



With funding from the Conrad N. Hilton Foundation, the Aquaya Institute is coordinating longitudinal water quality monitoring in two target districts in Uganda. In February 2024, Aquaya conducted surveys and water quality testing at households, water points, schools, and healthcare facilities in Kabarole District. This effort builds upon prior monitoring done in 2022 and 2023.

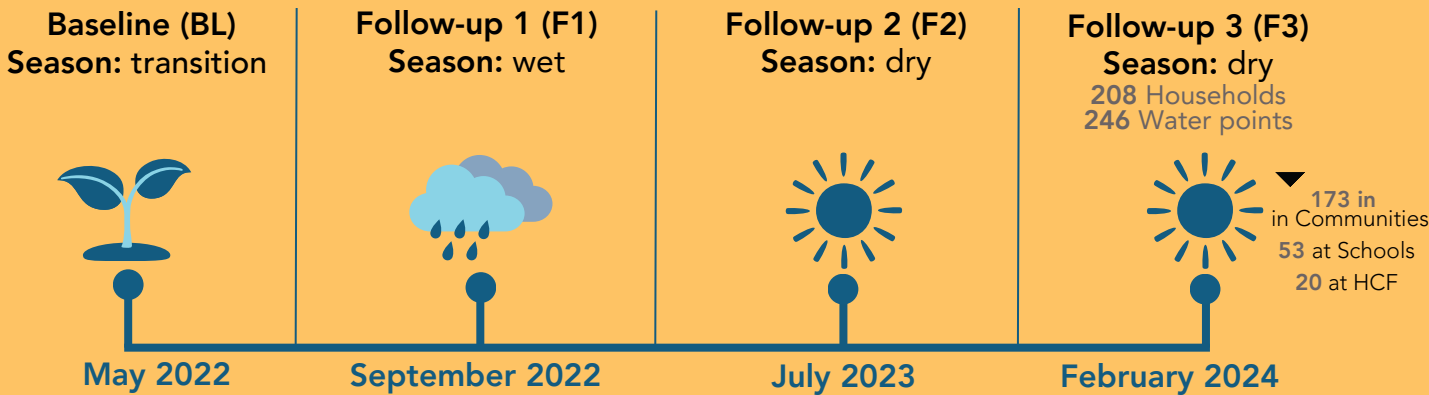
## WaterTRACS

Testing, Research, and Capacity Strengthening Initiative

# WATER QUALITY IN KABAROLE DISTRICT, UGANDA

February 2024

## Drinking water samples tested in Kabarole



## SUMMARY

- Water samples from improved sources had lower microbial contamination than those from unimproved sources.
- Piped systems with higher chlorine levels had lower microbial contamination.
- Wealthier households had safer drinking water and were more likely to use piped water and other improved sources.
- Most schools and healthcare facilities reported using multiple water sources; in healthcare facilities, secondary sources had lower water quality than primary sources.

## KEY RECOMMENDATIONS

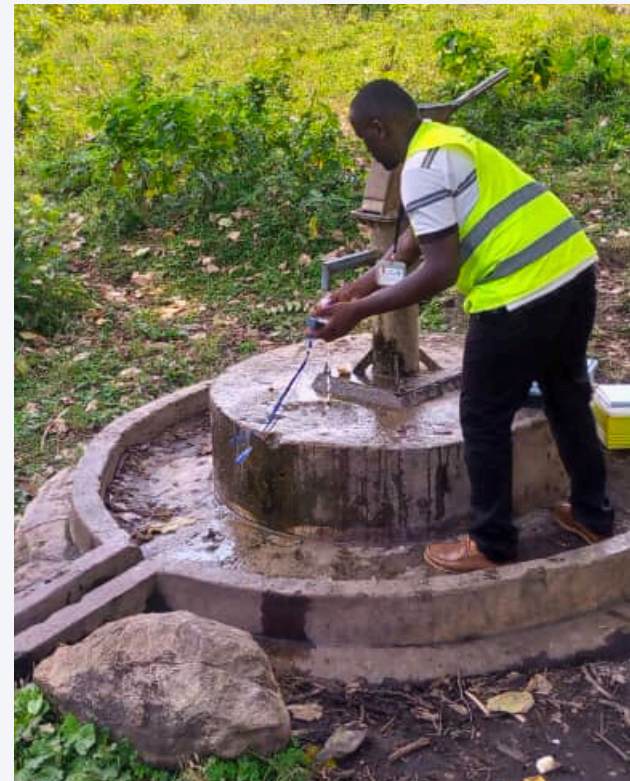
- Piped water systems should be treated with higher levels of chlorine.
- Improved water sources should be made more accessible to the poorest households.
- Improving water quality at schools and healthcare facilities should be a priority.



