

Article

The determinants of handwashing in humanitarian crisis setting during the COVID-19 pandemic: a multi-country analysis

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Abstract

The Wash'Em process was developed to improve the design of handwashing behaviour change programmes during outbreaks and humanitarian crises. It aims to rapidly create evidence-based, contextualized handwashing programmes. Wash'Em was widely used during the COVID-19 pandemic. This multi-country secondary data analysis compares data emerging from Wash'Em during the pandemic, to understand whether commonalities in programming constraints or the determinants of handwashing behaviour existed across countries. Wash'Em datasets ($n = 38$) were verified prior to inclusion in secondary data analysis; descriptively summarized and then statistical summaries of homogeneity were derived. Wash'Em was implemented as intended during the pandemic, typically taking a small number of humanitarian staff less than a week to complete. Most actors reported using the recommendations suggested by the process but did so within relatively short-term and poorly financed prevention programmes. Homogeneity in the responses to the Wash'Em tools was low indicating that the determinants of handwashing behaviour during the pandemic were predominantly shaped by pre-existing factors rather than the nature of the health threat. Hygiene programmes during outbreaks should avoid 'copying and pasting' interventions from one setting to another and instead make time to holistically understand the behavioural determinants in a specific context and develop programme activities that are designed to address these. Particular attention should be given to factors in the physical and social environment that may enable or constrain handwashing behaviour, pre-existing disease vulnerabilities and the secondary and non-health impacts of outbreaks. Wash'Em provides one feasible way of contextualizing handwashing interventions in outbreak or humanitarian settings.

Keywords: handwashing, humanitarian crises, COVID-19, behaviour change, programme design

Contribution to Health Promotion

- Handwashing is key to reducing transmission of COVID-19, but handwashing promotion programmes during the pandemic were generally short-term and poorly financed.
- Despite the global nature of the public health threat that was posed by the pandemic, the determinants of handwashing behaviour varied across contexts and were primarily affected by pre-existing contextual factors.
- Organizations should avoid 'copying and pasting' program ideas from one context to another and instead design contextualized programmes.
- The Wash'Em process was used successfully to assess behavioural determinants and design contextualized programmes in less than a week during the pandemic.

BACKGROUND

The COVID-19 pandemic drew attention to inequalities within and between nations which placed certain sub-groups of the population at greater health and socio-economic risks (McCann and Matenga, 2020; Schellekens and Diego, 2020). This was particularly true for populations who were already living in fragile, crisis-affected states or displacement settings

(Alawa *et al.*, 2020; Dahab *et al.*, 2020; Hargreaves *et al.*, 2020). Characteristically such settings often have dense housing (Raju and Ayebe-Karlsson, 2020), poorer access to water, sanitation, hygiene (WASH) services (Brauer *et al.*, 2020) and limited access to testing, vaccines and healthcare (Jordan *et al.*, 2021). Populations in these settings may also experience heightened rates of pre-existing health conditions (e.g. chronic illness,

malnutrition, disability and mental illness) (Grijalva-Eternod *et al.*, 2012; Aebischer Perone *et al.*, 2017; Charlson *et al.*, 2019, Hunt and Lena, 2022) and may be dealing with COVID-19 amid other co-existing outbreaks (Nachega *et al.*, 2020; Uwishema *et al.*, 2021). At the outset of the pandemic, it was therefore thought that crisis-affected populations were both at higher risk of exposure to COVID-19 and more likely to develop severe symptoms. Furthermore, adhering to COVID-19 preventative behaviours was often more challenging in these settings due to weak supply systems for preventative products (e.g. masks or soap) and water scarcity. Behaviours such as staying at home and physical distancing came at a much higher socio-economic cost given that crisis-affected populations are more likely to live in poverty or be reliant on informal employment or day-to-day wages (Coetzee and Kagee, 2020, Glassman *et al.*, 2020). Therefore, COVID-19 response programmes in these fragile settings had to rapidly respond to both the immediate challenges created by the pandemic while also addressing many of these chronic challenges.

Humanitarian actors involved in prevention programmes during the pandemic were also faced with a complex set of operational constraints: the urgency to act, limited available capacities and resources, the need to engage populations remotely and an imperfect state of evidence around the disease, its transmission and behavioural responses (Singh *et al.*, 2020). A large proportion of preventative work in these settings focused on improving handwashing given that was initially seen as the ‘first line of defence’ against this novel pathogen (WHO and UNICEF, 2020). As more was learned about COVID-19 transmission, handwashing was seen as one of a set of behaviours that were key in interrupting the spread of COVID-19 (Abdullahi *et al.*, 2020; Beale *et al.*, 2020; Talic *et al.*, 2021) but was also prioritized because of its demonstrated effect in reducing other faecal-oral diseases common in crisis-affected settings (Wolf *et al.*, 2018; Jefferson *et al.*, 2020; Chirgwin *et al.*, 2021). Supporting sustained adherence to preventative behaviours during public health emergencies is notoriously challenging (Michie and West, 2021), even with familiar behaviours like handwashing (De Buck *et al.*, 2017; Martin *et al.*, 2018). Indeed, during the COVID-19 pandemic, initial adoption of prevention measures was high but then this tended to wane over time, even though risk remained high (Olapeju *et al.*, 2021). Behaviour change programmes are likely to be most effective if they are informed by behavioural theory, and use a systematic process for programme design and target-specific contextual determinants of behaviour. However, previous studies have indicated that during outbreaks there is a tendency for programming to focus on a narrow range of behavioural determinants related to knowledge, fear and risk (White *et al.*, 2020) and programme design processes tend to be compromised (White *et al.*, 2022b). This may be one explanation for why programmes struggled to have a sustained impact during the pandemic.

