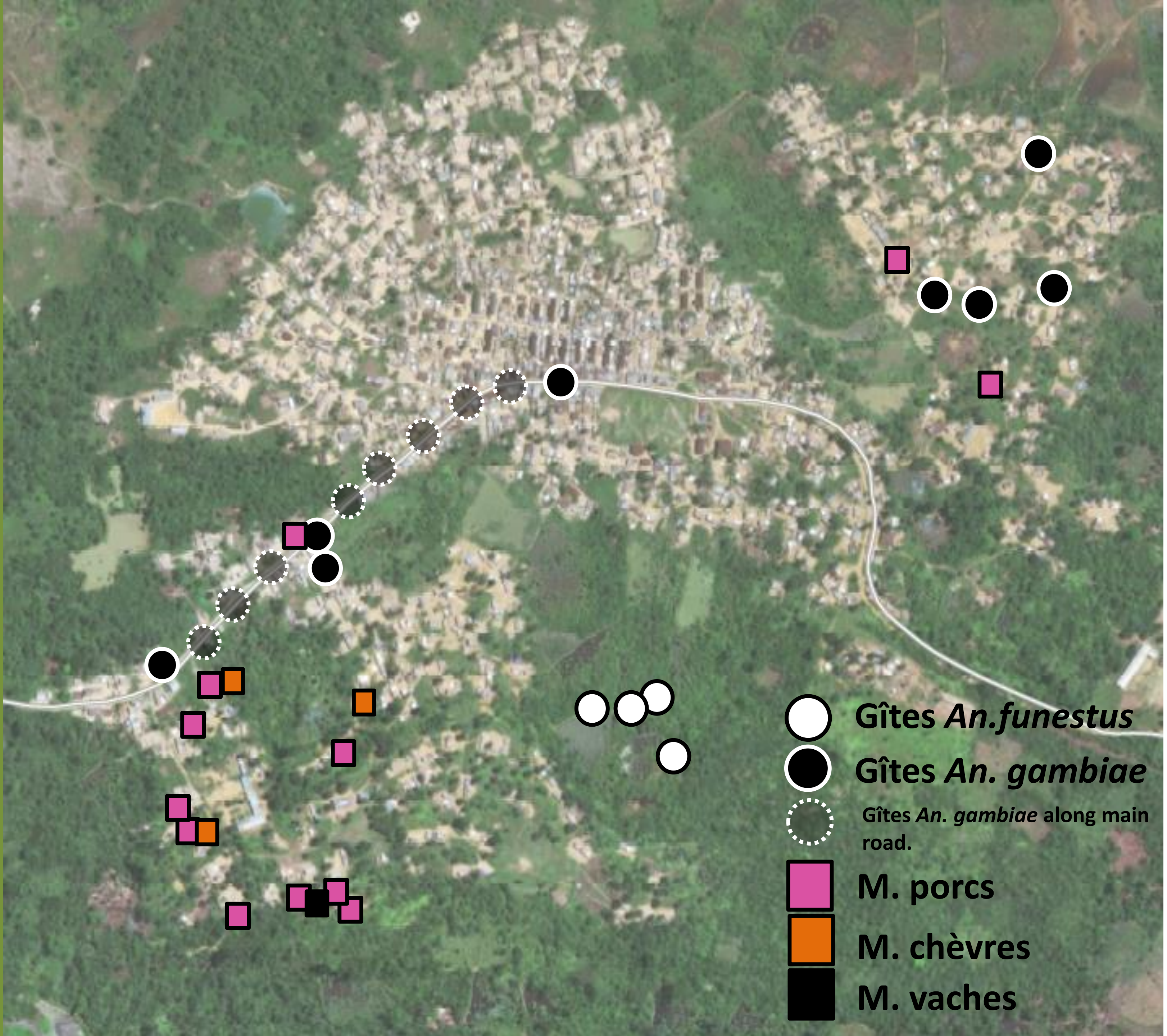


RESULTS

Mansonia spp. collected with CDC light traps



P I L O T


Gîtes *An.funestus*
Gîtes *An. gambiae*
Gîtes *An. gambiae* along main road.
M. porcs
M. chèvres
M. vaches

Roof types





D A T A ANALYSIS

Round 1 (baseline):

	An. gambiae	*An. funestus*	Culex sp.	Mansonia sp.
Control Cluster (23 houses)	13.2±3.1	45.6±10.9	13.4±3.5	6.70±1.6
Experimental Cluster (23 houses)	11.9±2.2	42.6±7.3	16.4±3.6	5.3±2.6

In total:

		Round 1	%	Round 2 to 6	%
An. Funestus	Blood fed	270	13%	793	13%
	Bait fed	1	0.0%	99	1.6%
	Non-blood fed Non-bait fed	1758		6117	
An. Gambiae	Blood fed	44	8%	185	7.3%
	Bait fed	1	0.2%	15	0.6%
	Non-blood fed Non-bait fed	533		2518	

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Data treatment & manipulation

Using: Total female captured

Data: Over dispersion of the data

Analysis: Mixed-effects negative binomial regression

Factors for statistical analysis: presence of baits, eaves opening, type of house structure

METHODS

300 ml :

10 % sugar

5 % colorant

0.005% ivermectin

FSM for Disaster Relief

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

Anna Grieve (Senior Engineer, Arup)

Aim

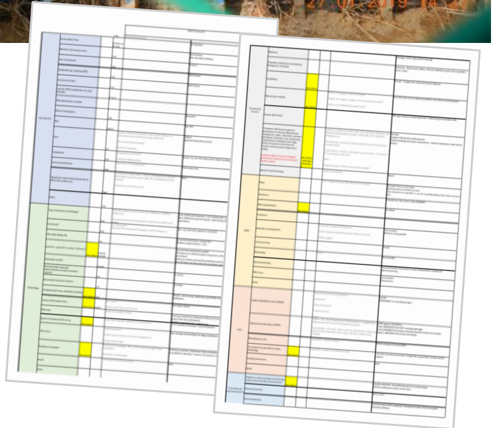
To draw conclusions on best practice FSM for disaster relief, from evidence gathered through practical experience in Rohingya refugee camps Cox’s Bazar (CXB), Bangladesh

Methodology

- Background review
- Field activities
- Reporting

Constraints and assumptions

- Data/evidence gathering
- Cost – globally representative?
- Full treatment train – cost and area
- Treatment effectiveness
- Effluent standards
- Centralised/decentralised



OXFAM

ARUP

Technologies

Decentralised biological and/ or mechanical treatment

- Upflow Anaerobic Filters
- GeoTubes
- Septic/retention-tanks/ABR

Decentralised biological treatment

- Constructed Wetlands
- Biogas Plants

Decentralised chemical treatment

- Lagoon lime treatment with dewatering bed
- In barrel lime treatment with dewatering beds
- Three stage lime tanks

Centralised biological treatment

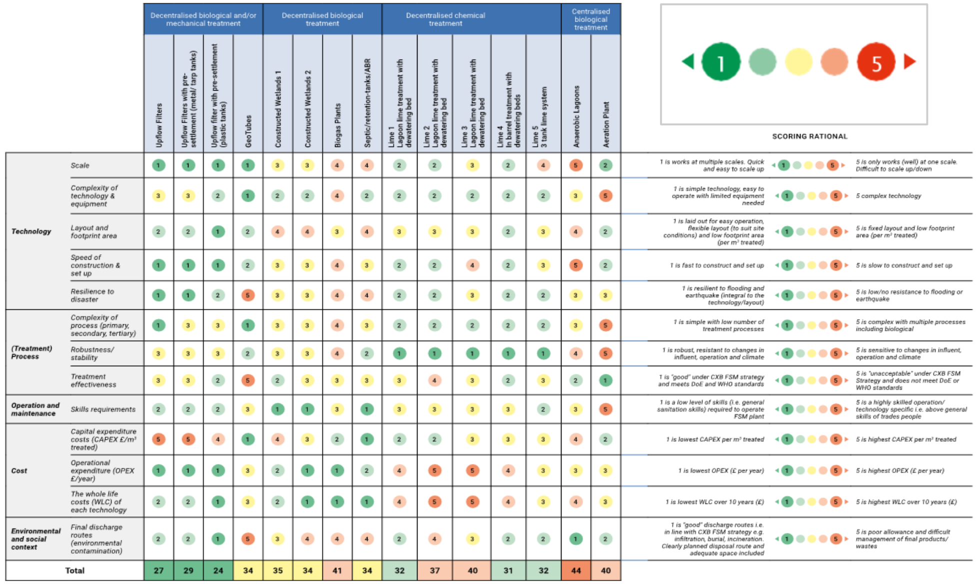
- Anaerobic Lagoons
- Aeration Plant

Indicators

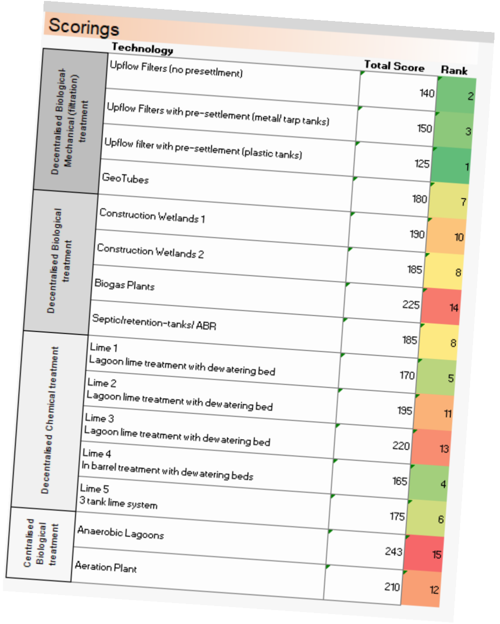
Group	Key indicators
Site specifics	Topography and proximity to groundwater
Technology	Area requirement and layout
	Speed of construction and commissioning
	Resilience to flooding/ natural disaster
Treatment process	Process pinch points
	Quality of liquid and solid effluent (pathogen inactivation)
	Complexity and stability
	Disposal of final products (liquid and solid)
Operation and maintenance	Operation and maintenance issues
	Expertise required for set up and operation
Costs	Capital and operational costs (Capex and Opex)
Environmental and social context	Final discharge routes
	Nuisance

Technology rating

- Technology comparison i.e. one technology against the other
- Site data against the typical parameters to identify any outliers
- A rating system of 1 (“most effective” shown in green) to 5 (“less effective” shown in red) for each indicator, for each technology
- Weighting of indicators dependant on site conditions



		Decentralised biological and/or mechanical treatment				Decentralised biological treatment				Decentralised chemical treatment					Centralised biological treatment		SCORING RATIONAL	
		Upflow Filters	Upflow Filters with pre-settlement (metal/ tarp tanks)	Upflow filter with pre-settlement (plastic tanks)	GeoTubes	Constructed Wetlands 1	Constructed Wetlands 2	Biogas Plants	Septic/retention-tanks/ABR	Lime 1 Lagoon lime treatment with dewatering bed	Lime 2 Lagoon lime treatment with dewatering bed	Lime 3 Lagoon lime treatment with dewatering bed	Lime 4 In barrel treatment with dewatering beds	Lime 5 3 tank lime system	Anaerobic Lagoons	Aeration Plant		
Technology	*Scale*	1	1	1	1	3	3	4	4	2	2	3	2	4	5	2	*1 is works at multiple scales. Quick and easy to scale up*	*5 is only works (well) at one scale. Difficult to scale up/down*
	Complexity of technology & equipment	3	3	2	1	2	2	4	2	2	2	2	2	2	3	5	*1 is simple technology, easy to operate with limited equipment needed*	*5 complex technology*
	Layout and footprint area	2	2	1	2	4	4	3	4	3	3	3	2	3	4	2	*1 is laid out for easy operation, flexible layout (to suit site conditions) and low footprint area (per m³ treated)*	*5 is fixed layout and low footprint area (per m³ treated)*
	Speed of construction & set up	1	1	1	2	3	3	4	3	2	2	4	2	3	5	2	*1 is fast to construct and set up*	*5 is slow to construct and set up*
	Resilience to disaster	1	1	2	5	3	3	4	4	2	2	3	2	2	3	3	*1 is resilient to flooding and earthquake (integral to the technology/layout)*	*5 is low/no resistance to flooding or earthquake*
(Treatment) Process	*Complexity of process (primary, secondary, tertiary)*	1	3	3	1	3	3	4	3	2	2	2	2	2	3	5	*1 is simple with low number of treatment processes*	*5 is complex with multiple processes including biological*
	Robustness/ stability	3	3	3	2	3	3	4	2	1	1	1	1	1	4	5	*1 is robust, resistant to changes in influent, operation and climate*	*5 is sensitive to changes in influent, operation and climate*
	Treatment effectiveness	3	3	2	5	2	3	3	3	3	4	3	2	3	2	1	*1 is "good" under CXB FSM strategy and meets DoE and WHO standards*	*5 is "unacceptable" under CXB FSM Strategy and does not meet DoE or WHO standards*
Operation and maintenance	*Skills requirements*	2	2	2	3	1	1	3	1	3	3	3	3	2	3	5	*1 is a low level of skills (i.e. general sanitation skills) required to operate FSM plant*	*5 is a highly skilled operation/ technology specific i.e. above general skills of trades people*
Cost	*Capital expenditure costs (CAPEX £/m³ treated)*	5	5	4	1	4	3	2	1	2	2	3	3	3	4	2	*1 is lowest CAPEX per m³ treated*	*5 is highest CAPEX per m³ treated*
	Operational expenditure (OPEX £/year)	1	1	1	3	2	1	1	2	4	5	5	4	3	3	3	*1 is lowest OPEX (£ per year)*	*5 is highest OPEX (£ per year)*
	The whole life costs (WLC) of each technology	2	2	1	3	2	1	1	1	4	5	5	4	3	4	3	*1 is lowest WLC over 10 years (£)*	*5 is highest WLC over 10 years (£)*
Environmental and social context	*Final discharge routes (environmental contamination)*	2	2	1	5	3	4	4	4	2	4	3	2	2	1	2	*1 is "good" discharge routes i.e. in line with CXB FSM strategy e.g. infiltration, burial, incineration. Clearly planned disposal route and adequate space included*	*5 is poor allowance and difficult management of final products/ wastes*
Total		27	29	24	34	35	34	41	34	32	37	40	31	32	44	40		

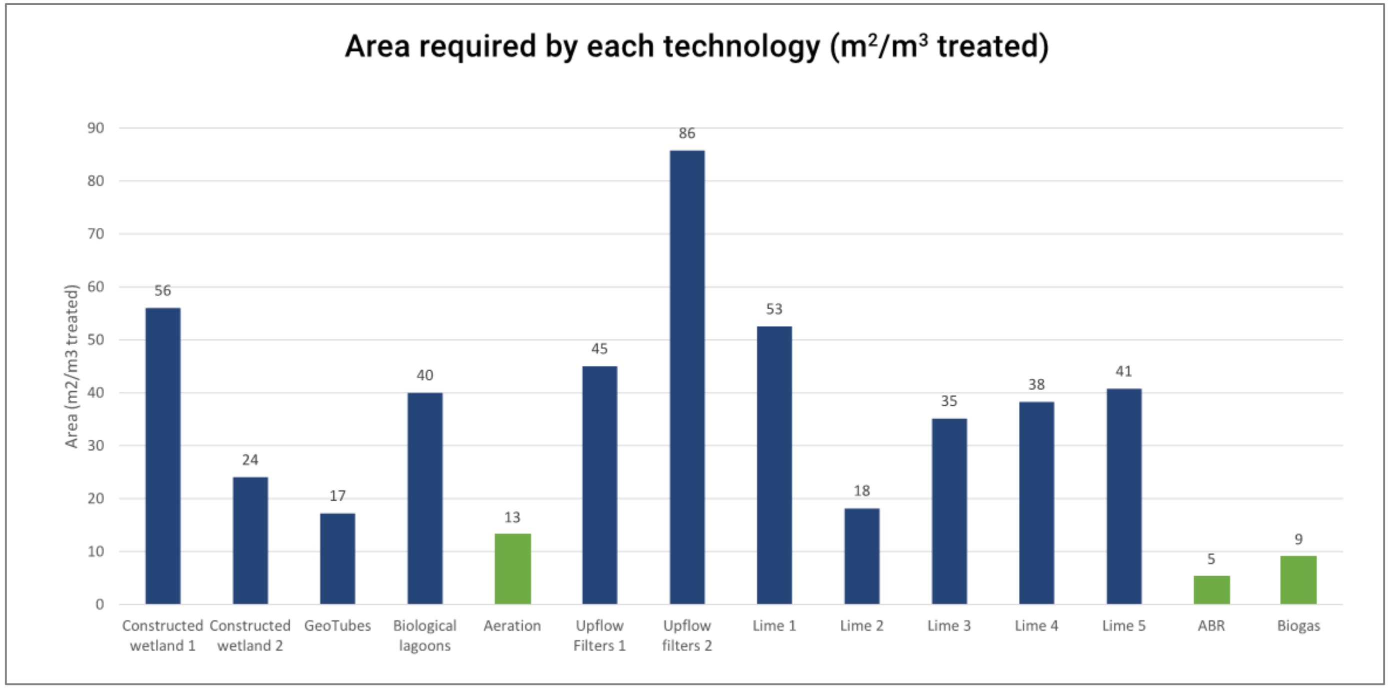


Scorings

	Technology	Total Score	Rank
Decentralised Biological-Mechanical (filtration) treatment	Upflow Filters (no presettlment)	140	2
	Upflow Filters with pre-settlement (metal/ tarp tanks)	150	3
	Upflow filter with pre-settlement (plastic tanks)	125	1
	GeoTubes	180	7
Decentralised Biological treatment	Construction Wetlands 1	190	10
	Construction Wetlands 2	185	8
	Biogas Plants	225	14
	Septic/retention-tanks/ ABR	185	8
Decentralised Chemical treatment	Lime 1 Lagoon lime treatment with dewatering bed	170	5
	Lime 2 Lagoon lime treatment with dewatering bed	195	11
	Lime 3 Lagoon lime treatment with dewatering bed	220	13
	Lime 4 In barrel treatment with dewatering beds	165	4
	Lime 5 3 tank lime system	175	6
Centralised Biological treatment	Anaerobic Lagoons	243	15
	Aeration Plant	210	12

