Cleaning the tap: Tap hygiene for safer drinking water

Story of change: Key findings & emerging impacts

Summary

- REACH research has demonstrated how a systematic gap between engineering and hygiene considerations in the water sector is reducing access to safe drinking water.
- Water user behaviour impacts the hygiene of water collection points and can thereby impact water quality. Previously the focus has been solely on household hygiene.
- Current estimates indicate that between two and four billion people lack access to drinking water that is free from faecal contamination. Evidence from Bangladesh suggests that regular cleaning of water point spouts and taps could substantially reduce this figure, even halving the number of contaminated handpumps.
- Based on this evidence, new WHO guidance on Sanitary Inspections includes cleaning of handpump spouts for the first time. Routine cleaning of taps and other collection points is now part of the recommended operation and maintenance actions for safe water supply.
- The evidence has also informed changes in the monitoring design of large campaigns to understand drinking water service levels, including the 2024 rounds of UNICEF's Multiple Indicator Cluster Surveys in South Sudan and Bangladesh.

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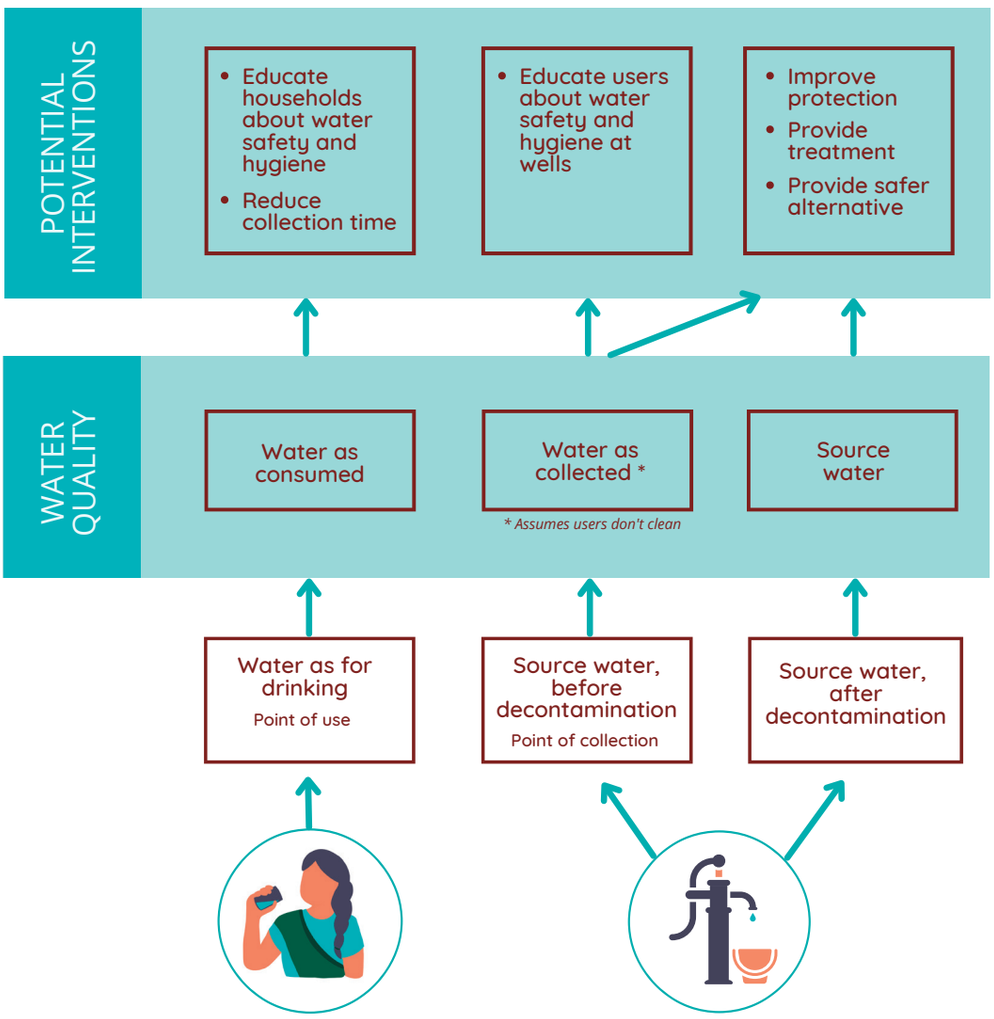
Faecal contamination in drinking water: A global challenge