Prior to the pandemic, the London School of Hygiene and Tropical Medicine (LSHTM), Action Contre la Faim and the Centre for Affordable Water and Sanitation Technology and USAID’s Bureau for Humanitarian Assistance had collaborated to create the Wash’Em process (www.washem.info). Wash’Em is designed to aid humanitarians in the design of rapid, evidence-based and contextualized handwashing programmes in crises or outbreaks. Wash’Em therefore provided an opportunity to overcome some of the challenges of handwashing promotion in fragile settings during the pandemic.

It also requires users to explore a wider range of behavioural determinants.

An overview of the Wash’Em process

The process is based on behavioural theory, literature reviews (White *et al.*, 2020) and research in crisis and outbreak-affected settings (Zangana *et al.*, 2020; White *et al.*, 2022a, 2022c). The first part of Wash’Em involves the use of five rapid assessment tools to understand the determinants of behaviour. These include tools that explore behavioural settings, risk perceptions and disease understandings, motives and aspirations, how behaviour has changed because of the broader experiences of the crisis, and ways of selecting delivery channels and engaging with communities. The rapid assessments use qualitative participatory methods that are undertaken either at a household level, through interviews and observations, or within focus group discussions (FGDs). For example, one of the rapid assessments involves users video recording household handwashing environments and process. The recording is then reviewed to identify handwashing challenges. The guides for the tools are included in [Supplementary Materials S1–S5](#). The second step of Wash’Em is for the data collection team to summarize the data by classifying it against a set of pre-defined common responses (derived through pre-testing in 30 settings). This process facilitates a quantitative summary of key patterns which can support rapid decision-making in humanitarian contexts. This step is aided by a decision-making tool which helps highlight common responses. Staff then log into the Wash’Em Programme Designer Software and are prompted to answer multiple-choice questions about their context (e.g. the nature of the crisis or outbreak, characteristics of the population, etc.), and the constraints for programme design (e.g. budget, timelines, safety issues, etc.). They also answer multiple-choice questions ([Supplementary Material S6](#)) relating to the five rapid assessments, entering the summary data related to behavioural determinants in their context. At the end of this process, the software generates programme recommendations. The programme recommendations come from a database of theory-driven or evidence-based handwashing behaviour change activities. Algorithms within the software recommended 5–7 activities based on the responses to the questions and what is therefore likely to be effective in the context. Each activity has a ‘recipe card’ which outlines the materials needed, the time it takes, the cost, and a detailed step-by-step process for implementing it. The full Wash’Em process was launched in March 2020. Initially, humanitarian organizations were discouraged from using the approach face-to-face (as it was intended) due to safety concerns during the pandemic. However, over time, organizations developed safety protocols or remote ways of using Wash’Em to inform their pandemic response (www.washem.info).

The Wash’Em programme designer software records the data entered by humanitarian users about their context, programming and the determinants of handwashing behaviour. This study aims to explore whether there were commonalities in the determinants of hygiene behaviour and the nature of COVID-19 response programmes in fragile settings. Given the unprecedented scale of the pandemic, the hypothesis underpinning this research was that we expected to identify similar constraints and behavioural challenges across multiple countries and datasets. Such insights are useful to inform policy and programming in these settings during the protracted phase of the COVID-19 pandemic and in future outbreaks. This article

is intentionally narrow in its scope, while some of the findings can contribute to understanding the usefulness of the Wash'Em tool, this was not the primary aim of the research as a separate, robust evaluation was conducted (Thorseth *et al.*, 2024).

METHODS

This study involves the analysis of datasets entered into the Wash'Em Programme Designer Software by organizations involved in COVID-19 response programmes in fragile or crisis-affected low- and middle-income countries (LMICs).

Data sets

The data entered in the Wash'Em Programme Designer Software are a summary of data collected through the use of the Wash'Em rapid assessment tools in a particular setting. The summary data take the form of responses to multiple-choice questions. The datasets do not represent individual-level behaviour or opinions but rather common patterns of behaviour or opinion in each setting. Owners of the datasets are identified by name, organization and email address and are typically staff of non-government organizations.