Technology selection – best for ‘Footprint Area’

- (Decentralised) Lime – compact & offers full treatment
- (Centralised) Aerobic plant – compact BUT energy requirement and needs to include solids handling
- ABR and Biogas – needs to include area for solids & liquid handling & disposal



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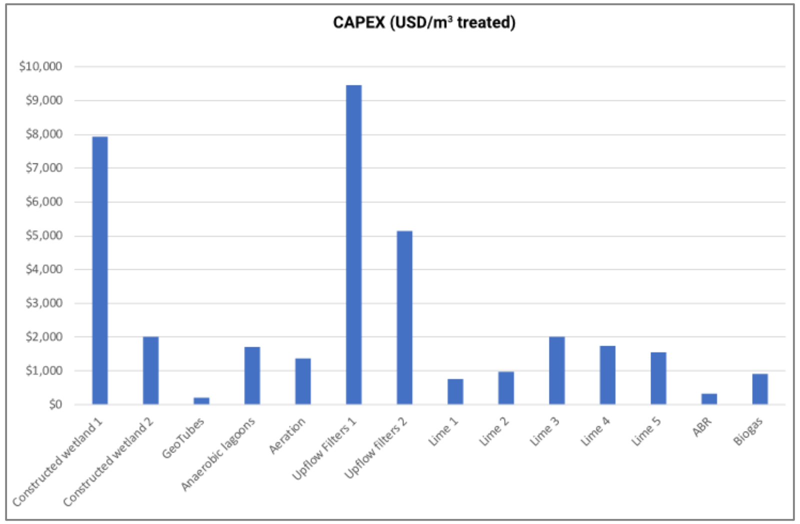
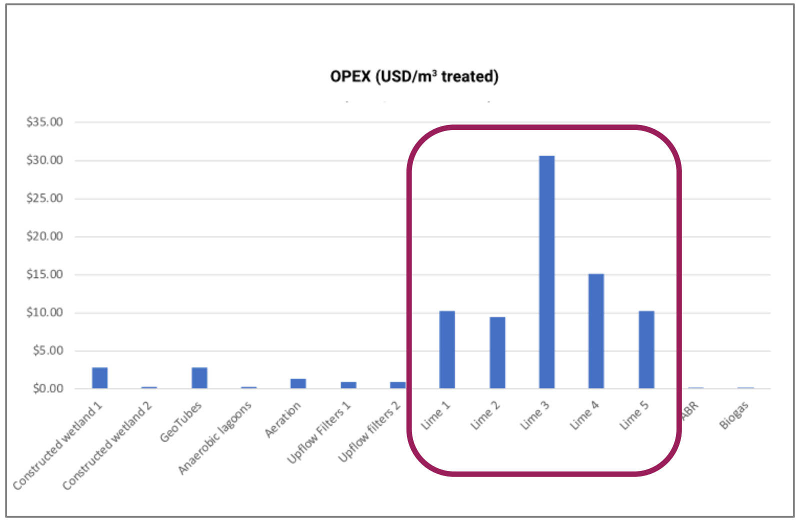
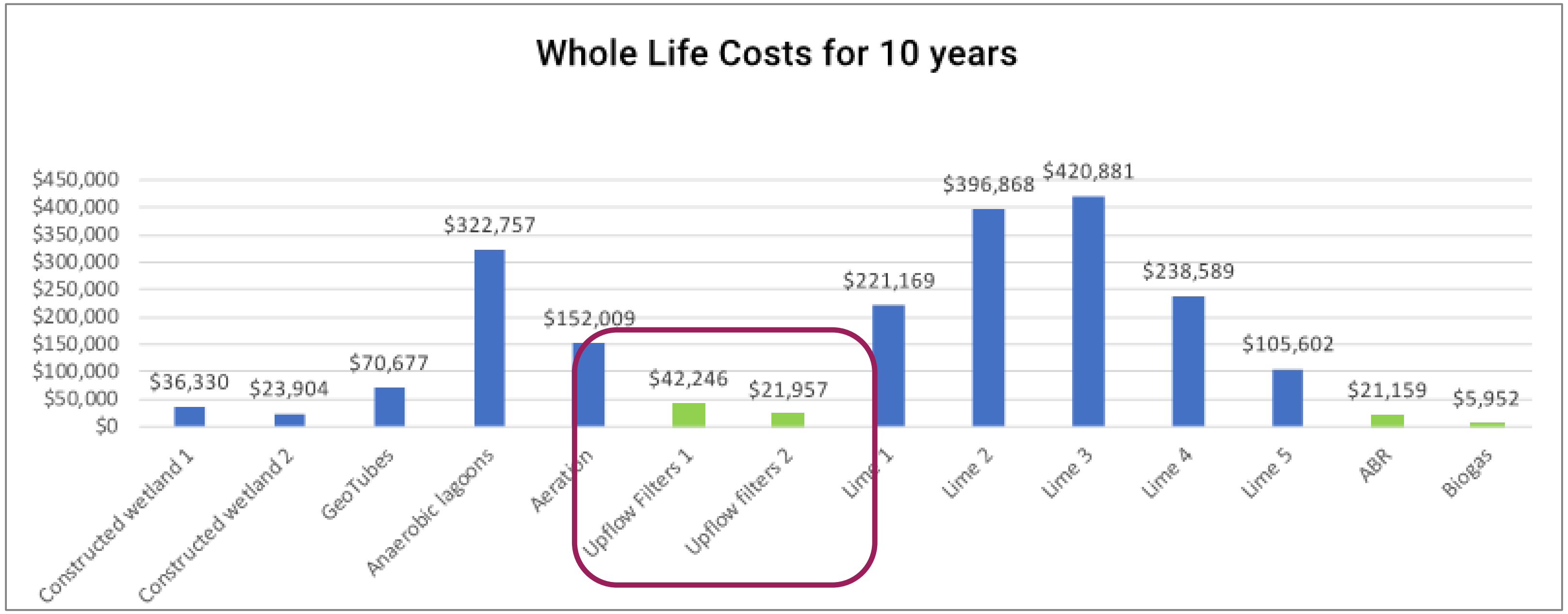
Technology selection – best for 'Cost'







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Other key indicators

- Best for ‘speed of set up’ and ‘resilience for disaster’ – Upflow Filters
- Best for ‘treatment effectiveness’ and ‘stability’
  - Centralised systems i.e. aeration and lagoons
  - Lime best for stability i.e. dose can be adjusted
- Best for (simple) O&M skills – Decentralised (biological & mechanical)

Conclusions

- Designers should consider the site specific factors to determine if this technology is the most appropriate (selection tool)
- **Short term** - Lime Treatment
  - speed of set up
  - stability of the treatment process
  - effluent quality
  - but high OPEX therefore not appropriate in longer-term i.e. after one year/immediate phase of an emergency
- **Longer term** (decentralised) - Upflow Filters
  - score well against a number of the key indicators
- **Centralised** (long term) - Anaerobic Lagoons
  - stable and simpler technology i.e. skill level appropriate in a refugee camp context
  - Full treatment & effluent quality

Reporting

- Study Report (barcode/download)
- Selection Tool

Further studies

- Operation in wet season/long term
- Full treatment train checks (Biogas, ABR, Constructed wetlands, (some) Lime). Implications on cost and area
- Actual Vs theoretical (better data)

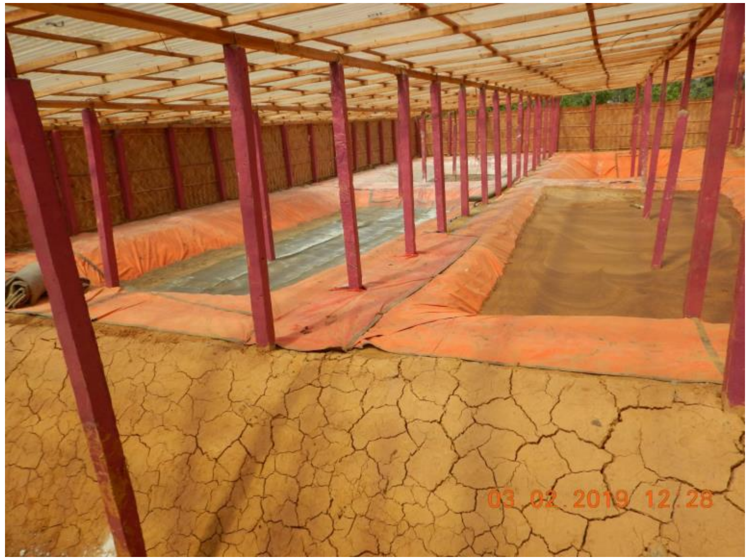
Upflow filters (1)

Upflow filters (2)

GeoTubes

Constructed Wetland

Lime



Lime

ABR

Biogas

Anaerobic Lagoons

Aerobic Treatment

Anaerobic Lagoons

Aerobic Treatment

People. Innovating. Sanitation.

The Septic Bag Kit - safely managed sanitation in early stages of emergency relief

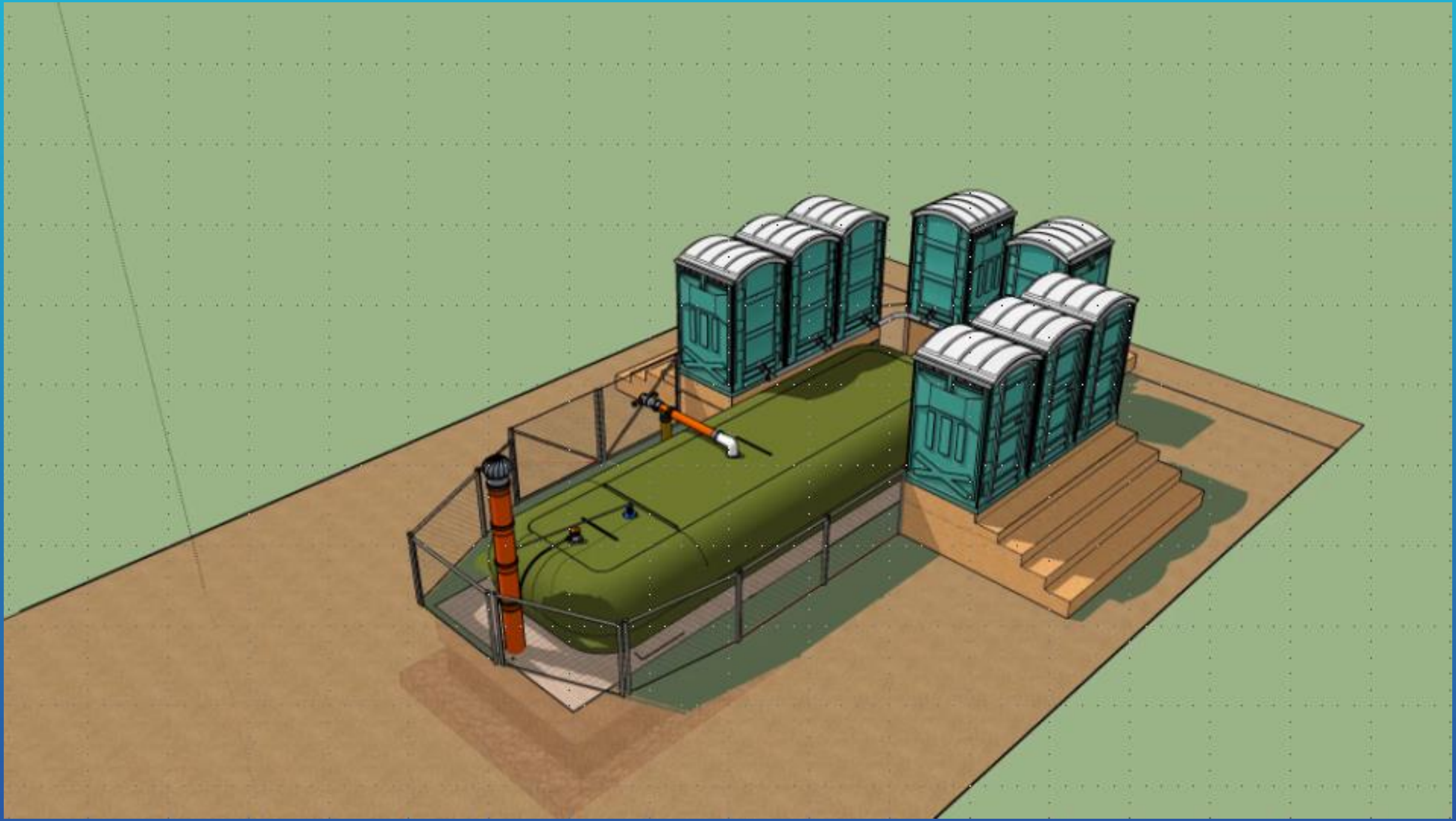
The urgent challenge

- Refugees and IDPs are often not granted with their basic human right to safely managed sanitation services.
- Shortcomings especially exist during the first relief phases and where permanent infrastructures are prohibited.
- So far there is no suitable sanitation solution on the market, which can be easily stored and quickly deployed.
- A lack of solutions which meets the needs of beneficiaries and relief organizations results often in risky and unsustainable sanitation practices.

3-D M

BORDA

3-D model Septic Bag Kit (animation deleted)



BORDA

The novel solution

- The pre-fabricated bag is made from a foldable membrane. An integrated baffle divides the bag into the two compartments.
- It functions like a two chamber septic tank - separates solids from liquids and stabilizes solids.
- The effluent can be infiltrated into the soil, drained off into a nearby sewer or be treated in an additional treatment modules (e.g. PGF, ABR DEWATS, disinfection unit).
- The Septic Bag is desludged by vacuum trucks. The sludge is then treated, safely disposed off or can be reused.
- The foldable structure of the Septic Bag allows to warehouse the kit and quickly deploy it (also via air freight) to emergency locations.

3-D M

Features of the kit

- Unit costs aimed at are 1000€
- Capacity 500 users per daily or 10 latrine cubicles per septic bag
- Expected desludging cycles: 6 to 8 month
- Expected lifetime 5 years
- Size 2m x 4,5m x 1m (w x l x h),
- Wastewater retention time 24h
- Made for concentrated blackwater: 2l urine, 0.4kg faeces, 1.5l water per day & capita
- Sludge is stabilized, especially under higher ambient temperature

Project status

- System has been developed and prototypes are produced
- Assembling and hydraulic tests have been successfully finished jointly with THW (Fed. Agency for Technical Relief Services)
- A long-term test under real life conditions is currently prepared jointly with the Swiss Corps for Humanitarian Aid (SKH), EAWAG SANDEC and Oxfam. Potential test locations in Bangladesh, Iraq and Switzerland are under discussion.

Vision

- Contributing to safely managed sanitation in emergencies by establishing a network of relief organizations, which will ensures global availability of the systems through warehousing and rapid deployment.

- To this end we invite other organizations to get involved in testing and improving the system and establishing the required supply chain.

People. Innovating. Sanitation.