Globally, it is estimated that between two and four billion people do not have access to safe drinking water (Greenwood et al., 2024; JMP, 2023). The most commonly detected contaminant is *E. coli*, a bacteria associated with fresh faecal contamination. In many contexts, faecal contamination is the main barrier to achieving water supply that can be categorised as 'safely managed': accessible on premises, available when needed, and free from faecal and priority chemical contamination (JMP, 2023). The burden of unsafe drinking water is unequally distributed.

Global analysis by the UNICEF and WHO Joint Monitoring Programme (JMP) highlighted that, in 2022, 60% of people who drank water from a contaminated supply lived in rural areas. The rural-urban inequality is strongest in low income countries, across which its estimated that 72% of the rural population drink from contaminated sources compared to only 40% of the urban population. There are also strong wealth disparities, with the poorest more likely to be exposed to contaminated drinking water (JMP 2019).

Figure 1: Guidance included in Key Findings booklet developed by REACH based on the 2019 Bangladesh Multiple Indicator Cluster Survey (MICS) led by Professor Katrina Charles.



Understanding the appropriate interventions to reduce contamination is necessary to reduce these inequalities and advance access to safer water for all (Figure 1). Interventions have typically focused in two areas: (1) engineering interventions to build appropriate infrastructure or treatment systems; (2) behavioural interventions that address household level change e.g. for personal hygiene or water treatment and safe storage. Risk assessment approaches such as sanitary inspections have included consideration of wider environmental sources of contamination, such as latrines or animal faeces. However, what has been overlooked is hygiene at the point of collection, or to put it more simply, cleaning the tap.

Re-examining water quality

In 2018, REACH work in Bangladesh and Kenya to compare an alternative microbial contamination risk indicator (tryptophan-like fluorescence) against standard *E. coli* testing approaches, began to highlight the importance of waterpoint hygiene for interpreting the results of *E. coli* monitoring.

In 2021, REACH co-director Prof Katrina Charles was invited by UNICEF to lead the analysis of the Bangladesh 2019 Multiple Indicator Cluster Survey (MICS) water quality results for *E. coli*.

Working with UNICEF, icddr,b, and the University of Dhaka, Charles and team highlighted the challenges for interpreting data where samples are taken from unclean waterpoints. MICS water samples are collected to reflect water quality 'as collected', with water flushed before sampling but no cleaning of the water point. It is not possible to identify from the resulting data whether interventions should prioritise protecting water sources, treating water supplies, or improving hygiene at water collection points.

The team extended their collaboration to analyse results of over 5,000 water quality records from eight previous icddr,b studies of water quality in Bangladesh, in which water quality sampling was done both before and after cleaning or decontaminating the water point. The analysis demonstrated the large benefit of cleaning handpump spouts, with the after-cleaning samples showing substantial reduction in contamination.

Alongside this work, REACH supported the WHO in their call for field testing of the new Sanitary Inspection guidance (2021) and provided expert review of the WHO Guidelines for drinking-water quality: small water supplies (2022/23). As part of this effort, the team analysed how cleaning was represented and provided recommendations for how to improve consideration of cleaning in Sanitary Inspection forms and associated guidance.

Figure 2: Contamination of taps during use and by animals is a common issue (left: waterpoint in Dhaka, Bangladesh; right: Itivanzuo waterpoint in Kitui County, Kenya).

Photos by Li Ann Ong & Susanna Goodall

Cleaning spouts and taps for safer drinking water

Cleaning the spout or tap has a considerable effect on water quality. Multiple activities at water collection points can potentially introduce contamination and degrade drinking water quality.