Eligibility and data validation

The owners of all datasets available in the Wash'Em Programme Designer software database were contacted and asked for informed consent to utilize the data they had submitted into the software for the purpose of this study. If the user had not responded after the third email their dataset was not included in the study. Datasets were otherwise eligible for inclusion if they were dated between March 2020 and June 2021, if all required multiple-choice questions were complete, and if the organization described the health outcome of interest as being COVID-19. Datasets were excluded if they were marked as test data or focused on a different health issue (e.g. diarrhoea). To confirm all datasets reflected an actual use of the Wash'Em process and understand how the process was used during the pandemic, dataset owners were asked to complete an online survey. The survey was designed to understand the quality of the dataset and whether it was collected by following the intended Wash'Em process. The survey included questions about how staff were trained, who was involved in data collection and how long this took, the modality of data collection, and how recommendations were used. Follow-up emails were sent to users between October 2021 and October 2022 to clarify responses to certain questions as necessary. Datasets were excluded if responses to the survey were not aligned with the intended Wash'Em process.

Data analysis

Data from the Wash'Em Programme Designer software and survey responses were exported to Microsoft Excel and cleaned. The data were checked to identify any missing values, and consistency checks were completed. Descriptive analysis was conducted in Stata 16 (StataCorp, 2019). To explore the homogeneity of contextual factors, programming and the determinants of handwashing behaviour across countries and use cases, we developed a heat map to compare user responses to the multiple-choice questions in the software. The colours of the tiles within the heatmap were determined by the proportion of responses to each part within each question. Fleiss's kappa was used to assess the level of agreement in user responses within each of the sections of the software and interpretation was based on standard thresholds

(< 0 = Poor agreement or no agreement, 0.00–0.20 = Slight agreement, 0.21–0.40 = Fair agreement, 0.41–0.60 = Moderate agreement, 0.61–0.80 = Substantial agreement, 0.81–1.00 = Almost perfect agreement) (Nichols *et al.*, 2010). The R statistical software was used (R Core Team, 2018).

Ethics approval for this study was provided by the ethics committee at the LSHTM (ID: 25092).

RESULTS

In total, 220 datasets were added to the Wash'Em software between March 2020 and June 2021. A total of 62 of these datasets were excluded as they were marked as test data by the users. Owners of the remaining 158 datasets were contacted to seek consent and validation. In total, 48 datasets were verified, and owners provided informed consent for the data to be used for research purposes. We excluded 10 datasets because they did not list COVID-19 as a health concern that their programme was trying to address. Table 1 summarizes the characteristics of the contexts the 38 final datasets came from.

Contexts where Wash'Em was used

The main regions where COVID-19 response programs adopted Wash'Em were sub-Saharan Africa, Latin America and the Caribbean (Supplementary Material S7). In many of these settings, COVID-19 was not the only disease outcome targeted by the hygiene programme and most programmes (63%) included a focus on people who were displaced. Exposure to risk and loss was common, with two-thirds of Wash'Em users reporting that the targeted populations had lost either their houses or belongings due to prior or ongoing humanitarian crises.

Programme constraints

The correlation between the duration of the grant and the funding allocated for hygiene programming is presented in Table 2. This illustrates most COVID-19 programmes that used Wash'Em covered a short timeline and a relatively small injection of funds.

Nearly half of the organizations using Wash'Em (18, 47%) worked in collaboration with other smaller local organizations or community volunteers to deliver their handwashing programmes. A total of 26 (68%) of the organizations using Wash'Em anticipated there would not be any barriers to effectively reaching populations during the pandemic. The remaining 32% indicated programmatic activities were likely to be suspended due to safety and security concerns. In most projects, Wash'Em users reported that donors had not provided any specific direction on the delivery channels they should use within their projects. The results indicate multiple delivery channels were recommended by donors during the pandemic. Despite the health risks, a mix of in-person and remote delivery channels were still being encouraged including house-to-house visits (47%, $n = 18$) and women's, men's or youth groups (47%, $n = 18$). Remote channels suggested by a donor included radio (53%, $n = 20$), mobile phones or social media (42%, $n = 16$) and television (24%, $n = 9$). A total of 39% of authors made no specific suggestion for delivery channels.

Patterns of Wash'Em use

There were similarities in the ways organizations used Wash'Em during the pandemic. On average, organizations trained 9.8 people (median of 3.5) on the Wash'Em process.