Thorsten Reckerzügl

Regional Advisor West & Central Asia

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+49.421.40 89 52 – 29

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

Murray Burt, Senior WASH Officer, UNHCR

Emergency Environmental Health Forum

17-18 June 2019

UNHCR
The UN Refugee Agency

THE CHALLENGE

Social challenges for Sanitation

Women and Girls Toilet and Shower at Home

NHCR
efugee Agency

Environmental challenges for Sanitation

Steep terrain and High population density

NHCR
efugee Agency

Challenges with Emptying & Transport of FS

Lack of emptying

Access difficulties

UNHCR
The UN Refugee Agency

Direct disposal of FS into open drains

UNHCR
The UN Refugee Agency

Drains flow downhill to streams

UNHCR
The UN Refugee Agency

THE OPPORTUNITY

Opportunity to Achieve SDG 6
for refugees and host community

long term access to safely managed sanitation

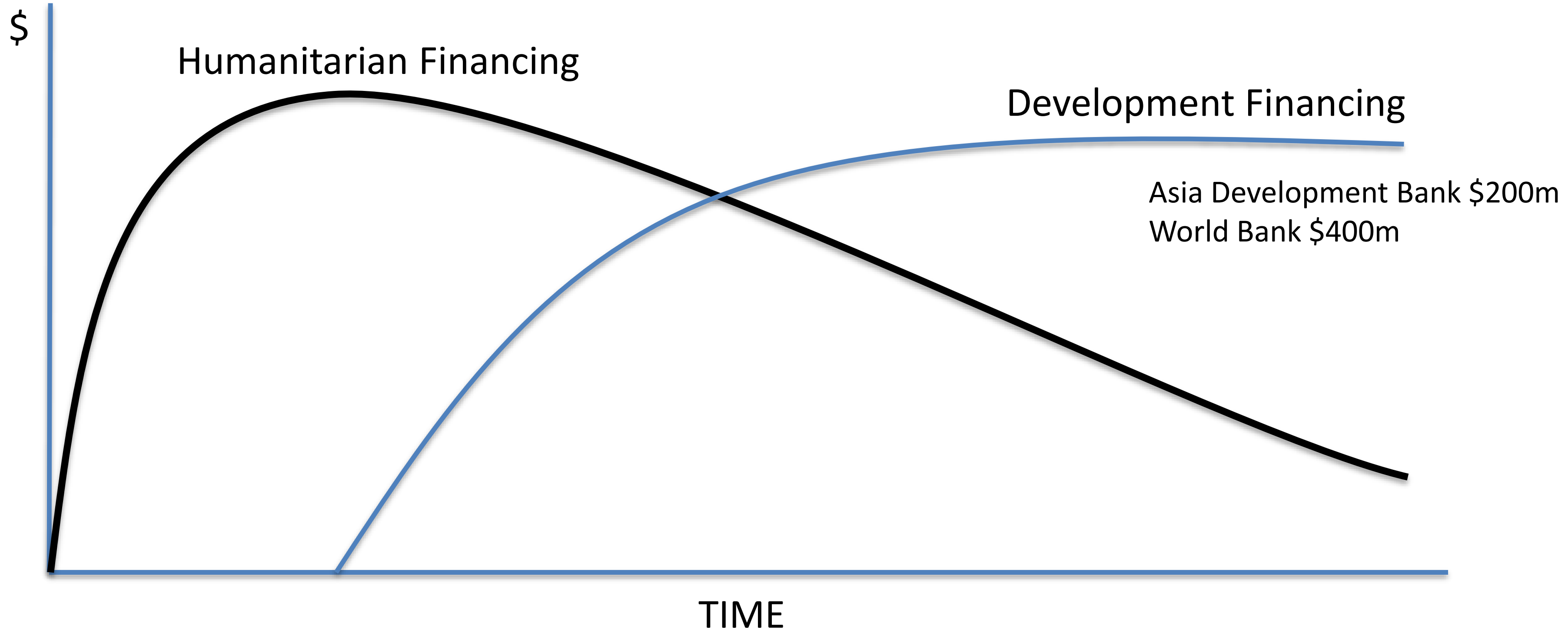
environmentally sustainable solutions

inclusion of refugees within national services

long term low cost sanitation services

Humanitarian to Development Continuum

Humanitarian to Development Planning and Financing



Possibility of High CAPEX, Low OPEX Solutions

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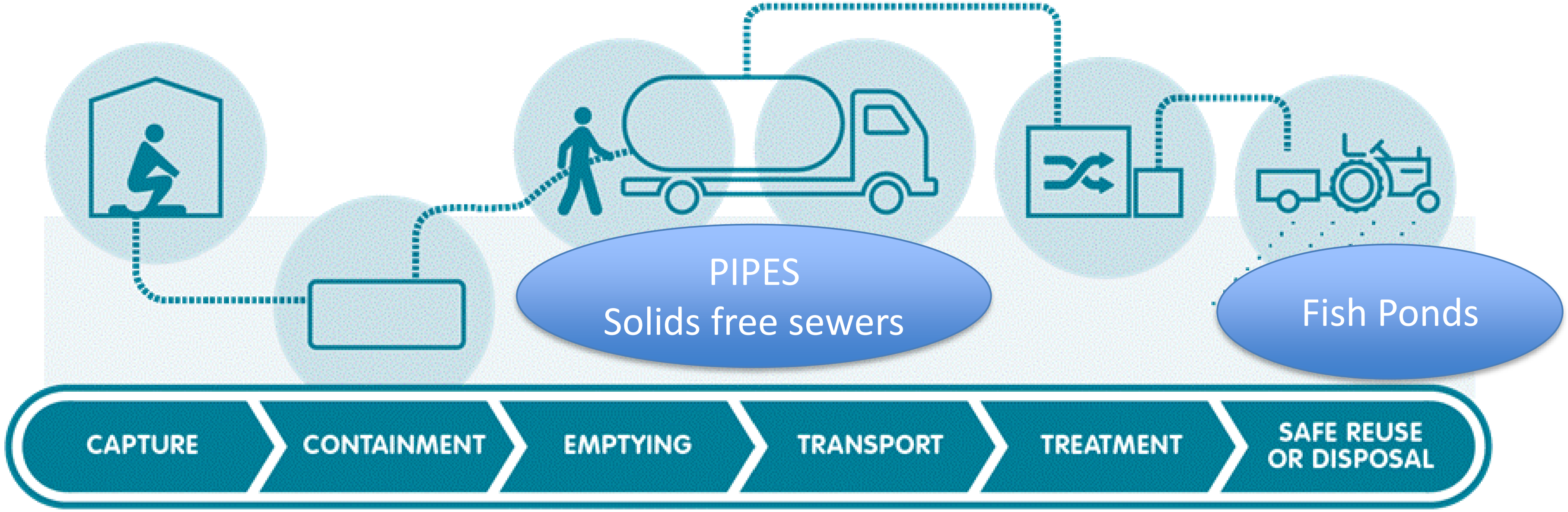
THE SOLUTION

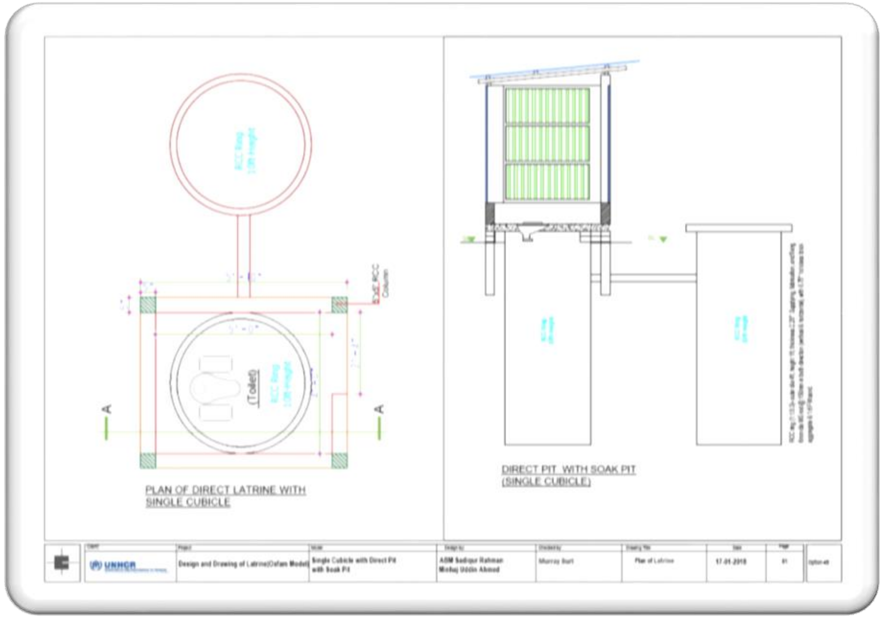
Sanitation Masterplan

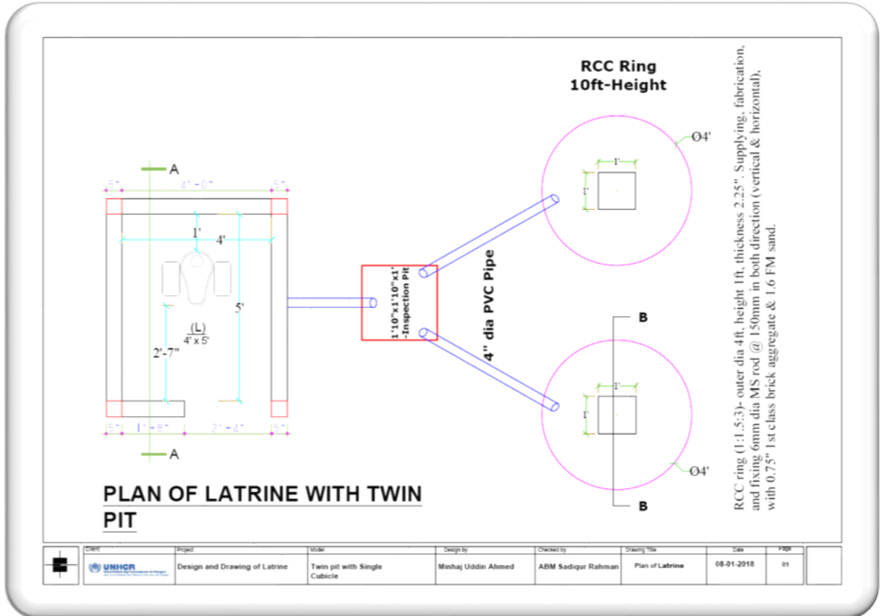
- Multi-year investment plan for sanitation
- Agreed technology and management models
- Economic - lowest long term operation cost
- Environmental – protection of environment, fit within limited space,
- Socially acceptable, reduce public health risks, wastewater reuse,
- Household/Family Latrines and Bathrooms where possible
- Different solutions for different sites -Centralised, semi-centralized, decentralized

Full sanitation chain
Urban style sanitation solutions



Sanitation Unified Designs





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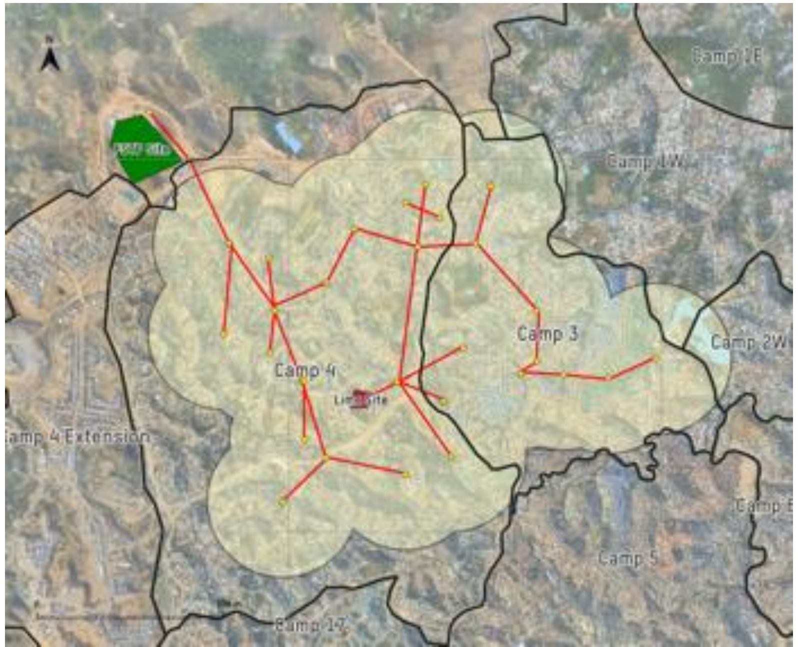
Manual/Truck Transport → Pipe Transport



‘Deployable’ system flexible to changing situation

System needs to be engineered/optimized:

- Reduce/remove need for sludge trucking
- Reduce time to pump from one stage/tank to next

Introduce **gravity flow** options where possible as situation stabilizes

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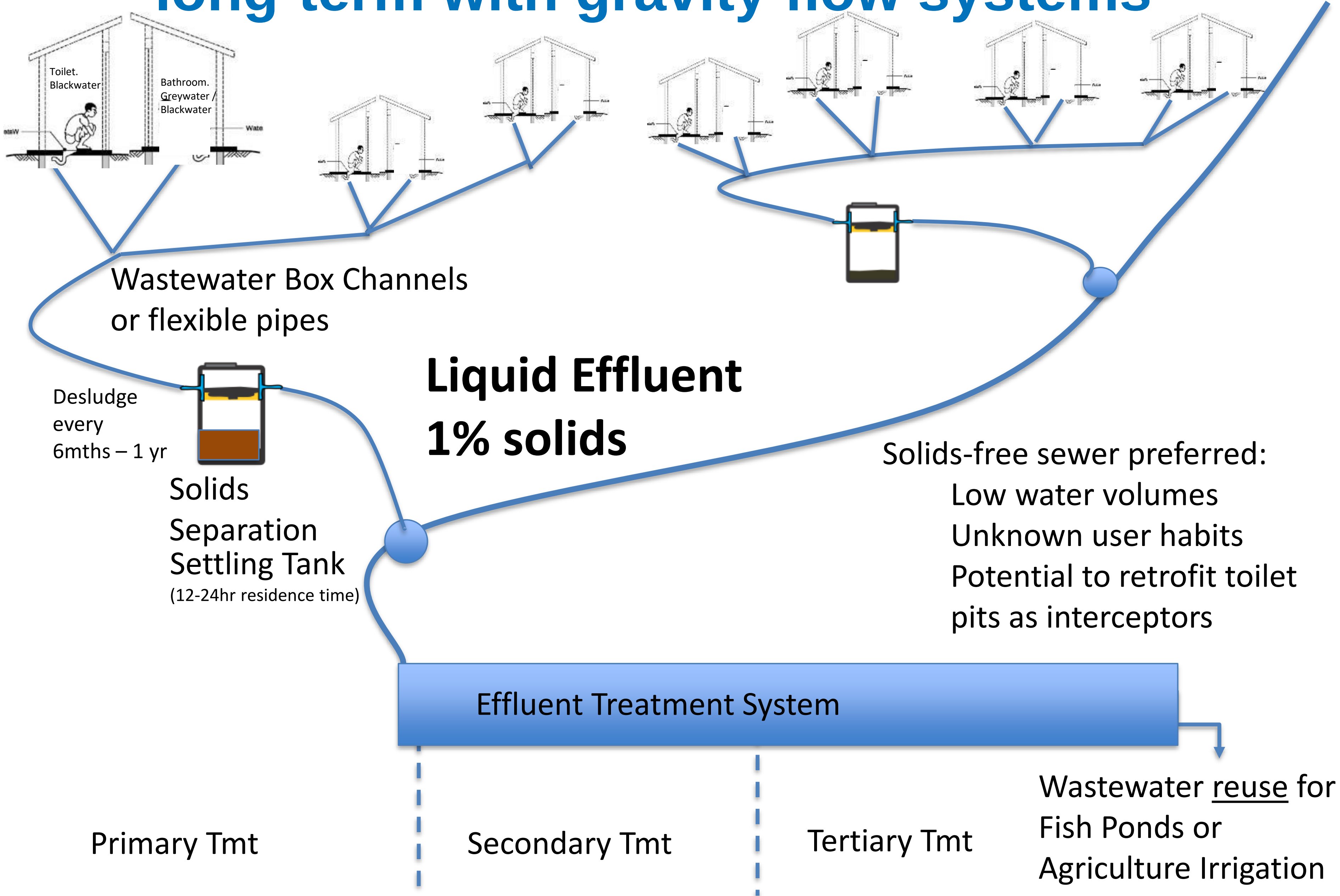
The UN Refugee Agency

Reducing the emptying & transport cost in the long-term with gravity flow systems