## WATER POINTS

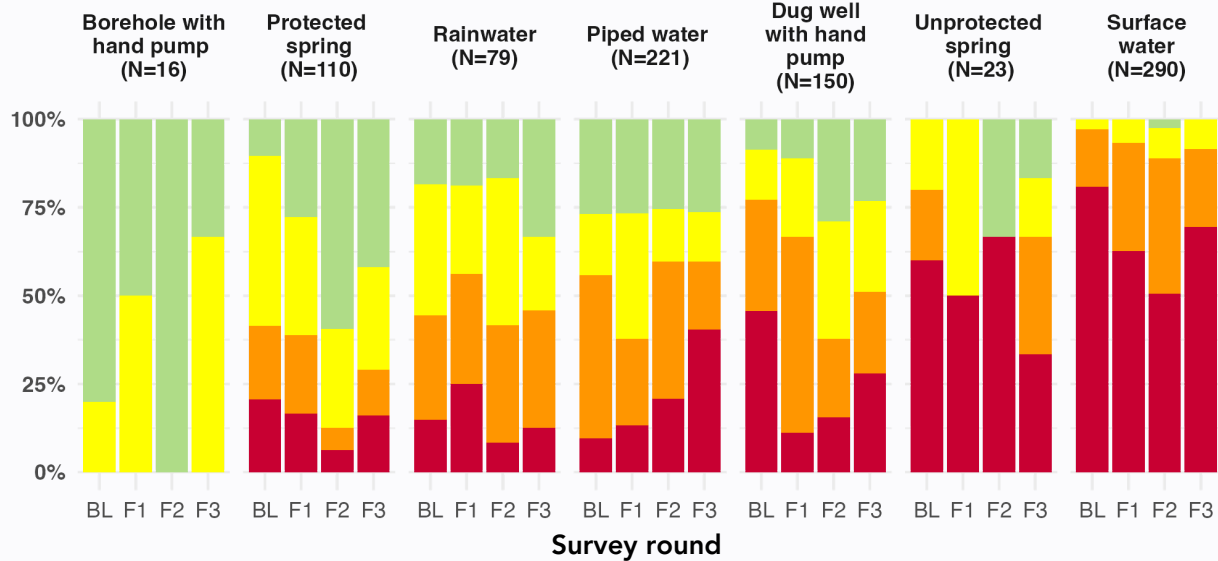
We conducted surveys and tested *E. coli* at 246 water points in February 2024. A fifth of water samples (20%) were free from microbial contamination, defined as *E. coli* <1 CFU/100 mL, which is consistent with previous survey rounds. **Water was safest from boreholes with hand pumps and protected springs** (41% free from *E. coli*), and **surface water was least safe** (none free from *E. coli*). Across all survey rounds, water was consistently safest from boreholes with hand pumps. Water from protected springs, dug wells with hand pumps, and unprotected springs had slightly better quality during the dry season (F2, F3) compared to the wet season (BL, F1, Figure 1).

Free chlorine residual protects water from recontamination during transport and storage. In the most recent survey, 28% of samples from piped systems had at least some free chlorine, though only 9% were above the minimum recommended level of 0.2 mg/L. Across all survey rounds, water was safer when free chlorine exceeded 0.2 mg/L (76% free from *E. coli*) compared to lower chlorine levels (28% free from *E. coli*) or no detectable chlorine (19% free from *E. coli*). This indicates that **higher chlorination levels could be more effective at protecting piped water against microbial contamination.**



**Image 1.** A research assistant collects a water sample at a handpump in Kabarole, Uganda.

### Water Point Samples



Excludes Rainwater (n<5 total across all survey rounds). Sample sizes shown are totals across all survey rounds.