Table 1: A summary of the contexts where Wash'Em was used as part of COVID-19 response

Contexts where Wash'Em was used as part of COVID-19 response	Number	Percentage
Number of humanitarian organizations using Wash'Em to inform their COVID-19 response during the study period.	38	100%
Number of countries represented by the data sets		
Sub-Saharan Africa	18	47%
Latin America and the Caribbean	13	34%
East Asia and Pacific	4	11%
Other (Middle East, North Africa, South Asia and Europe)	3	8%
Disease outcome of interest identified in the datasets		
COVID-19	38	100%
Diarrheal diseases or respiratory infections	30	79%
Other outbreak-related disease (e.g. Cholera or Ebola)	19	50%
Datasets indicating, they were responding to multiple crises		
COVID-19 and another disease outbreak	26	68%
COVID-19 and a disaster	11	29%
COVID-19 and armed conflict or political or social unrest	13	34%
Duration of the humanitarian crisis		
More than 10 years	7	18%
5–10 years	1	3%
1–5 years	9	24%
6 months to a year	5	16%
Within the last 6 months	15	39%
Within the last month	0	0%
Location of the target population		
People residing in a formal camp setting	9	24%
People residing in an informal or unregulated camp settings	8	21%
Damaged buildings	2	5%
Their homes, in their place of origin	28	74%
Host communities in another community, not their place of origin	5	13%
People are on the move and have no regular place of residence	4	11%
Diversity of the target population		
From a similar religious or cultural background	19	50%
Multiple religious or cultural groups in the area of operation	19	50%
Access to latrines		
Most of the population have access to household latrines	12	32%
Most of the population have access to shared latrines	18	50%
Most of the population practice open defecation	7	18%
Responsibility for handwashing infrastructure, water and soap		
Humanitarian organizations responsible	18	47%
Households responsible	20	53%

Table 2: Budget and timeframe available for COVID-19 focused hygiene programming during use of Wash'Em

Budget and timeframe	Less than USD \$10,000	USD \$10,000–\$50,000	USD \$50,000–\$100,000	USD \$100,000–\$500,000	More than USD \$500,000
6 months or less	11 (29%)	5 (13%)	3 (8%)	1 (3%)	0 (0%)
6 months to 1 year	1 (3%)	1 (3%)	2 (5%)	2 (5%)	1 (3%)
1 year to < 2 years	0 (0%)	2 (5%)	5 (13%)	4 (11%)	0 (0%)
More than 2 years	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

During the pandemic, organizations used a mix of training tools, as is recommended. A relatively high proportion of users (18, 47%) opted to deliver Wash'Em trainings remotely.

Wash'Em training ranged from 0.5 to 5 days, with a median of 2 days. Data collection using the rapid assessment tools

took on average 2 days. Nearly all organizations used all five tools. However, Wash'Em guidance does recommend omitting the Personal Histories tool in settings where supportive services (e.g. psychosocial support) are not present and six projects omitted it. The majority (36, 95%) of Wash'Em data

collection was done face-to-face during the pandemic, despite recommendations to minimize face-to-face interactions. However, some users conducted interviews or FGDs through online platforms or phone calls.

At the point of being surveyed, 40% (15) of Wash'Em users indicated that some or all of the Wash'Em programme recommendations had been implemented in their hygiene programmes. A further 37% (14) said they had used adapted activities to make them more feasible in their context.

Handwashing determinants based on the Wash'Em rapid assessment tools

Handwashing demonstrations

The Handwashing Demonstrations tool is designed to understand how aspects of the behavioural setting (Barker and University of Kansas Midwest Psychological Field, 1968; Curtis *et al.*, 2019) enable or constrain the practice of handwashing. The tool also focuses on describing how the individual interacted with the setting to perform the behaviour (Supplementary Material S1).

Among the included projects, only four (11%) reported that most households had a permanent dedicated handwashing facility near the toilet or kitchen. In total, 13 (34%) projects reported most households had no facilities at all. The remainder of the projects indicated there was a place where hands were often washed but this was done using mobile devices (e.g. using a jug to pour water onto hands) or people washed hands at multi-functional facilities (e.g. a shared tap stand). A total of 10 (26%) projects reported the facilities that did exist were convenient and easy to use, while the remainder indicated the available facilities were often undesirable and unclean (16, 42%), were desirable and attractive (3, 8%) and clean and undesirable (8, 21%). Additional barriers identified included inconvenient facility heights (15, 40%), facilities allowing people to only wash one hand at a time (8, 21%), locations far from kitchen or toilet areas (13, 34%) and fragile or easy to break infrastructure (2, 5%).

Most projects (31, 82%) reported availability of soap within households. In total, 16 (42%) had soap near toilets, kitchens or handwashing facilities, while 13 (34%) stored it in less accessible locations, potentially making handwashing inconvenient at key times. Furthermore, 16 (42%) projects found participants used products which were not primarily intended for handwashing (e.g. laundry soap, dishwashing liquid or ash) and 11 (29%) projects used bar soap designated for handwashing and bathing.

Like soap, water was stored elsewhere in the house. A total of 16 (42%) projects reported most Wash'Em research participants had to collect water from elsewhere in the compound and four (10%) reported water scarcity.

Disease perception

The Disease Perception tool helps Wash'Em users to understand local constructions of disease, health priorities, perceived vulnerability to the disease, the severity of health and non-health consequences of the disease, and action-efficacy related to disease prevention. Among the included studies it was used to explore perceptions related to COVID-19 (Supplementary Material S2).