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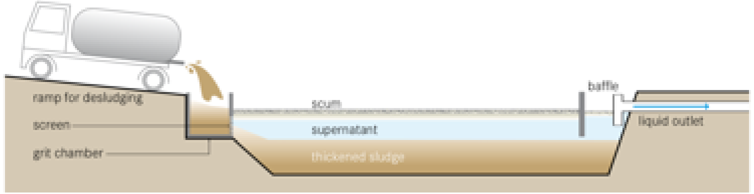
Sustainable Treatment

Centralised

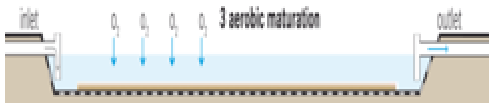
Initial anaerobic settling/thickening step: high HRT to allow for initial start-up period



Need to substitute treatment function provided by facultative pond

Intermediate aerobic steps (trickling filter, coco-peat filter)

Polishing ponds for pathogen reduction

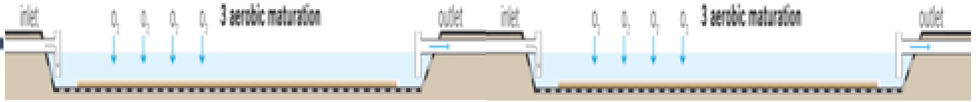


Partially decentralised

Anaerobic Baffled Reactor with 1-2 Up-flow Filter Reactor chambers

Cost- and space-efficient, but performance needs careful monitoring – hydraulic regime at inlet can be adjusted (intermittent flow may improve performance of ABR)

Maturation/polishing ponds



All 3 elements currently in use, but not in combination

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The UN Refugee Agency

Centralised FS/WW treatment favoured where possible in the long run

Centralised	Decentralised
Waste is treated away from population Reducing Health Risks	**Treatment close to population Poses Health Risks**
More space for cheaper and environmentally less damaging non-chemical pathogen destruction	Some units, notably constructed wetlands under-engineered due to space constraints
More scope for pond-based treatment, which facilitates larger storage and HRT	DEWATS (ABR, AFR) cost-effective and low footprint, but treatment incomplete (e.g. nitrogen, pathogens)
	Chemicals required for pathogen destruction (opex↑)

Need for systematic testing/data on key parameters of FS/WW Influent and Effluent Discharge

Photo credit: Roman Ryndin

Wastewater/FS characterisation

Wastewater/FS volumes

Infiltration rates

UNHCR The UN Refugee Agency

THE FUTURE

Going Forward in Bangladesh

- Focus on solving the FS/WW transport issue
- Centralised treatment preferred
- Flexibility of solutions (no holy grail)
- **Finalise and agree unified sector wide sanitation strategy/masterplan**
- Inform plans/activities of DPHE, ADB, WB.

UNHCR
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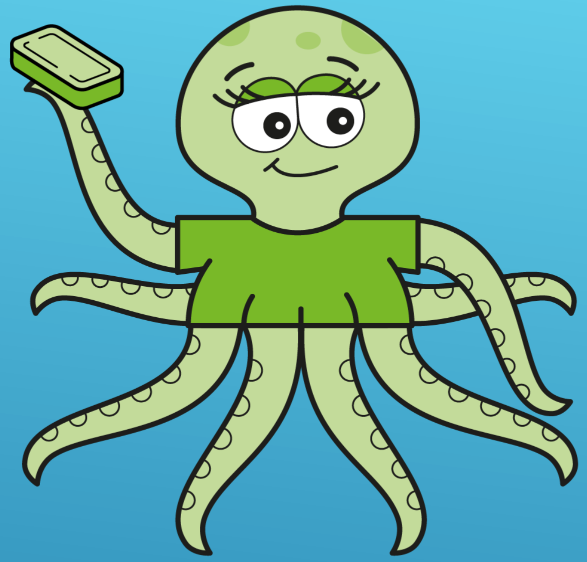
Going Forward in the WASH Sector

- Humanitarian WASH Sector needs new partnerships/ increased capacity for urban style FS/WW management
- **FS/WW discharge indicators need to be included in Sphere (BOD, COD, TSS)**
- Formation of global humanitarian sanitation technical working group.



SANI TWEAKS

Changing the way the WASH sector implements sanitation programmes

Andy Bastable – PHE Lead
Eva Niederberger – PHP Lead
Tanya Glanville-Wallis – Wash Coms

OXFAM

WHY SANI TWEAKS

- Sanitation Lighting
- Sanitation users centred design project
- Social Architecture project , Rohingya Response, Bangladesh
- Evidence from Oxfam’s past and current sanitation projects

SANITATION LIGHTING & GBV IN CAMPS

OXFAM WEDC Loughborough University

How perceptions of safety affect usage rates

Does lighting reduce fear of GBV? Does it reduce crime in general?

DOES SANITATION LIGHTING REDUCE THE RISK OF GBV IN CAMPS?

What type of lighting is most sustainable, cost-efficient & effective?

How can we make sanitation facilities safer, more private and more dignified for users?

LATRINE LIGHT RESEARCH SHOWS THAT ON AVERAGE **40%** OF WOMEN ARE NOT USING THE LATRINES PROVIDED. – DURING THE DAY

The main reasons stated are

- **not wanting to be seen going to the toilets,**
- **lack of privacy (people peeking in) sexual harassment,**
- **cleanliness,**
- **lack of lighting at night**
- **Lack of locks on doors**
- **vermin**

2017: The HIF challenge

Test and evaluate rapid community engagement in user-centred sanitation design & generate practical solutions

OXFAM

The Process and Partners

One partner to carry out research and evaluation (Oxfam)

1) Landscape Review – what's out there now?

2) 4 pilot projects testing user-centred design:

- **Bangladesh (Save the Children with Eclipse)**
- **Iraq (Save the Children with Eclipse)**
- **Lebanon (Qatar Red Crescent)**
- **Uganda (Welthungerhilfe)**

3) Evaluation

OXFAM

The Problem

- Sanitation is designed without consultation
- The facilities don’t suit people
- Latrines don’t get used
- Needs not met – health, dignity
- Aid workers lack time and resources
- Don’t know what to do, especially in rapid-onset
- The effectiveness of engaging communities is not proven

OXFAM

Findings from the User centred Design Project

- In a 1st phase emergency there is not time to do what they did in this project
- It is though, essential to consult before any latrines are built & translate community feedback into designs quickly
- Then get feedback and modify , feedback & modifiy
- Eclispe software can support this process

OXFAM

Social Architecture Project – Bangladesh

Project aims:

- Put women and girls in the 'designer's shoes'
- Use expertise from architects to design spaces based on user feedback
- Advocate for design changes with the WASH Sector

2 Phases:

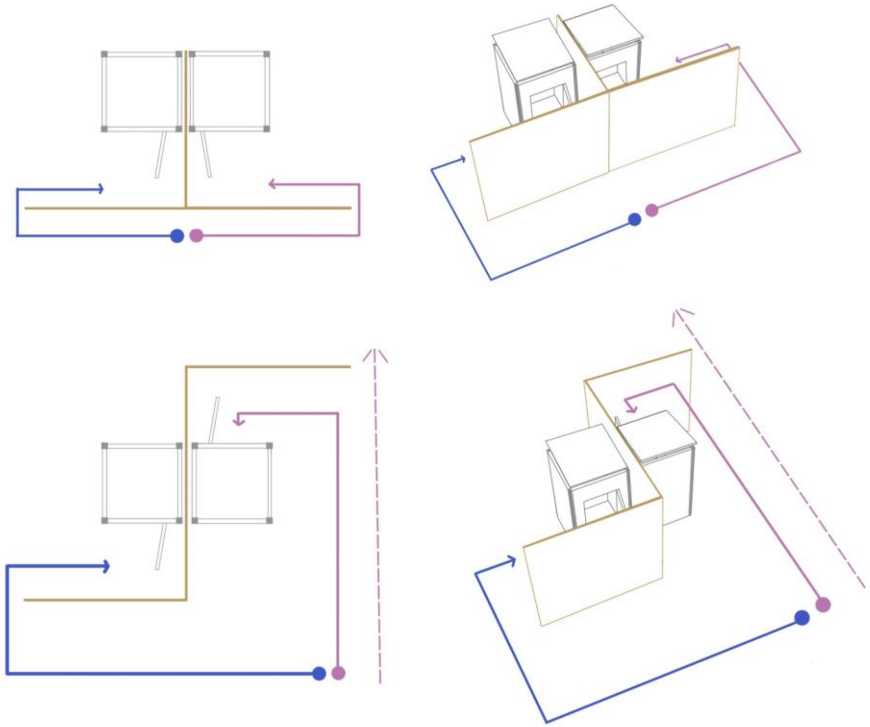
Phase 1:

- Formative research on issues
- Concept designs
- Cross Sector Workshop

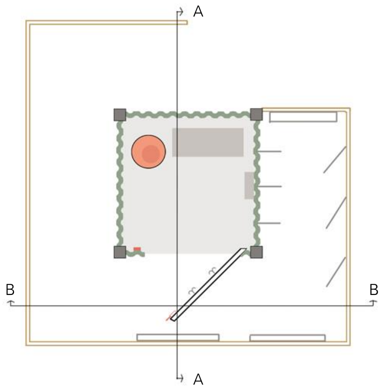
Phase 2:

- Adapting the concept designs
- Creating buildable structures
- Women as designers, constructors, monitors, evaluators

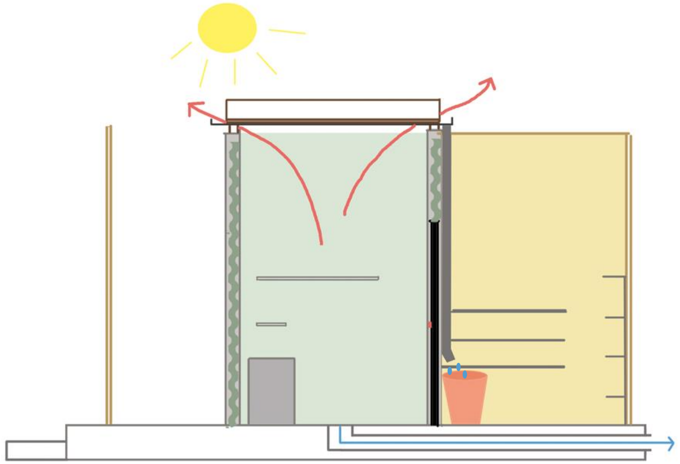
From concepts to designs ready for build



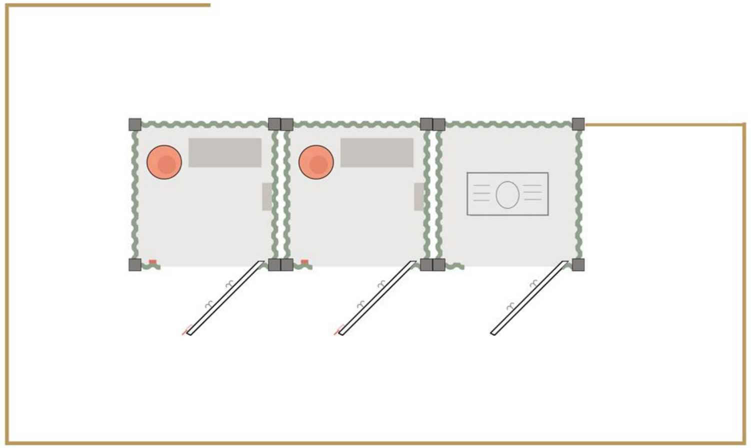
Bathing Facilities Plans:



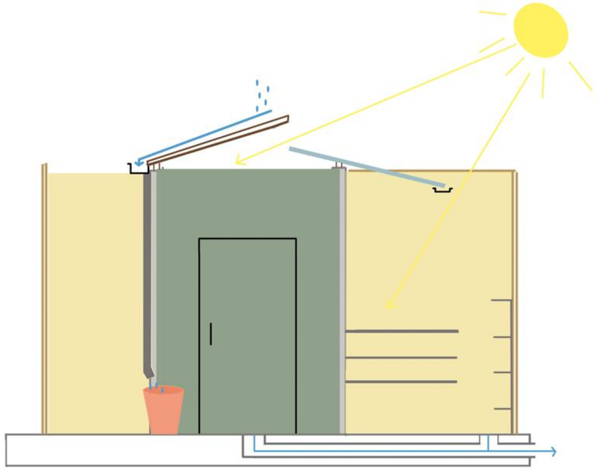
Single unit with drying space.



Section AA



Multiple units together, provide safer space for women to congregate (where space permits)



Section BB

From concepts to designs ready for build

OXFAM

What is Oxfam going to do to change the way agencies implement sanitation programmes?

1)

Sani Tweaks

Minimum requirements in sanitation programming for all PHEs and PHPs

Excreta Disposal is a service not a 1 off installation

Recent research from a number of latrine programmes has shown that on average 40% of women are not using the latrines provided. The main reasons stated are not wanting to be seen going to the toilets, lack of privacy (people peeking in), sexual harassment, lack of lighting at night and the lack of locks on doors

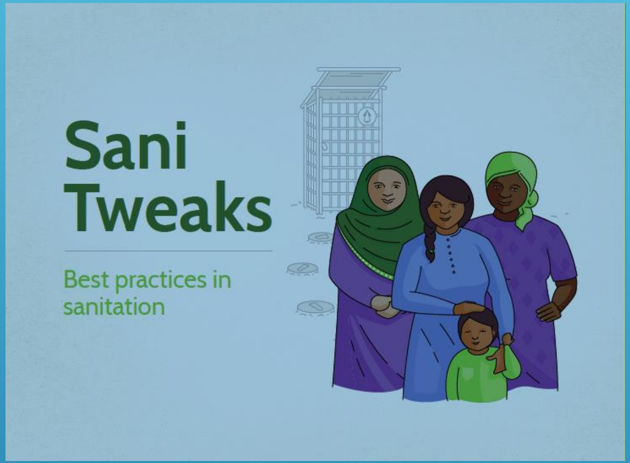
If latrines aren't used, money, time and resources are wasted and we are failing in our responsibility to the communities we work with. Addressing the key issues below will help us to deliver better quality latrines for all users.

Before starting a latrine building programme – *consult the users*
➢ How did people dispose of excreta before the crisis, what are they doing now & what would they find acceptable now
➢ Religious/cultural habits and anal cleansing practice
➢ Are there any barriers to WASH services and facilities for specific groups of people such as the disabled or elderly
➢ Segregated communal toilets – what is the minimal acceptable distance between the women's and men's toilets - *they should never be back to back*
➢ Who will be responsible for cleaning and maintenance of communal toilets - what are the issues involved in paying latrine attendants?

➢ Shared family toilets – can a latrine be shared between four families? Can they share with other families, even if they don't know them. If sharing, do they still need separate male and female latrines?
➢ What are people's main concerns about using public or shared family latrines?

➢ What happens to children's and babies' excreta – at what age do children use the latrine on their own?
➢ Are latrines are used to dispose of **MHM materials – how else could it be managed**
➢ Consult and explain siting constraints
Design
➢ What structures did the community use to make Sanitation decisions before the crisis and what are these now? Who participates in decision-making spaces? Do women and men have an equal voice?
➢ Where possible show users model latrines so they can comment on the design or pictures if that works
➢ Ensure maximum concentration is given to privacy – if plastic sheeting is used it needs to be opaque – **all latrines should always have a method of internal locking** even in rapid on-set emergencies – an efficient & easy way of doing this is a string hooking on to a nail technique which is not prone to door warping issues.
➢ How can the latrines be positioned or screened so people are not seen going into the toilet.
➢ Using the toilet at night / can lighting or torches be provided" in the toilet or the pathway
➢ Calculate the time when the pit should be full based on pit volume and no. of users and **plan** for desludging or decommissioning (+solid waste). If desludging is planned the pit should be lined and have easy access for a hose or slab removal
➢ On completion a PHE or PHP needs to sign off the construction quality before payment is made or the latrine is "opened"
➢ What is the best way of ensuring people wash their hands after defecation (consult)
Monitoring – Regular repairs
➢ Most programmes build new latrines aiming for 1:20 or 50 people per latrine while neglecting the many latrines which have fallen into disrepair and are not in use.
➢ Within a month most plastic sheeting superstructures will be damaged. Regular monitoring and repair – every 2 weeks – is essential to ensure the latrines are still being used.
➢ What system will you use for people to report damage / design issues and give feedback?

What is Oxfam going to do to change the way agencies implement sanitation programmes?