At handpumps, especially when soap is not present, people rub their hands on the spout as part of cleaning their hands. This can transfer contamination onto the spout. Additionally, animals that can access the handpump will drink from the spout, potentially transferring microorganisms and increasing the risk that people who use the handpump will be exposed to zoonotic diseases.

In the analysis of over 5,000 water quality records from Bangladesh, 631 community handpumps had *E. coli* detected before the spout was cleaned Cleaning the handpump spout was enough to ensure that *E. coli* were no longer detectable in water samples in almost half (52%) of water points (Figure 3). A further 16% of water points had a reduction in the concentration of *E. coli* with cleaning of the spout. This effect was even larger in the monsoon.

Cleaning the tap addresses a significant gap in the sector by managing hygiene at the point of collection; this can have health benefits for water users. However, it should be noted that it will not address many other underlying drivers of contamination of drinking water. As was highlighted in the MICS report and has been reported elsewhere, surveys based on one-off grab samples underestimate faecal contamination, especially when undertaken in drier periods.

Figure 3: The importance of cleaning the tap: Comparison of water quality risk category in drinking water samples taken from cleaned and uncleaned taps and spouts (for the subset of waterpoints where *E. coli* was detected before cleaning). It shows how water quality deteriorates with poor tap hygiene. The graph shows only the subset of samples where *E. coli* was detected before cleaning. Source: Saskia Nowicki (paper in prep).

Figure 4: Water sampling carried out by Sobur Ali and Rintu Saha in the REACH programme observatory in Matlab, Bangladesh.

Photo by REACH Programme

Changing policy and practice

The collaborations and research described above have led to explicit consideration of cleaning as a regular operations and maintenance (O&M) activity for water points and as a management response in WHO's updated Sanitary Inspection forms and guidance released in 2024. The work has also brought about change in monitoring programme designs, for example, in 2024, MICS water quality sampling programmes in South Sudan and in Bangladesh are implementing cleaning of taps and spouts in their sampling.

Poverty impact

The potential impact for people living in poverty is significant. Impoverished communities are more likely to rely on shared water sources, such as handpumps, where their water quality is impacted by the hygiene of others. In Bangladesh alone, the contribution of cleaning the tap is estimated to increase the number of people with access to drinking water that tests free from *E. coli* by 35 million, and to reduce the amount of contamination for a further 11 million people.

The inclusion of cleaning for taps and handpump spouts in the new Sanitary Inspection forms has the potential to benefit the billions of people globally who rely on shared water sources.

Selected outputs

Written outputs from the research are listed below. Further research is also on-going, including work with icddr,b in hospitals to explore the impacts of tap cleaning where there is significant biofilm growth.

Charles, K., Nowicki, S., Armstrong, A., Hope, R., McNicholl, D. and Nilsson, K. (2023). Results-based funding for safe drinking water services: How a standard contract design with payment for results can accelerate safe drinking water services at scale. REACH working paper 13. Oxford, UK: University of Oxford and Uptime Global.

Charles, K., Ong, L., El Achi, N., Ahmed, K.M., and Khan, M.R., with input from Hoque, S. and Nowicki, S. (2019). Water Quality Thematic Report MICS 2019. Bangladesh Bureau of Statistics Statistics Division, Ministry of Planning Government of the People's Republic of Bangladesh, DPHE and UNICEF.

Drinking water quality in Bangladesh – 2021 updates: Key findings from the Bangladesh Multiple Indicator Cluster Survey (MICS). Booklet prepared by the REACH programme.

Sanitary inspections for drinking-water supplies, World Health Organisation.

Other outputs

REACH Impact Video – Delivering safe water in Africa and Asia – reachwater.uk/impact-videos

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REACH is a global research programme to improve water security for the poor by delivering world-class science that transforms policy and practice. The REACH programme runs from 2015–2024 and is led by Oxford University with international consortium of partners and funded with UK Aid from the UK Government's Foreign, Commonwealth & Development Office. Project code 201880.