In total, 30 (79%) projects found that FGD participants listed COVID-19 among their five greatest health concerns at that point in time. Regarding perceived susceptibility, 15 (39%) of the projects reported FGD participants thought they

would get COVID-19 in the next 6 months. When asked who is more likely to get sick with COVID-19 between their own family and other families in the community, most projects (32, 84%) reported participants felt at equal risk of infection.

When asked about the perceived impacts associated with getting COVID-19, Wash'Em participants mentioned impacts on their physical and mental wellbeing (21, 58%). Economic impacts associated with either loss of income when sick (27, 75%), or costs associated with travelling to and accessing healthcare services were mentioned by 20 projects (56%). A total of 16 projects (44%) found participants were concerned about being less productive if they were to get COVID-19. Others mentioned social impacts they associated with COVID-19, including with feeling isolated or stigmatized (17, 47%) or taking on additional responsibilities because of others getting sick (11, 31%).

Regarding COVID-19 prevention, 24 projects (63%) reported participants felt capable of taking preventive actions, however, in 11 projects (29%) participants did not think handwashing with soap was an effective mode of prevention. Despite this, in 16 projects (44%) participants reported they thought handwashing behaviour had increased recently due to fear of COVID-19.

Motives

The Motives tool explores motivations associated with handwashing behaviour, perceived identity and aspirations. When using the Motives tool, facilitators introduce participants to a set of character cards. The character cards contain visuals and descriptions of a person with a particular characteristic. Each characteristic is linked to a core human motive as defined by [Aunger and Curtis \(2016\)](#), with some adaptations made so that these were more relevant to the experiences of crisis or outbreak-affected populations (Supplementary Material S3).

The motives most associated with handwashing across all projects were status and comfort. FGD participants across all projects identified themselves as hard-working, neat and orderly. In most projects, FGD participants said they aspired to be respected because of their education or wisdom (motive: status), because they were good parents. Others aspired to be able to be neater and orderly (motive: comfort). [Figure 1](#) illustrates what currently people feel like and their aspirations.

Personal histories

Unlike the Wash'Em tools described above, the Personal Histories tool is not focused on handwashing behaviour specifically, but rather is designed to explore the broader experiences of a crisis or outbreak in people's lives (Supplementary Material S4).

During the pandemic, 34 (89%) of projects found interview participants reported their role within their family or community had changed. For example, parents often felt less able to provide for their families or fulfil their regular or professional role. Interview participants in 15 projects (45%) reported friends and family had avoided them because of stigma. In 16 projects (48%) most participants reported choosing to be less sociable during the pandemic. However, in seven of the projects (21%) the interview participants felt their existing social network was a source of great support during the pandemic. A total of 35 projects (92%) reported interview participants said their hopes and goals for the future had changed because of their experiences associated with COVID-19. People reported an increased fear about their future and that of