2) 

3) **Animated** Sani Tweaks

https://oxfam.box.com/s/7oxt0d7v960gbtwmpkdv544u7uqlgnaj

4) **Short video series** – how make better latrines & the process involved - https://oxfam.box.com/s/mbkm7haybxu6c5ol187y74nhbyy4he0c

5) **Sani Tweaks Dissemination Proposal** – role out – forums, learning from Sphere at each large scale emergency, working with other agencies to embed it in every agency that does sanitation – modify the products after field consultation

NEXT STEPS:

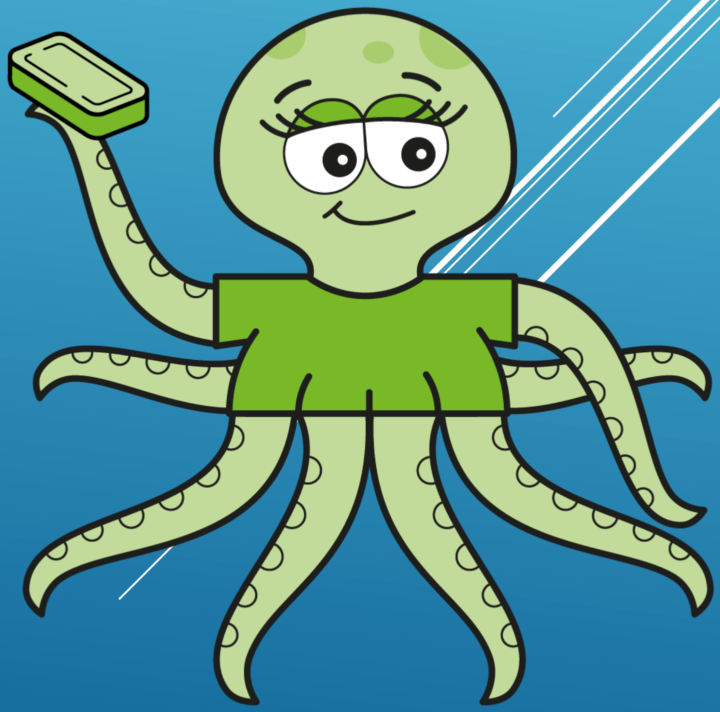
ALL SANI TWEAK RESOURCES AVAILABLE FOR DOWNLOAD AT **WWW.OXFAM.ORG.UK/SANITWEAKS** **IN ENGLISH ,FRENCH, ARABIC , BENGALI + AMHARIC**

EMAIL QUESTIONS AND ISSUES TO **TWEAKS@OXFAM.ORG**

SECTOR-WIDE DISSEMINATION PLAN TBC

M&E

QUESTIONS



Chlorine Tablet Use for Household Water Treatment in Emergencies: Development and Field Piloting of Tablet Selection Guidelines

Marlene Wolfe, Mustafa Sikder, Daniele Lantagne

Tufts University

Department of Civil and Environmental Engineering

Chlorine Tablets

- Chlorine tablets are widely used for water treatment in emergencies

- Tablets are:
    - Effective for water treatment
    - Widely available
    - Cost-effective
    - Easily transported
    - Simple to use

Appropriate Dosing

- Dose recommendations:
  - Normal/low risk of outbreaks: 0.2-0.5 mg/L FCR
  - High risk of outbreaks: 0.5-1 mg/L FCR
  - FCR should not exceed 5.0 mg/L

- Challenges
  - Tablets are available in different sizes
  - No process for selecting size
  - Distributing multiple sizes causes confusion

Litres	Emergency	Household Water
1 Litre	8.5mg	3.5mg
4-5 Litres	33mg	17mg
10 Litres	67mg	33mg
20-25 Litres	167mg	67mg
200-400 Litres	1.67gm	1.67gm

Dosing Confusion

Aquatabs® Tablets	
Strength	Color of Packet
8.5 mg	Yellow packet
17 mg	Green packet
33 mg	Green packet
67 mg	Blue packet
167 mg	Red packet

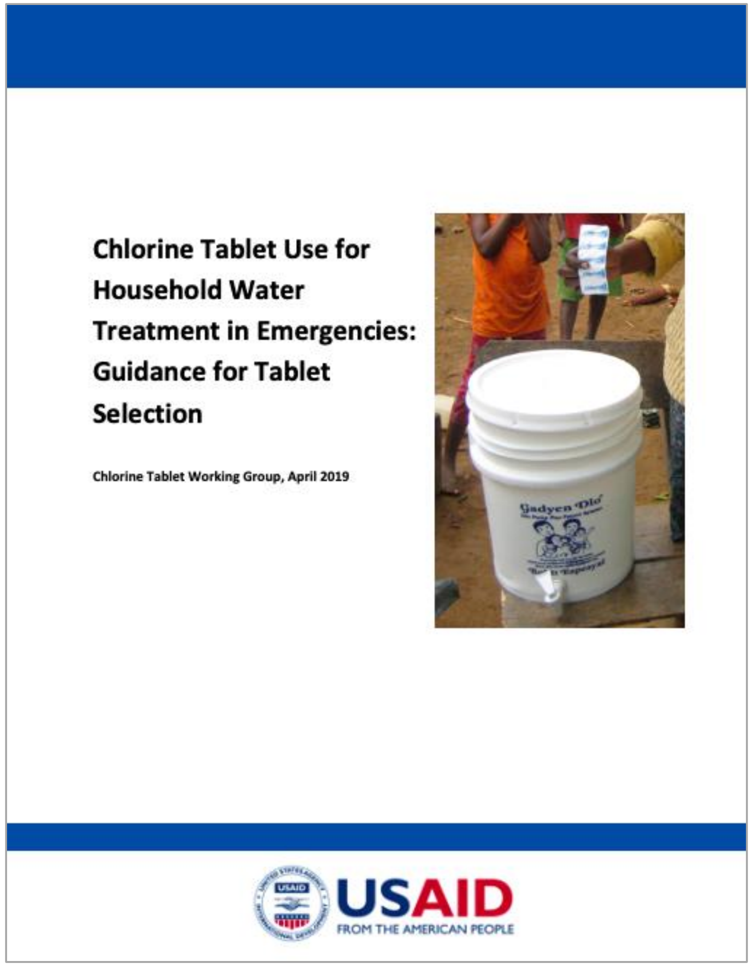
- Haiti (2016)
  - 5 different tablet sizes available
  - Tablets not appropriate for typical containers
  - WASH Clusters prescribes and coordinates use of 33 mg tablet
- Confusion reported elsewhere (e.g. Bangladesh, Yemen)

Aim: to provide guidance on

1) The assessment and interpretation of parameters that influence tablet choice
2) The selection of size(s) of tablets recommended for a particular context

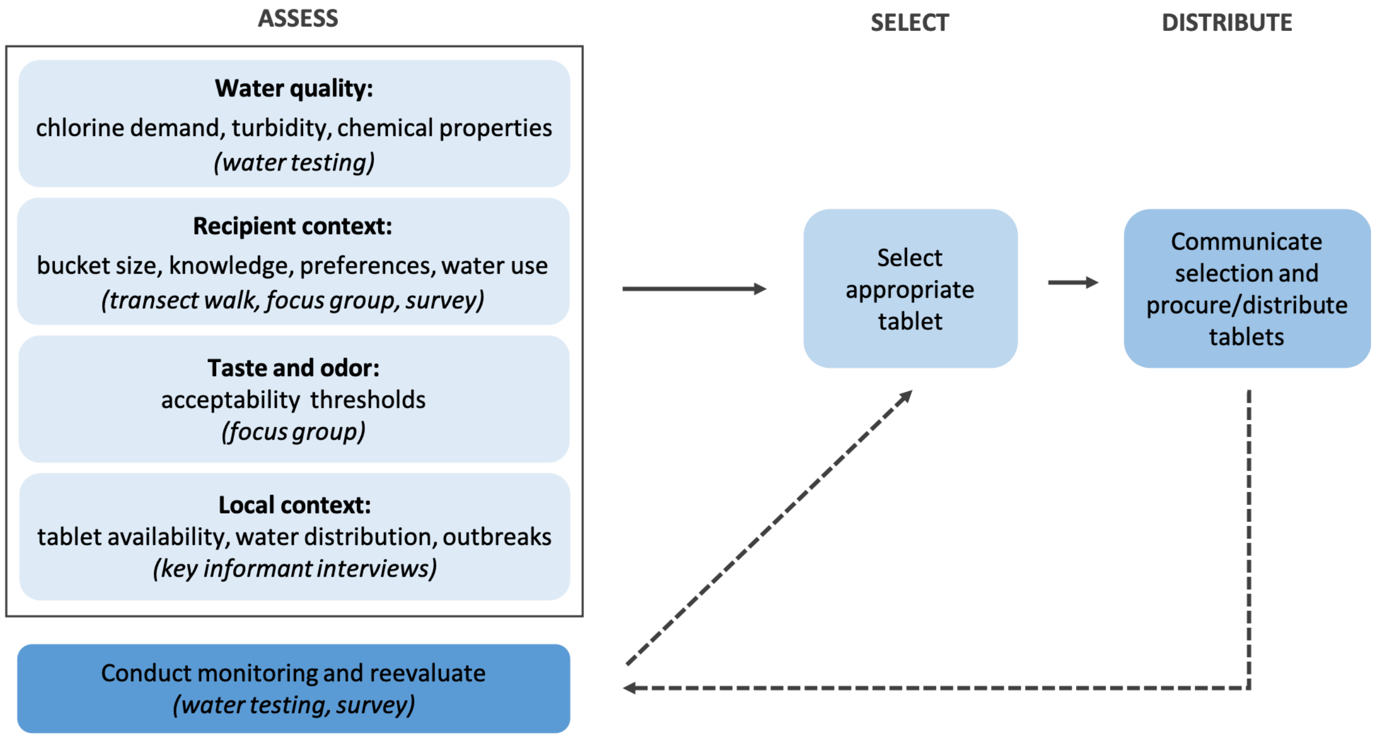
Methods

- Assemble Working Group
  - Responders, academics, and business leaders
    - 24 people
  - 6 phone calls to develop a guidance document
- Field test in Cox's Bazar, Bangladesh
  - Pilot tools in emergency where tablets used



Guidance Process

- Goal:
  - Maintain 0.2-1.0 mg/L FCR (for duration of storage)
  - Avoid taste and odor rejection
- Three steps:
  - Assess the context
  - Select a tablet(s)
  - Distribute and monitor



1. Assessment

- Activities provide information on **primary** and **secondary** parameters:
    - Transect walk
    - Focus group and/or survey
    - Water quality testing
    - Jar testing (chlorine demand)
    - Taste testing (taste and odor rejection)
    - Key informant interviews

- Allow for 3-5 days for assessment
- May utilize a subset of activities

Primary Parameters	
What is/are the most common or most frequently observed container size(s)? *From transect walk, focus group, or survey*	1 L 4-5 L 10 L 20-2! Other: ___________ L
Length of storage (90th percentile) *From focus group or survey* *1. Place responses in order from lowest to highest value* *2. Calculate the 90th percentile rank using: Rank = 0.9*(# of answers + 1)* *3. Choose the value at this rank #*	|___|___| hours *Use this number to evaluate FCR levels from jar*
Which doses of chlorine tablets resulted in FCR readings between 0.2 and 1.0 mg/L after |___|___|? *Use results from jar testing for the 90th percentile storage length time.*	17mg 33mg 67mg 16 *Note: This value should be based on the test in time was equal to or exceeded the storage time If the volume of containers used for testing was as most commonly used container, multiply or*

Assessment summary worksheet

2. Selection

- **Primary** parameters:
  - Chlorine demand
  - Container size
  - Storage time
- **Secondary** parameters:
  - Turbidity
  - pH
  - Outbreak
  - Taste and odor threshold
  - Safe storage practices

Step 1: Select top candidates based on primary parameters

Circle each tablet size that resulted in an FCR between 0.2 – 1.0 mg/L after the average storage time.
These tablets are the choices that are appropriate for the bucket size, storage, and chlorine demand; doses at the higher or lower end of this range may be chosen based on Step 2.

17mg 33mg 67mg 167mg

Step 2: Make adjustments based on secondary parameters

Summarize secondary parameters to identify if dosing should increase (↑), decrease (↓) or stay the same (–).

Turbidity	
Low	–
High	↑
Do Not Use	X

pH	
<7.6	–
>7.6	↑

Outbreak	
No	–
Yes	↑

Unpalatable FCR	
< 1 mg/L	–
1-2 mg/L	– or ↓
> 2 mg/L	↓

Storage Practices	
Recommended	–
Risky	↑

Step 3: Discuss choice with stakeholders and account for availability

Considering whether secondary parameters indicate an over all increase or decrease in dose, discuss results with the WASH cluster and local stakeholders to choose the most appropriate tablet.
Cross out any tablets that cannot be procured before adjusting results from step 1.

17mg 33mg 67mg 167mg

Step 4: Confirm choice is resulting is desired levels of chlorination via monitoring

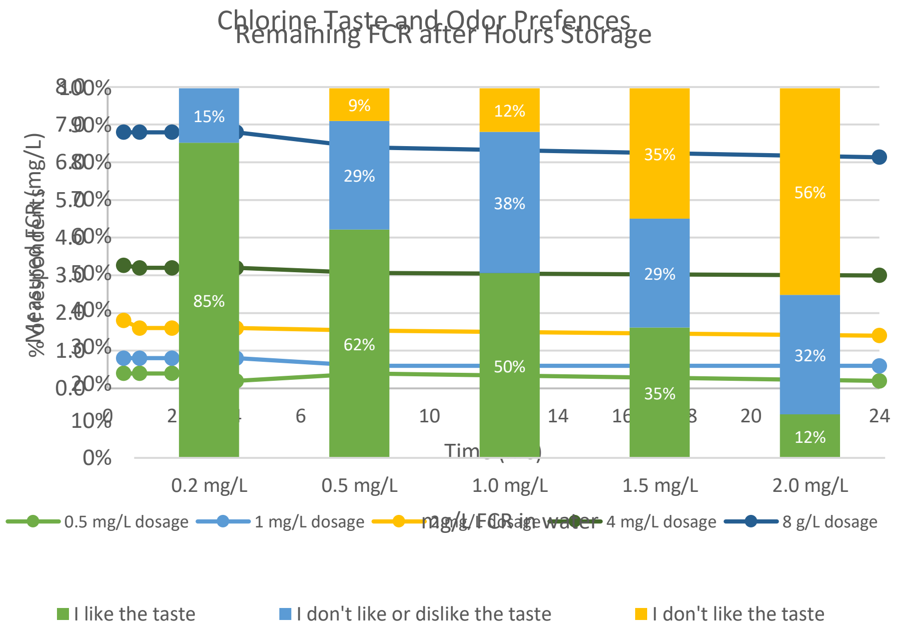
Confirm that the choice is appropriate by testing for chlorine residual and inquiring about challenges.
If appropriate FCR levels are not maintained, or there are concerns about community misuse or distaste, repeat this process to identify a different tablet choice.