#### *E. coli* risk categories

 Low <1 CFU/100mL     Medium 1 - 10 CFU/100mL     High 11 - 100 CFU/100mL     Very high >100 CFU/100mL

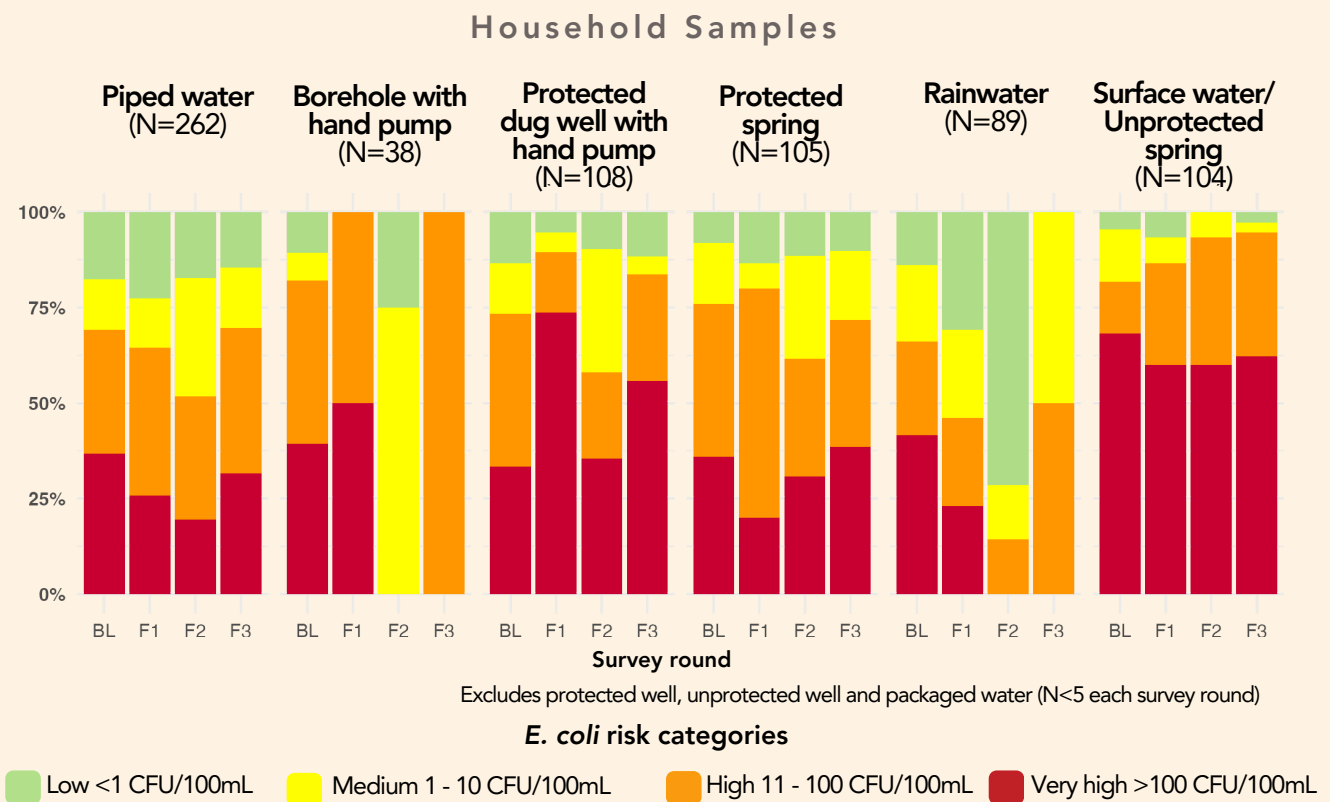
**Figure 1:** *E. coli* risk levels in water point samples collected at BL (N=226), F1 (N=173), F2 (N=244), and F3 (N=246) survey rounds, displayed by water point type.



## HOUSEHOLDS

Overall, 12% of the 208 household drinking water samples were free from *E. coli*, and nearly half (42%) were in the highest risk category (>100 CFU/100 mL *E. coli*). Across all survey rounds, stored **household water sourced from piped systems and protected springs was generally the safest**. Water from unimproved water points such as surface water and unprotected springs were the least safe (Figure 2). Household samples had consistently higher *E. coli* levels than samples collected directly from the source (Figure 1 versus Figure 2). Household water storage and treatment practices were similar across survey rounds.