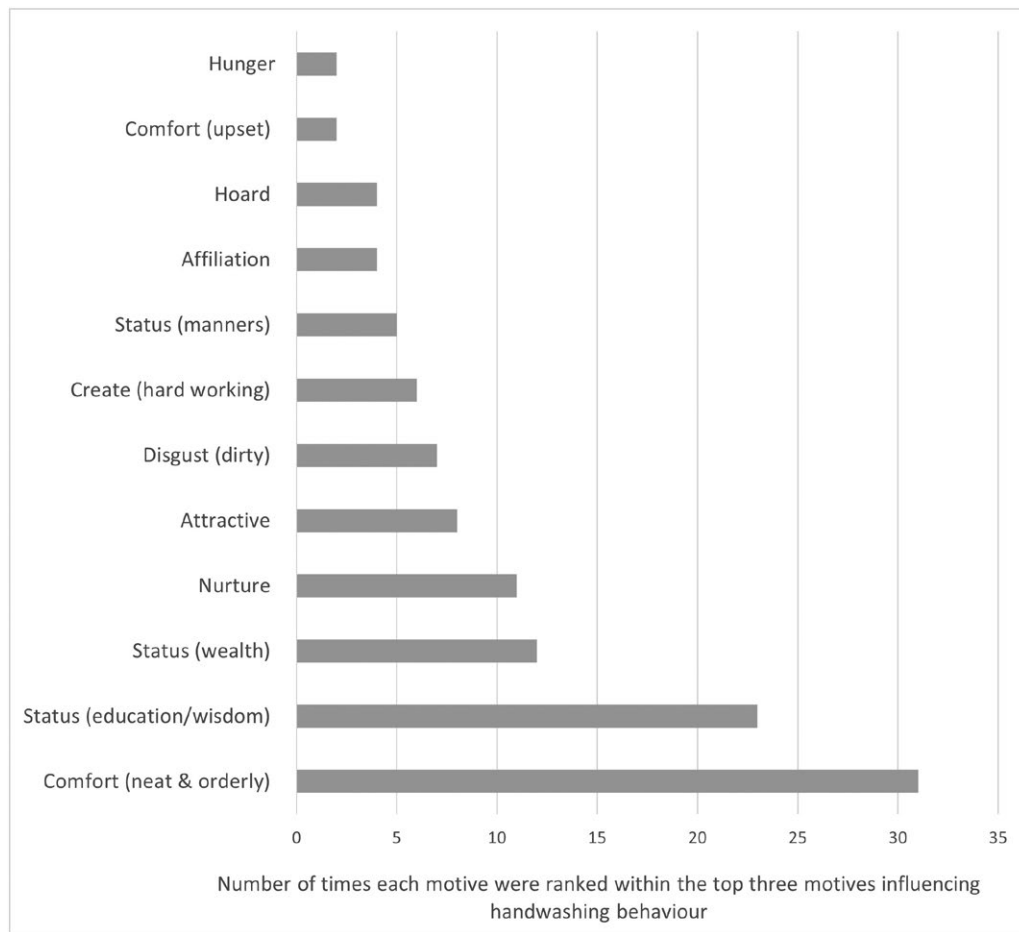


Fig. 1: Motives which emerged as being linked with handwashing: summary of data from Wash'Em Motives rapid assessment tool.

their children, including mental and physical health concerns. Many felt the future was in God's hands and there was little they could do. In total, 23 projects (70%) reported most interview participants felt their economic situation was not precarious and 19 projects (57%) found most participants felt they had lost agency during the pandemic and were now reliant on others for basic aspects of survival.

Touchpoints

The final Wash'Em tool, Touchpoints, is designed to understand the multiple ways organizations could reach and engage with populations when delivering programmes ([Supplementary Material S5](#)).

Among the included projects, the three most effective Touchpoints for reaching crisis-affected populations during the pandemic were television (prioritized in 26 projects, 68%), radio (prioritized in 22 projects, 58%) and mobile phones (prioritized in 20 projects, 53%). When FGD participants were asked about whose opinions they respected most, community leaders/elders and religious leaders were reported by most FGD participants (87% and 84% of projects, respectively).

Consistency in the determinants of handwashing behaviour across contexts

There was a low level of homogeneity across the 38 COVID-19 datasets in terms of both the contextual factors,

programming constraints and determinants of handwashing behaviour during the pandemic ([Figure 2](#)). This is supported by the Fleiss' kappa results, which for all categories indicated poor agreement or slight agreement only (most were approximately 0.20 or lower) ([Nichols et al., 2010](#)). Higher levels of agreement across the datasets were seen within programmatic context and constraints, motives and disease perception and delivery channels.

DISCUSSION

The coincidental launch of Wash'Em in March 2020, just as the COVID-19 pandemic was spreading around the world, provided a unique opportunity to learn about hygiene programme design and the determinants of handwashing behaviour across multiple fragile settings that were facing the same health threat. Our findings provide insights into the applied use of Wash'Em for supporting humanitarian hygiene programming, while also generating more transferable learning about the determinants of behaviour during outbreaks and how these vary by context.

Learning about the Wash'Em process and its utility for informing outbreak responses

While not the primary aim of this research, our findings do indicate that during the pandemic Wash'Em was used in a way that was consistent with the intended process. Specifically, it