3. Distribution and Monitoring

- Coordinate alignment
  - All responders provide the same tablet size
- Monitor uptake in households
  - Monitoring survey provided in guidelines
  - Confirm expected FCR
- If conditions change
  - Repeat process
  - Generate new recommendations

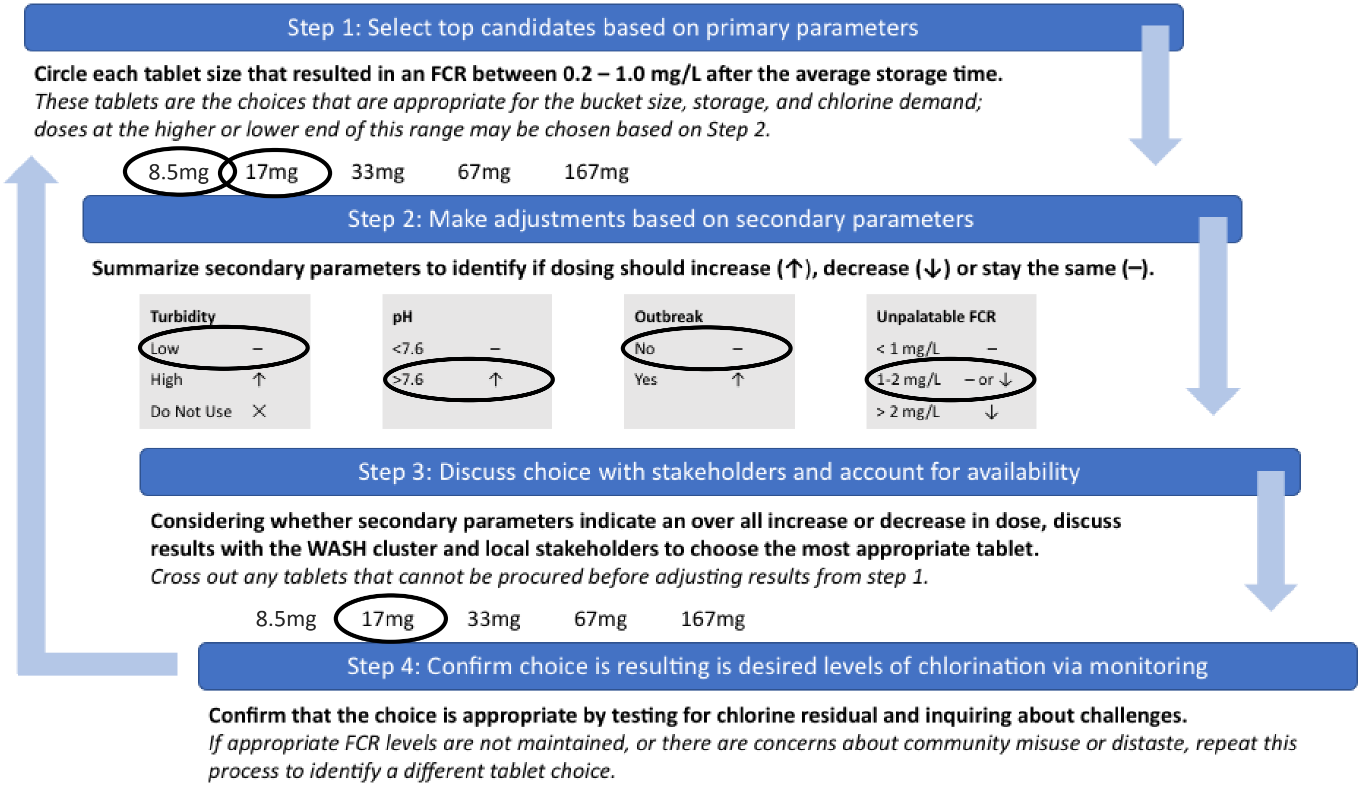
Field Trial: Cox's Bazar, Bangladesh

- Partnership with Oxfam in Rohingya refugee camps
- Chlorine tablet distribution recently ended
- Implemented all tools, except monitoring survey



Field Trial Recommendations

- Recommend 17 mg tablet
  - Differs from tablet in circulation
- All tools used successfully
- Challenges:
  - Jar testing requires space
  - Focus group facilitation



Conclusions

- Chlorine tablets are often a good choice in acute emergencies
- Uptake may be improved by:
  - Avoiding dosing confusion by limiting the number of tablet doses
  - Avoiding taste rejection by incorporating preferences into recommendations

Recommendations:

- Utilize a structured process to select the most appropriate tablet size
- Purchase and pre-position a wider range of options to enable use

Acknowledgments

- Working Group Participants – many here
- Oxfam
- Field trial participants

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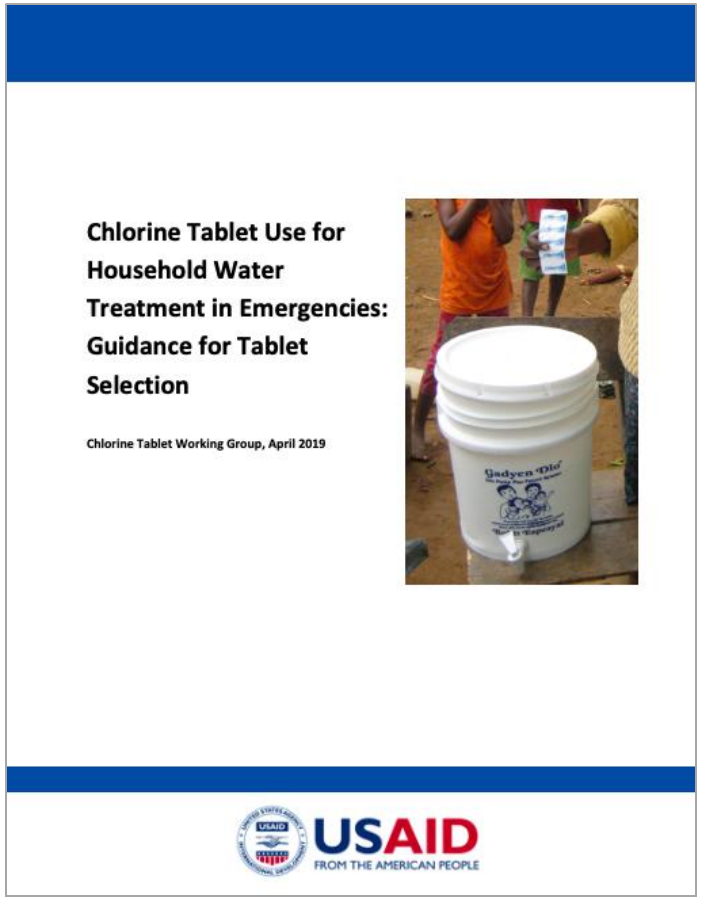
For copies of the Guidance Document



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USAID FROM THE AMERICAN PEOPLE

Action Research on Common Under Researched WASH Interventions
Tufts University, in collaboration with response organizations

Efficacy of Jerrican Disinfection Methods

Marta Domini, Gabrielle String, Hanaa Badr, Anthonia Ogudipe, Trang Vu, Marlene Wolfe, and Daniele Lantagne

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

Introduction: Jerricans

Jerricans are commonly used for household water storage and often distributed in emergency contexts.

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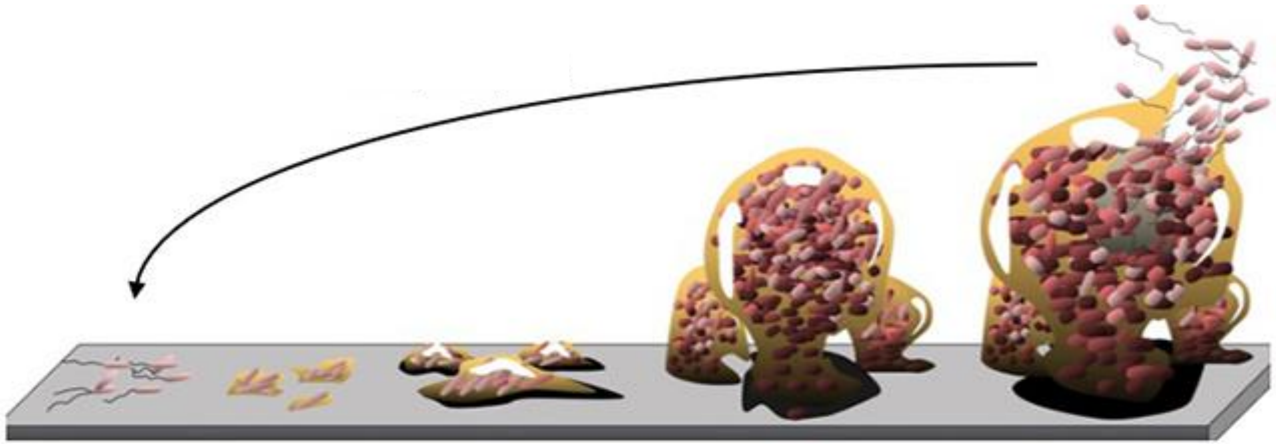
Introduction: Biofilms

- Biofilms are microbial communities
  - Comprised of pathogenic and non-pathogenic organisms
- Persist and grow on surfaces in contact with a liquid
- Able to shed cells promoting the growth of microorganisms
- Resistance to environmental changes and disinfection



Zeng, Bay Area Lyme Foundation

Tufts UNIVERSITY School of Engineering

Introduction: Cleaning jerricans

We hypothesized that biofilms will grow in jerricans, and when biofilms grow chlorine demand and *E. coli* in water will increase.

Furthermore, biofilm growth will be conditioned on treatment of water, water turbidity, cleaning methods used, and frequency of cleaning.

Steele et. al, *J Water Health*, 2008
Burkowska et. al, *J Water Health*, 2015
Jagals et. al, *J Water Health*, 2003
Momba et. al, *Water Res*, 2002

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Study Design

Cleaning Methods
0.5% NaOCl
Rocks
Sand
0.5% NaOCl + Rocks
0.5% NaOCl + Sand
Control

X

Turbidity
5 NTU
50 NTU

X

Water Treatment
Aquatabs
Control

72 jerricans total

1 per combination destructed each Phase

Jerricans cleaned and refilled

- Daily (Phase 1, 24 days)
- 2x / week (Phase 2, 24 days)
- 1 / week (Phase 3, 18 days)

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Method: Growing *E. coli* biofilms

Apply cleaning method

Prepare new cleaning materials

Buffered MilliQ + sediments + *E. coli*

Repeat
Daily (Phase 1)
ıwice per week (P2)
Weekly (P3)

Aquatabs dose based on turbidity

Membrane filtration (*E. coli)* and DPD1 colorimeter (FCR)

Membrane filtration (*E. coli)* and DPD1 colorimeter (FCR)

Incubate at 35ºC

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Method: Jerrican Destruction

que

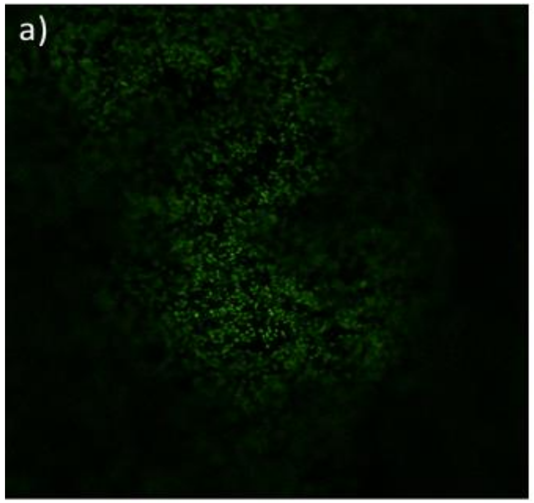
Culture

Potential for recontar

Air Sea Containers , Inc

Tufts UNIVERSITY School of Engineering

Results: Imaging *E. coli*



Cross-sectional image of biofilm through z-direction

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Results: Imaging *E. coli*

End of Phase 3

5 NTU

Cleaning Method	position	Treated: Sample 1	Untreated: Sample 1	Untreated: Sample 2
Chlorine	Bottom	No biofilm	Few cells	Small biofilm
	Side	No biofilm	Few cells	Few cells
	Front	No biofilm	Small biofilm	Small biofilm
Rocks	Bottom	Few cells	Medium biofilm	Small biofilm
	Side	No biofilm	Dense biofilm	Dense biofilm
	Front	Few cells	Dense biofilm	Dense biofilm
Sand	Bottom	No biofilm	Small biofilm	Small biofilm
	Side	No biofilm	Dense biofilm	Dense biofilm
	Front	Few cells	Dense biofilm	Dense biofilm
Chlorine + Rocks	Bottom	No biofilm	Small biofilm	Few cells
	Side	No biofilm	Small biofilm	Small biofilm
	Front	No biofilm	Small biofilm	Small biofilm
Chlorine + Sand	Bottom	No biofilm	Small biofilm	Small biofilm
	Side	No biofilm	Small biofilm	Small biofilm
	Front	No biofilm	Small biofilm	Small biofilm
Control	Bottom	No biofilm	Medium biofilm	Medium biofilm
	Side	No biofilm	Medium biofilm	Medium biofilm
	Front	No biofilm	Dense biofilm	Dense biofilm

50 NTU

Cleaning Method	position	Treated: Sample 1	Untreated: Sample 1	Untreated: Sample 2
Chlorine	Bottom	No biofilm	Small biofilm	Medium biofilm
	Side	No biofilm	Medium biofilm	Medium biofilm
	Front	Few cells	Small biofilm	Medium biofilm
Rocks	Bottom	Small biofilm	Medium biofilm	Medium biofilm
	Side	Few cells	Dense biofilm	Medium biofilm
	Front	Small biofilm	Small biofilm	Dense biofilm
Sand	Bottom	Small biofilm	Small biofilm	Small biofilm
	Side	Few cells	Medium biofilm	Medium biofilm
	Front	Few cells	Small biofilm	Small biofilm
Chlorine + Rocks	Bottom	Few cells	Small biofilm	Small biofilm
	Side	Small biofilm	Small biofilm	Few cells
	Front	Few cells	Small biofilm	Small biofilm
Chlorine + Sand	Bottom	No biofilm	Few cells	Few cells
	Side	No biofilm	Small biofilm	Few cells
	Front	No biofilm	Small biofilm	Small biofilm
Control	Bottom	No biofilm	Medium biofilm	Medium biofilm
	Side	Few cells	Medium biofilm	Small biofilm
	Front	Few cells	Medium biofilm	Small biofilm

No biofilm | Few cells | Small biofilm | Medium biofilm | Dense biofilm

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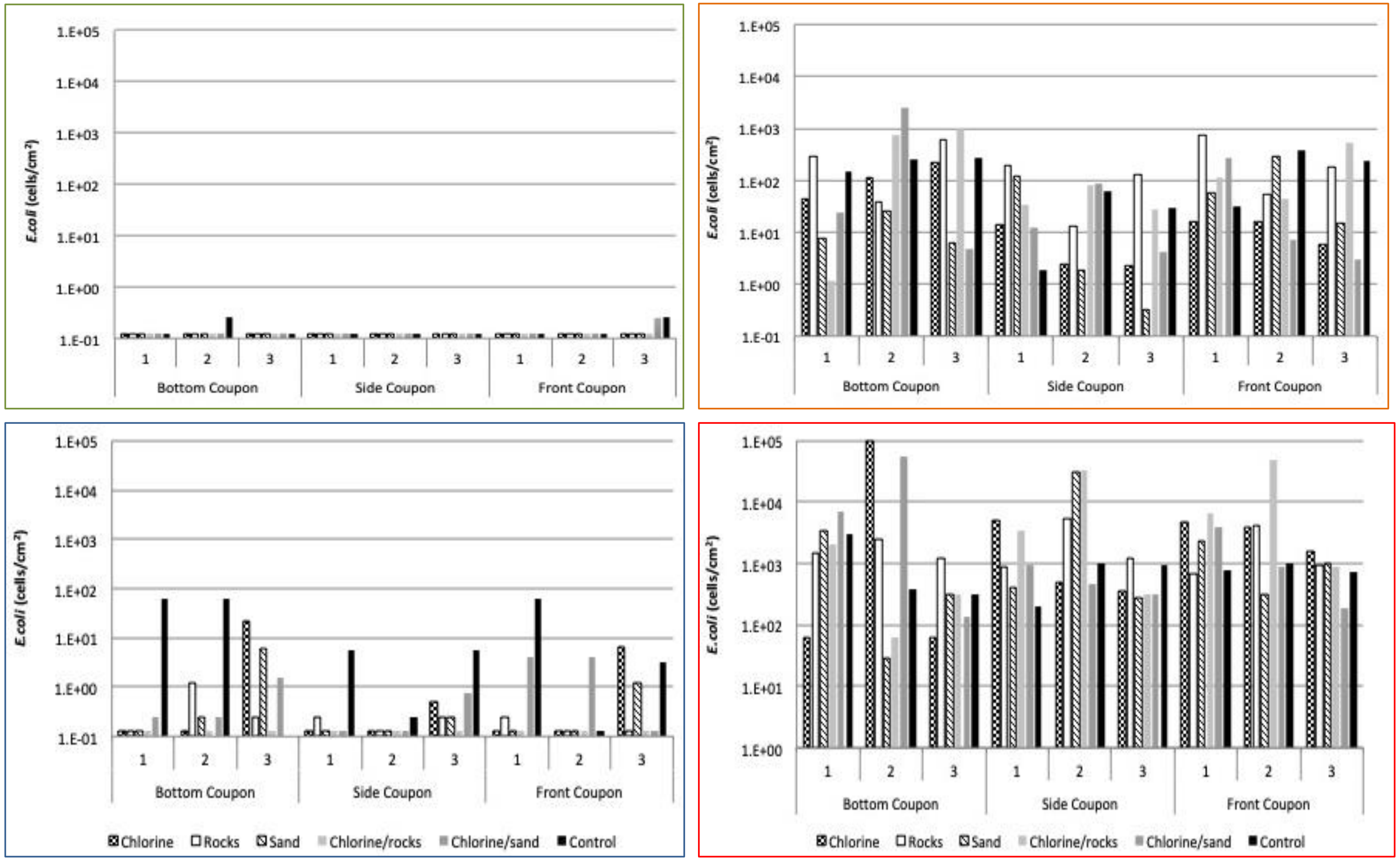
Results: Surface Biofilm *E. coli* (CFU/cm^2)