In the most recent survey, 83% of households reported drinking water from improved water points including piped systems, protected dug wells with hand pumps, and protected springs. Piped water was reported most often. Half of stored piped water samples had detectable free chlorine, but no samples were above 0.2 mg/L.



**Figure 2:** *E. coli* risk levels in household stored drinking water samples collected at BL (N=223), F1 (N=95), F2 (N=185), and F3 (N=234) survey rounds, displayed by the water point type samples were reportedly collected from.

**Wealthier households had safer drinking water and more often relied on improved water sources** compared to poorer households. Two thirds of households (62%) in the wealthiest quintile reported using piped water compared to 8% in the poorest two quintiles. Overall, 22% of households in the wealthiest quintile had water free from *E. coli*, while no households in the poorest quintile did. Across all survey rounds, households in wealthier quintiles were more likely to use piped water or other improved sources, while poorer households relied on unimproved drinking water sources.

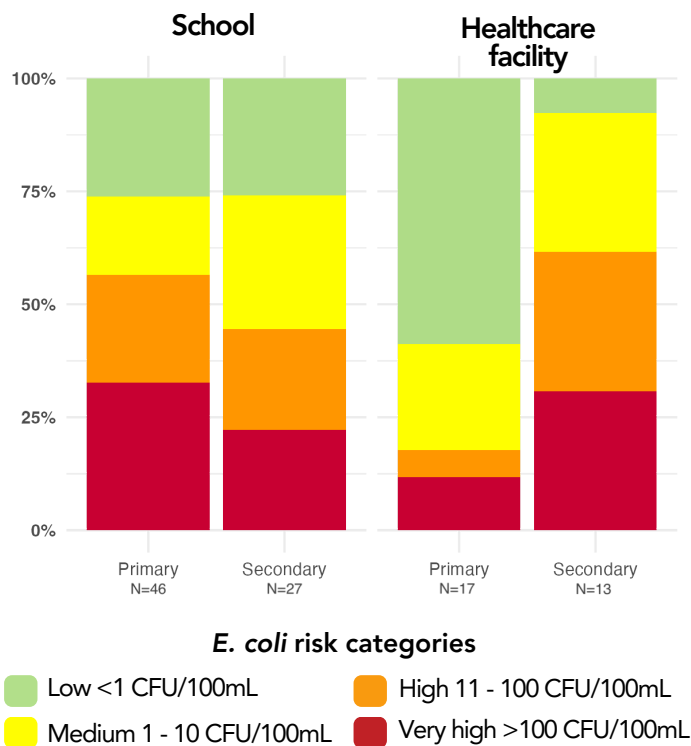


## INSTITUTIONS

We surveyed 53 schools and 20 healthcare facilities and tested *E. coli* from their primary and secondary drinking water points. Nearly all schools (93%) and all healthcare facilities used improved water points, and most (84%) had basic water service (i.e., an improved water point on premises with water available). Across all survey rounds, the most common primary drinking water points at institutions included piped sources, mechanized boreholes, and rainwater. Healthcare facilities had higher access to piped water than schools. Less than half (41%) of institutional water points were free from *E. coli*.




**Secondary water points differed in quality and in use between schools and healthcare facilities.** In schools, secondary water points were most commonly used seasonally when the primary water point was dry (38%) or in addition to primary water points (36%); in healthcare facilities, secondary water points were used as backups in case of breakdowns (64%). In schools, primary sources had similar microbial quality to secondary sources, while in healthcare facilities, secondary sources had significantly worse microbial quality than primary sources (Figure 3).

## Institutional Drinking Water Sources



**Figure 3:** *E. coli* risk levels in primary and secondary drinking water points used by schools and healthcare facilities.

## RECOMMENDATIONS

- 1 Piped water systems should be treated with higher levels of chlorine** to maintain a residual greater than 0.2 mg/L at all tap stands in the water distribution system. This could improve water quality at both the point of collection and the point of use. 
- 2 For households, education is needed to encourage safe water storage** for household drinking water and household water treatment for any untreated source. 
- 3 Water sources with lower levels of microbial contamination, such as boreholes and piped water systems with adequate treatment, should be made more accessible** to households with the lowest socioeconomic status. This may include the provision of reduced tariffs. 
- 4 Improving water quality at schools and healthcare facilities should be a priority.** For healthcare facilities, this may require ensuring primary water systems remain reliable, as secondary sources provide lower water quality. 