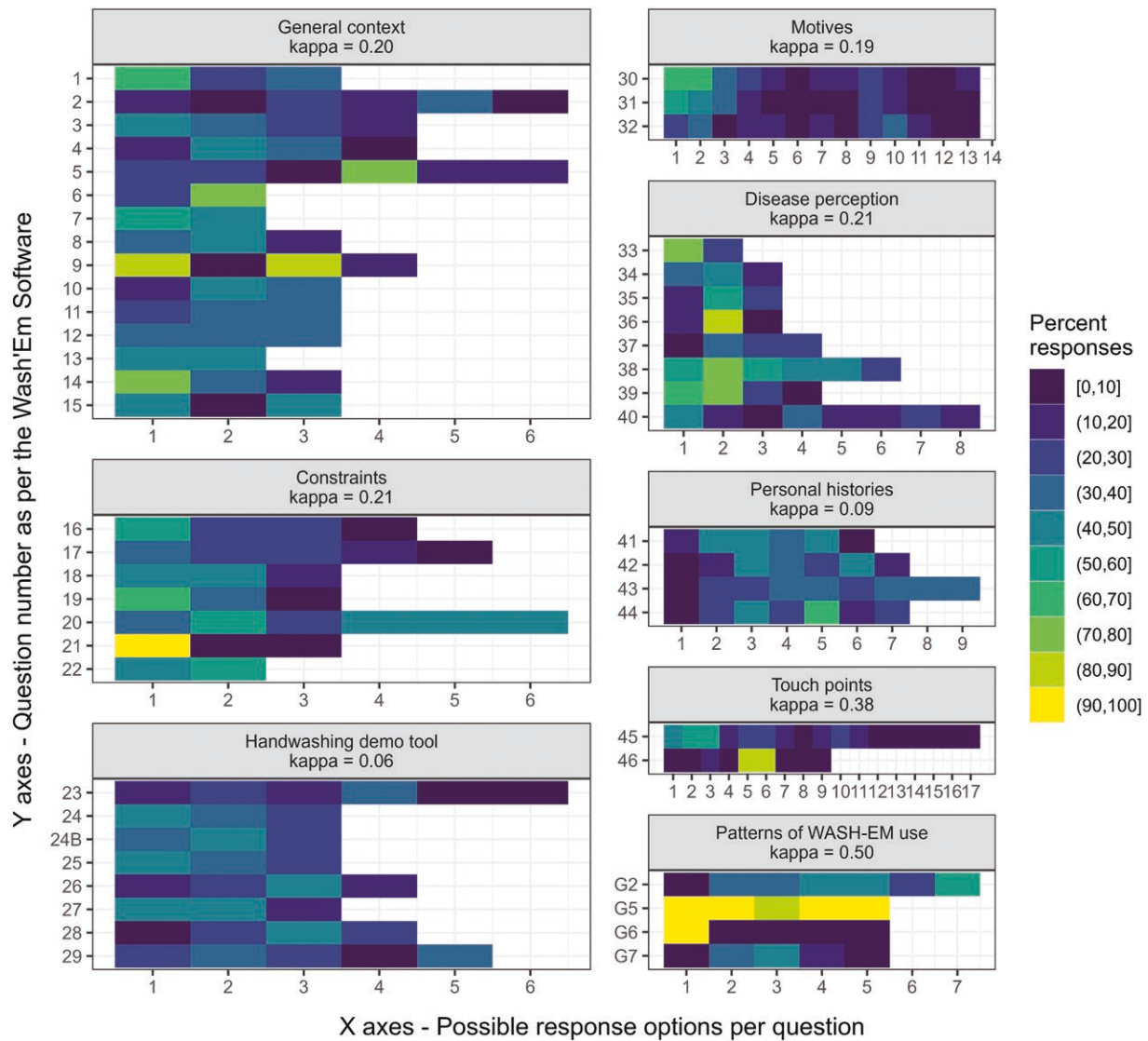


Fig. 2: Heatmap showing the level of consistency across the responses to the questions in the Wash'Em software from the 38 COVID-19 datasets. The heatmap illustrates the level of consistency in user responses to the Wash'Em questions and is divided by each of the sections in the software. Bright shading, which indicate a high proportion of sites selecting the same response, are not common. Responses tended to be varied for most questions.

appeared to be an approach which could be feasibly implemented by a small team of humanitarian staff and conducted within a week. Despite an increasing amount of remote data collection taking place during the pandemic (Hensen *et al.*, 2021) this multi-country analysis indicated most users opted for in-person data collection using Wash'Em. Our data also indicated many users still felt the need to further contextualize and adapt the Wash'Em recommendations and this is something that merits further exploration so clearer guidance can be provided to users about implementation strategies. We found Wash'Em was typically used within short-term COVID-19 response programmes where hygiene-related prevention activities comprised a relatively small percentage of the budget. This is consistent with broader evidence which indicates hygiene promotion has historically been underfunded (World Health Organization, 2019) and major gaps exist in terms of what it would take to effectively finance hygiene globally (Hutton and Varughese, 2016; Ross *et al.*, 2021). Surprisingly, this pattern of underfunding persisted during the pandemic, when increasing global attention was given to improving

handwashing behaviour (Brauer *et al.*, 2020; Giné-Garriga *et al.*, 2021).

During the COVID-19 pandemic, and indeed during prior outbreaks, most research and programming disproportionately focused on assessing behavioural determinants such as knowledge, risk and fear (White *et al.*, 2020; Xu *et al.*, 2020; Al-Wutayd *et al.*, 2021; Krägeloh *et al.*, 2021; Olapeju *et al.*, 2021, Yildirim *et al.*, 2021). While Wash'Em does generate learning on these determinants it intentionally also assesses a more diverse set of determinants including factors related to the physical and social environments. By taking this more holistic view, Wash'Em users were able to build up a more nuanced understanding of the barriers and enablers of handwashing behaviour.

The determinants of handwashing behaviour during outbreaks

Our descriptive and statistical analysis of Wash'Em data from 38 project settings during the pandemic indicated the determinants of handwashing behaviour during outbreaks are

predominantly shaped by the context rather than the nature of the health threat. One explanation for this is that the COVID-19 pandemic did not bring about a substantial shift in the underlying circumstances that create disease vulnerability. For example, the presence of a conveniently located and desirable handwashing facility with soap and water available is recognized to be a critical enabler of regular handwashing practice (White *et al.*, 2020). However, consistent with global data on handwashing facility access (Wolf *et al.*, 2019; Brauer *et al.*, 2020; Moffa *et al.*, 2021) and water and soap availability (Ekumah *et al.*, 2020; Jiwani and Antiporta, 2020; Stoler *et al.*, 2021), our findings from the Handwashing Demonstration tool showed that in fragile contexts desirable handwashing infrastructure, as well as access to water and soap, were major barriers to behaviour during the pandemic. Similarly, findings from the Personal Histories tool indicated the profound non-health impacts of the pandemic on people's lives, particularly in settings where people were already dealing with co-existing outbreaks and crises. Most programmes identified major shifts in the way participants perceived their role in the family or community, their agency and their economic fragility during the pandemic—findings which are consistent with broader research in LMIC settings (Banati *et al.*, 2020; Buheji *et al.*, 2020; Govender *et al.*, 2020; Sumner *et al.*, 2020) but which are rarely considered when designing hygiene prevention programmes (White *et al.*, 2022c). Stigma and isolation were commonly reported among those directly affected by COVID-19. While this was raised as a concern during the pandemic (Roelen *et al.*, 2020; Peprah and Gyasi, 2021), research on this within LMICs is lacking and merits further investigation.