Treated

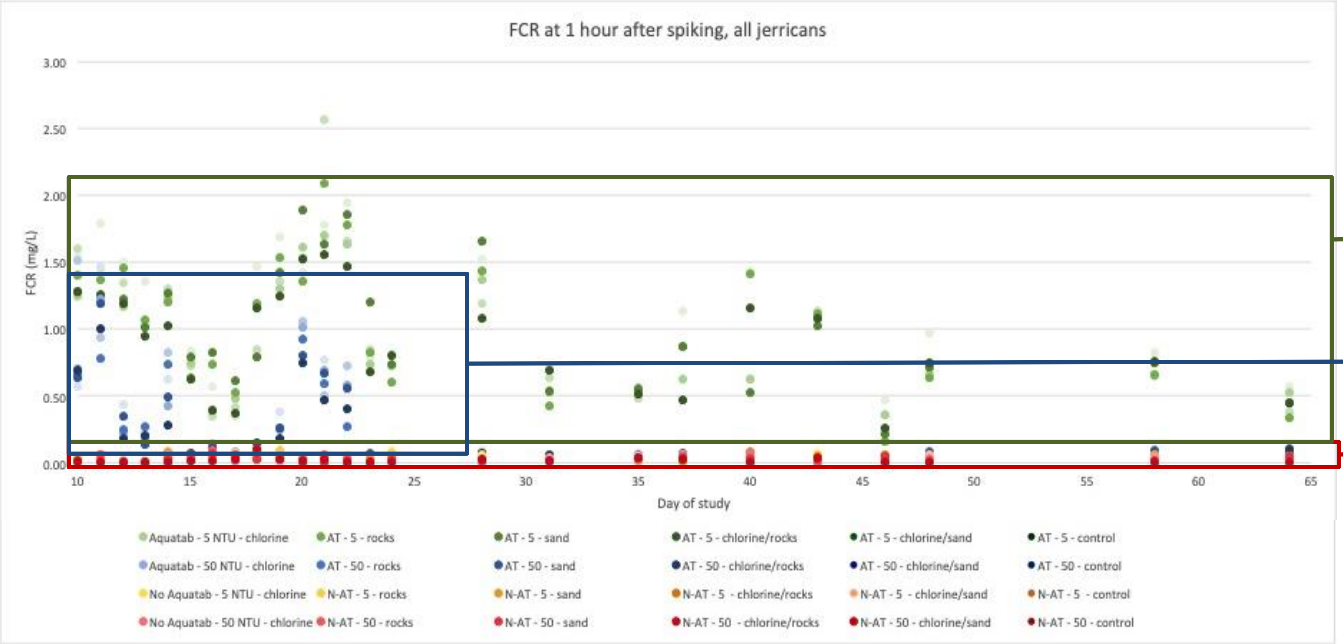
Untreated

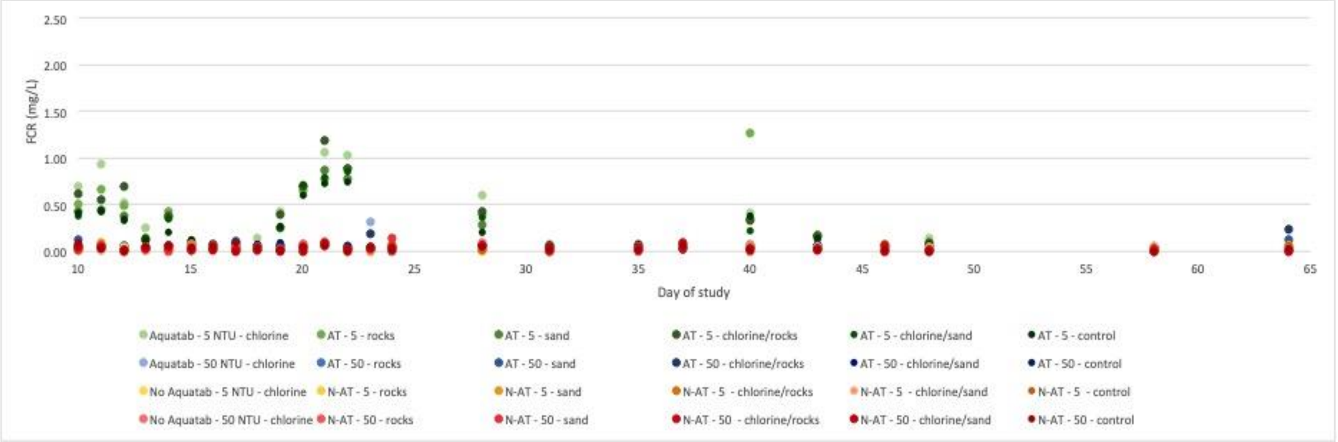
5 NTU

50 NTU



Results: Free Chlorine Residual (mg/L)





5 NTU, treated

t

Overall decrease in FCR in treated containers across months

detectable FCR M1

Untreated containers had zero to minimal FCR

Similar trend for 22 hour FCR, with decreased FCR across all containers

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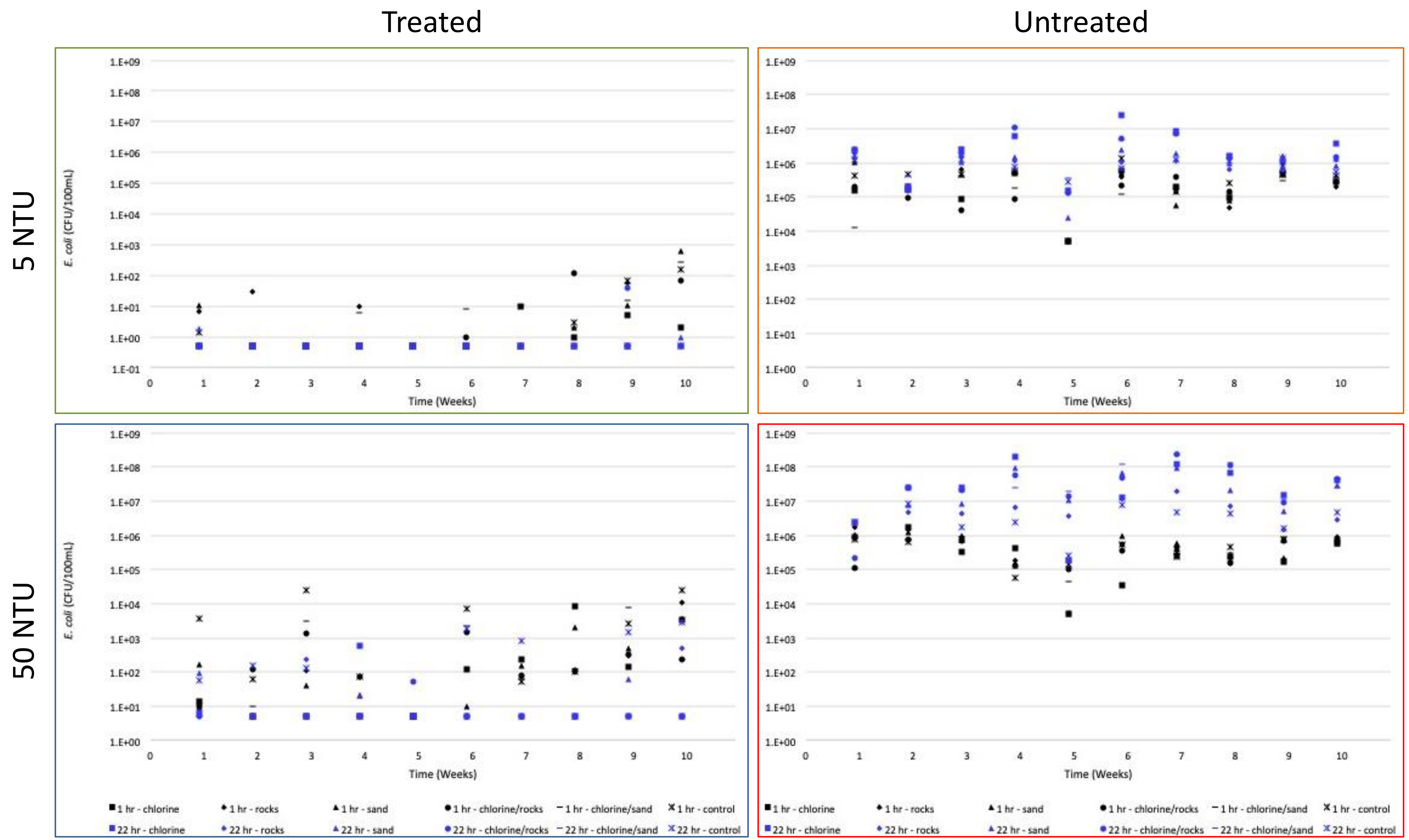
Results: Weekly Aqueous *E. coli* (CFU/100mL)



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Key Takeaways

- Biofilms grew rapidly in containers
  - Chlorine demand increased steadily over time
  - *E. coli* in untreated containers did not increase over time

- Treatment
  - Daily chlorine tablet
    - Inhibited biofilm growth,
    - Maintained FCR, and
    - Reduced *E. coli* over 22 hours

  - Less effective when used twice per week or weekly

- Water turbidity
  - Chlorine demand and *E. coli* levels increased with turbidity

- Cleaning methods
  - Denser biofilms present when cleaned with abrasives only (rocks/sand)

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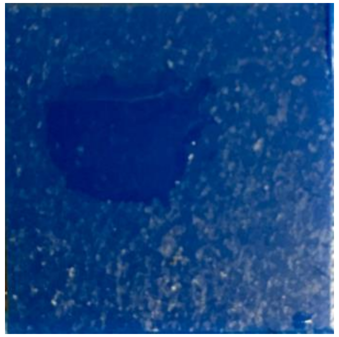
Recommendations

- **OPTIONS** to prevent container contamination
  - Use chlorine tablets daily
  - Use chlorine to clean 5 NTU
  - Use chlorine + abrasive in 50 NTU (or reduce turbidity)
  - Do not use abrasives alone (esp. untreated)

- Further work
  - Surface roughness investigation (ongoing)
  - Statistical analysis for frequency of cleaning (ongoing)
  - Efficacy of high-dose chlorine shock over time

Virgin



Scratched

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Bucket Chlorination

Emergency Environmental Health Forum

June 19, 2019

Anu Rajasingham & Gabrielle String

Overview

1. Assessment and Monitoring of Bucket Chlorination Programs in Cox’s Bazar, Bangladesh during the 2018 Monsoon Season (CDC)

2. Evaluation of the Effectiveness of Bucket Chlorination (Tufts)

Assessment and Monitoring of Bucket Chlorination Programs in Cox's Bazar, Bangladesh during the 2018 Monsoon Season

Anu Rajasingham, Andrea Martinsen, Brooke Yamakoshi, Rafid Salih,
Patson Kaendesa, Travis Brown, Stephanie Doan, Martin Worth, & Thomas Handzel

unicef

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

Background

- **919,000 Rohingya refugees in Cox's Bazar, Bangladesh**

- **WASH infrastructure vital to prevent waterborne disease outbreaks**
  - > 12,000 tube wells and > 40,000 latrines installed

- **Fall 2017-WHO indicated high levels of fecal contamination at tube well (65% samples *E.coli* positive) and household levels (93% *E.coli* positive)**

- **Quality of tube wells improved during dry season, but stored water in households (HHs) remained poor**
  - WHO: 56% (627/1120) HH samples *E. coli* positive
  - Icddr,b: 35% (2177/6279) HH samples *E. coli* positive

Background

- **Long term water provision strategy:**
  - Chlorinated piped distribution networks with community tapstands
- **Short-medium term options for the 2018 monsoon season:**
  - Household water treatment (HHWT)
  - Bucket chlorination

- **CDC collaborated with UNICEF and the WASH Sector from June-September 2018 to improve chlorination during the monsoon season**

Activities

1. Free residual chlorine rapid assessments to document chlorine coverage in HHWT and bucket chlorination areas
2. Pilot bucket chlorination expansion
3. Implementation of a bucket chlorination monitoring system
4. Guidance note for bucket chlorination scale-up

Free Residual Chlorine Rapid Assessments

- Snapshot of chlorination coverage in a camp with both HHWT and bucket chlorination

- Two assessments conducted in Camp 7

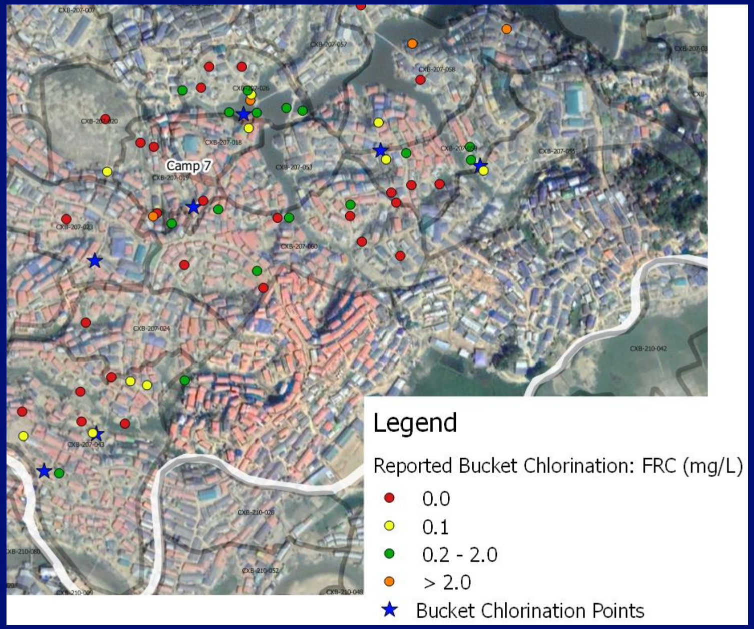
- 444 randomly selected households in 38 blocks

Free Residual Chlorine Rapid Assessments

- **Water Collection and Treatment**
  - 35% (156) collected from a bucket chlorination point
  - 26% (113) had NaDCC tablets in their homes and did <u>not</u> collect from a bucket chlorination point
  - 39% (175) did <u>not</u> have NaDCC tabs and did <u>not</u> collect from a bucket chlorination point
- **Detectable levels of Free Residual Chlorine (FRC) in HH water**
  - 38% (59) that collected from bucket chlorination points had FRC
  - 9% (10) that had NaDCC tablets at home had FRC

Conclusions: Free Residual Chlorine Rapid Assessments

- **Bucket chlorination more effective in getting chlorinated water to households than HHWT in this context**
- **Needed more and better distributed bucket chlorination points**
- **Increase attendant hours to match peak collection times**
- **Improve monitoring of bucket chlorination**



Pilot Expansion of Bucket Chlorination

- **Provided technical assistance to UNICEF partners conducting bucket chlorination (NGO Forum and Terre de Hommes)**
  - Selecting locations
  - Identifying <u>key</u> drinking water tube wells using community participatory approaches
  - Improving dosing methods
    - High iron content- varying chlorine demand at wells
    - Unknown container volumes
  - Creating monitoring tools

Bucket Chlorination Monitoring

- **Two monitoring systems created**
  - Internal monitoring by implementer
  - UNICEF third party monitoring
- **Third party monitoring**
  - 71 Bucket chlorination points:

    72% had FRC between 0.2-2.0 mg/L
  - 446 HHs near bucket chlorination points: 63% of all households had FRC $\geq$ 0.1 mg/L

Bucket Chlorination: Monitoring and Reporting

Water Sampling Point	Number of Samples (N) (N/TOTAL%)	Samples with FRC < 0.1 mg/l n (n/N%)	Samples with FRC = 0.1 mg/l n (n/N%)	Samples with FRC = 0.2-1.0 mg/l n (n/N%)	Samples with FRC >1.0 -2.0 mg/l n (n/N%)	Samples with FRC > 2.0 mg/l n (n/N%)
Households- reported collecting from bucket chlorination points	446 69.4%	73 16.4%	82 18.4%	158 35.4%	54 12.1%	79 17.7%
Households- reported collecting from bucket chlorination points but attendant not there	157 24.4%	127 80.9%	5 3.2%	5 3.2%	5 3.2%	15 9.6%
Households - reported not collecting from bucket chlorination points	40 6.2%	38 95.0%	1 2.5%	0 0.0%	0 0.0%	1 2.5%
TOTAL	**643**	**238 37.0%**	**88 13.7%**	**163 25.4%**	**59 9.2%**	**95 14.8%**
Bucket Chlorination Points (Tube Wells) Visited	**Number of FRC tests (N)** 71	**9 12.7%**	**8 11.3%**	**36 50.7%**	**15 21.1%**	**3 2.5%**

Table 1: Results from EIMS Bucket Chlorination Monitoring at households surrounding and at bucket chlorination points (tube wells) in Camps 6 and 7, August 5-September 24, 2018.

Scaling-up Bucket Chlorination Guidance Note

- **Key components included**
  - Selection of bucket chlorination sites
  - Selection of chlorination method (NaDCC tablets or HTH)
  - Training of bucket chlorinators
  - Social mobilization
  - Monitoring and reporting
  - Plan for corrective actions

Lessons Learned

- **Bucket chlorination is an option when chlorination needs to be scaled-up quickly**
- **Large number of water points in the camps made it necessary to work with the community to identify key drinking water tube wells**
- **Monitoring allowed partners to improve programming**
- **Bucket chlorination scale-up in all camps would be cost prohibitive, more strategic to prioritize:**
    - Tube wells in higher risk areas (near cluster of cases)
    - Areas with contaminated wells
    - Construction of chlorinated piped distribution networks

Acknowledgements

- UNICEF
- NGO Forum
- Terre de Hommes
- CDC Bangladesh

Questions?

For more information please contact Martin Worth mworth@unicef.org or Centers for Disease Control and Prevention

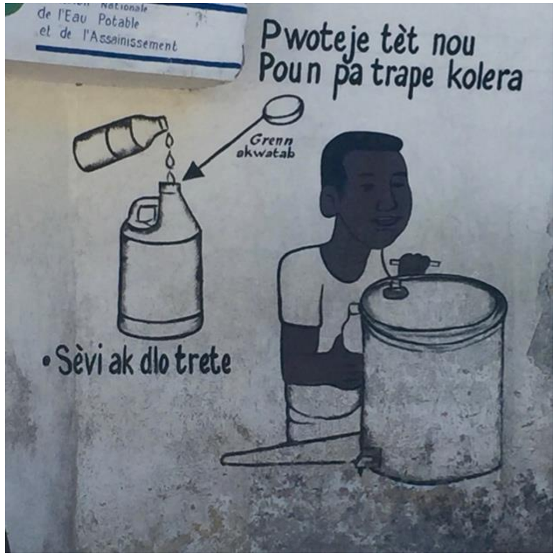
1600 Clifton Road NE, Atlanta, GA 30333
Telephone: 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348
Visit: www.cdc.gov | Contact CDC at: 1-800-CDC-INFO or www.cdc.gov/info

Evaluation of the Effectiveness of Bucket Chlorination

Gabrielle String, Mustafa Sikder, Yarmina Kamal, and Daniele Lantagne

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

Background



- Commonly implemented in outbreak response
- Lack of quantitative and qualitative evidence
- Need to understand chlorine types, concentrations and dosages

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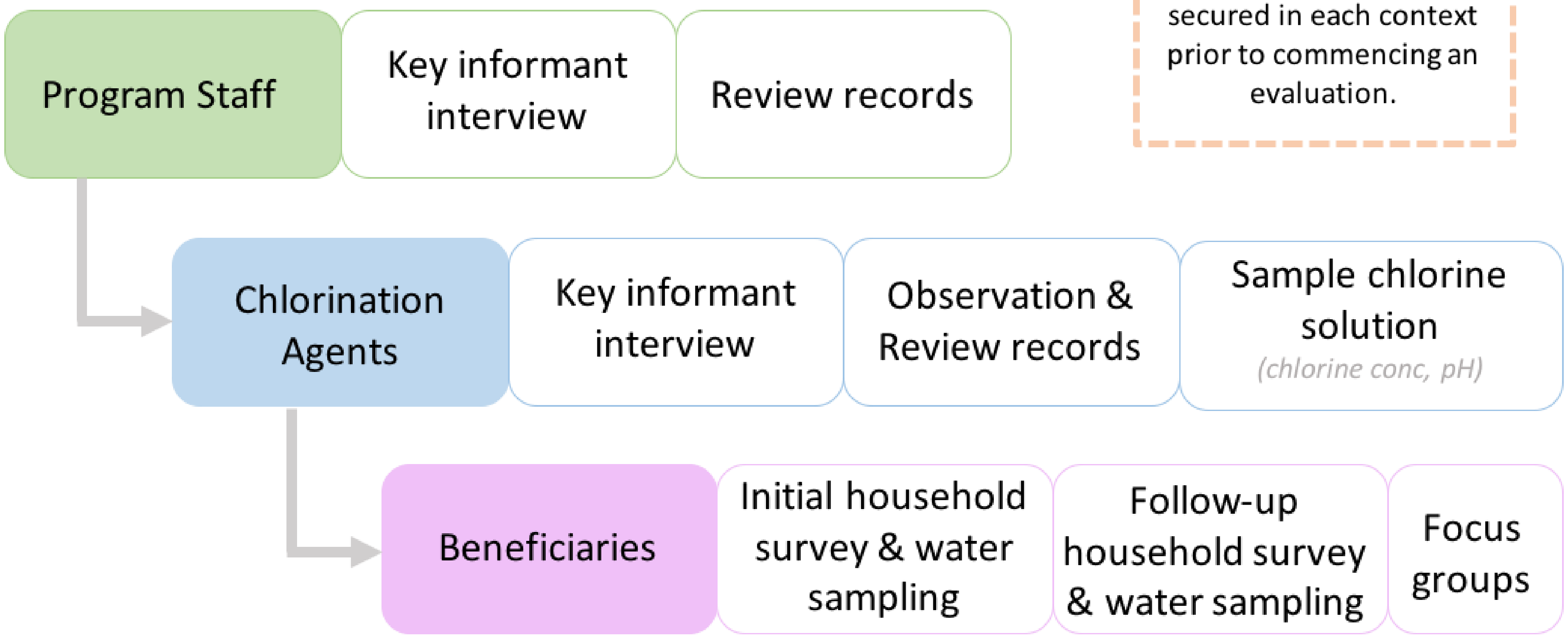
Methods

Local ethics approvals are secured in each context prior to commencing an evaluation.



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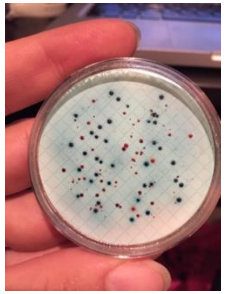
Results

- Four evaluations completed
  - DRC (2)
  - Cox's Bazar (1)
  - Haiti (1)
- 45 program staff and agents interviewed
- 40 chlorination points observed
- 702 households surveyed
- 11 focus group discussions conducted

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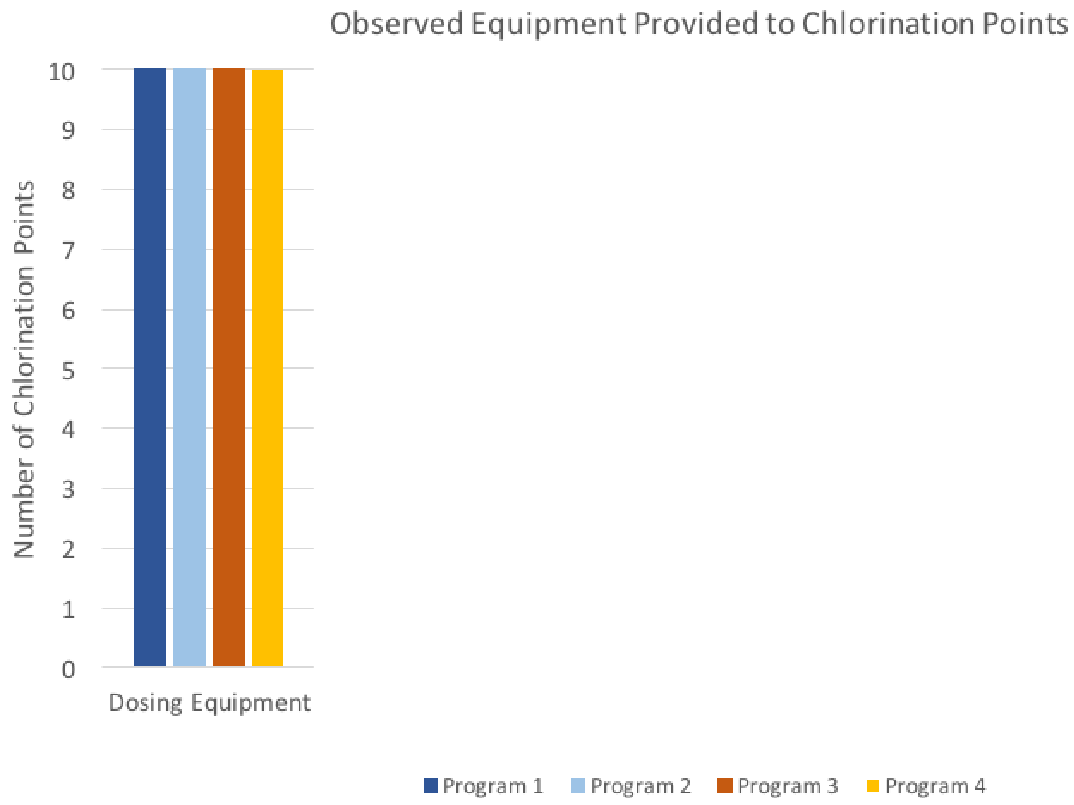
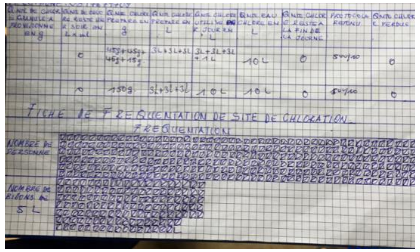
Results: Observation of Chlorination

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Results: Chlorine Preparation and Dosing

Preparation Protocol

	Amount of HTH [g]	Method to measure	Vol. Water [L]	Method to measure	Combination
Program 1	15	1 level spoon	1	Bucket	Mix with stick
Program 2	15	1 spoon	1	Bucket	Mix with stick
Program 3	15	1 spoon	1	½ L bottle	Shake
Program 4	15	2.5 spoons	1	½ L bottle	Swirl

Chlorine stock solution preparation, storage, and dosing.

	Average Concentration [%]	Min. [%]	Max. [%]
Program 1	3	1.3	7.2
Program 2	0.78	0.13	1.19
Program 3	0.18	0.07	0.34
Program 4	0.51	0.28	0.78

No programs adjusted preparation or dosing protocols.

Variability in produced stock **chlorine concentration** when targeting 1%.

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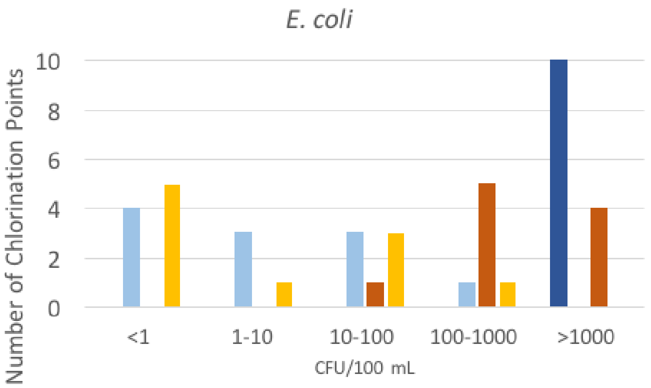
Results: Source Water

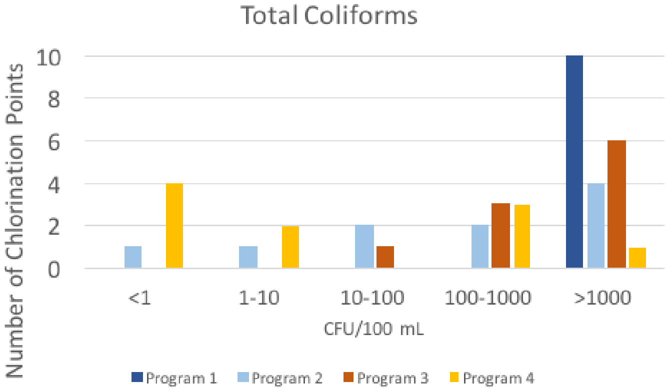
	Min. Users	Max. Users
Program 1	9	656
Program 2	4	90
Program 3	2	5
Program 4	3	31

Number of users varied widely within and between programs.

	Program 1	Program 2	Program 3	Program 4
pH	■	■		■
Turbidity	■		■	■
Tot. Dissolved Solids				■
FCR	■	■		■
Microbiological				■

Testing completed ad-hoc and “jar tests” used at program start.





Water from semi- or unprotected sources in Programs 1 and 3 and quality was poor.

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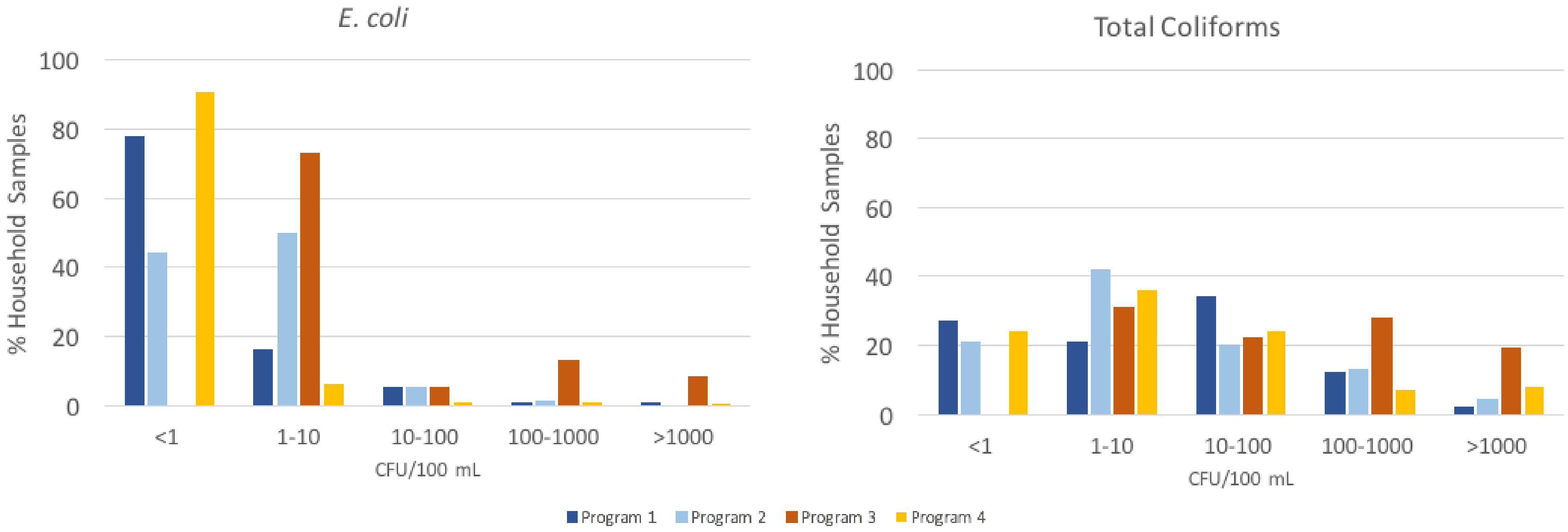
Results: Stored Water



	Average FCR [mg/L]	Min. [mg/L]	Max. [mg/L]	FCR < 0.2 mg/L [# HH]
Program 1	1.1	0.2	3.4	0
Program 2	0.4	0.0	2.6	26
Program 3	0.3	0.0	1.2	42
Program 4	0.7	0.0	1.8	9

***E. coli* reduced ≥ 1-log** in 73% of households with >100 *E. coli* CFU/100mL at source.

Variable FCR and high presence of total coliforms indicates **risk of recontamination**.

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Key Takeaways

- **Variation** across programs and **inexactness** in implementations
  - Management of chlorination points
  - Chlorine solution concentrations
  - Dosing protocols
  - Testing and monitoring protocols

- **Generally effective** at reducing *E. coli* & providing FCR >0.2 mg/L

- Need to **consider beneficiary opinion** of programs

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Preliminary Recommendations

1. Safely store HTH powder and stock solution
   - Prevents degradation of chlorine concentration

2. Provide shade at chlorination points
   - Protects agents and chlorine from sun exposure

3. Conduct more frequent jar tests
   - Ensures proper chlorine dosage of beneficiary containers

An **additional evaluation will be conducted** prior to data synthesis, qualitative data analysis, and development of final recommendations to responders.

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In each evaluation context:

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Contributors:

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USAID FROM THE AMERICAN PEOPLE

Action Research on Common Under Researched WASH Interventions
Tufts University, in collaboration with response organizations

r2hc Research for health in humanitarian crises | elrha

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