Unsurprisingly, there were slightly higher levels of homogeneity in terms of responses to the Disease Perception tool. COVID-19 was seen as a major health concern by Wash'Em participants in most programmes and most people felt they were vulnerable to getting the disease. Within many of the Wash'Em use cases, participants doubted the efficacy of handwashing to interrupt COVID-19 transmission, yet still reported increases in community-level handwashing behaviour. This seemingly contradictory finding, that outcome expectancy (e.g. the belief that handwashing is effective in preventing COVID-19), is not a particularly strong motivator of behaviour has also been identified in other studies during the pandemic (Lao *et al.*, 2023). Greater homogeneity in responses was observed in the Touchpoint tool which identified mass and digital media as key modalities for reaching people remotely during the pandemic. Despite variations in access to mass and digital media within many LMIC settings (Hernandez and Roberts, 2018) it would seem these channels, as well as the engagement of community leaders, are promising avenues for the delivery of outbreak interventions.

LIMITATIONS

While the follow-up survey with users was designed to help verify the data and ensure it was collected in the way intended by Wash'Em, the survey still required users to self-report their experiences and this may have been affected by recall or social desirability bias. This, together with the brevity of the survey, means we may not have identified key challenges related to data collection quality, which may have in turn affected the overall patterns observed. Some data collection

errors are likely within this dataset, given it was collected by 38 different teams.

Wash'Em intentionally collects data from a small number of people within the crisis or outbreak-affected population. This is done with the aim of making the approach feasible for humanitarian actors needing to respond quickly in crises, and because the data are designed to inform programming only (rather than being seen as independently valid in-depth or representative research). Users are encouraged to continue with data collection until a point of saturation is reached for each rapid assessment tool. However, from the summary data inputted into the software it is not possible to see how many individuals participated in each use case. Inferring common patterns across this data, as we have done in this manuscript, may therefore mean different things in each use case. Furthermore, Wash'Em requires users to summarize qualitative data quantitatively due to the need for rapid decision-making in resource-constrained settings. This means some of the nuance expressed in the qualitative data may be lost, although teams are encouraged to discuss and action findings which are not captured directly in the software inputs.

This analysis represents a small sub-section of the Wash'Em use cases during this period, with many other datasets being excluded because timely consent was not provided by the organizations collecting the data. While we are not aware of any specific biases this may have introduced, it may be that a more geographically diverse and numerous sample could lead to differing findings.

CONCLUSION

Historically, hygiene programmes that have been delivered during outbreaks have been criticized for 'cutting and pasting' programmatic interventions from one setting to another, with limited community engagement or contextualization (Vujcic *et al.*, 2015; Czerniewska and White, 2020; White *et al.*, 2022b). Our findings support the need for the assessment of behavioural determinants prior to intervention design so programmatic activities can address pre-existing and emergent factors that influence behaviour and create disease vulnerabilities. Based on this multi-country analysis, Wash'Em appears to be one such example of a feasible approach for holistically understanding the determinants of handwashing behaviour in fragile and outbreak-affected settings.

The findings also have broader implications for the way we think about hygiene programme design in humanitarian crises and outbreaks. Specifically, it is critical that such programmes go beyond just assessing cognitive determinants of behaviour (such as knowledge and risk perception), but also consider social and physical determinants which are likely to shape behaviour. Similarly, it is important responses to any emerging health threat consider the secondary non-health impacts of outbreaks and the competing priorities of populations living in fragile LMICs. These broader, context-dependent factors appear to substantially influence disease vulnerability and behavioural responses.

SUPPLEMENTARY MATERIAL

Supplementary material is available at *Health Promotion International* online.

AUTHOR CONTRIBUTIONS

S.W. and A.H.T. conceptualized and designed the study. A.H.T. conducted data collection, cleaning and analysis. J.L. also conducted data analysis and was responsible for writing the article. A.M.D. supported with data analysis by presenting the findings through heat maps. S.W. and W.T. reviewed and edited the manuscript. All authors read and approved the final manuscript.

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CONFLICT OF INTEREST STATEMENT

W.T. and S.W. were involved in the design of the rapid assessment tools and Wash'Em Software.

DATA AVAILABILITY

The datasets used and/or analysed during the study are available from the corresponding author upon reasonable request.

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