WaterTRACS
Testing, Research, and Capacity Strengthening Initiative

With funding from the Conrad N. Hilton Foundation, the Aquaya Institute has been coordinating longitudinal water quality monitoring in two target districts in Ghana since 2022. In February 2025, Aquaya conducted a sixth round of surveys and water quality testing at households, water points, schools, and healthcare facilities in Asutifi North District.

WATER QUALITY IN ASUTIFI NORTH DISTRICT, GHANA

A FOCUS ON PIPED AND PACKAGED WATER

February 2025

SUMMARY

Packaged water consumption has increased substantially in Asutifi North from 2022-2025, while use of piped water for drinking has decreased.

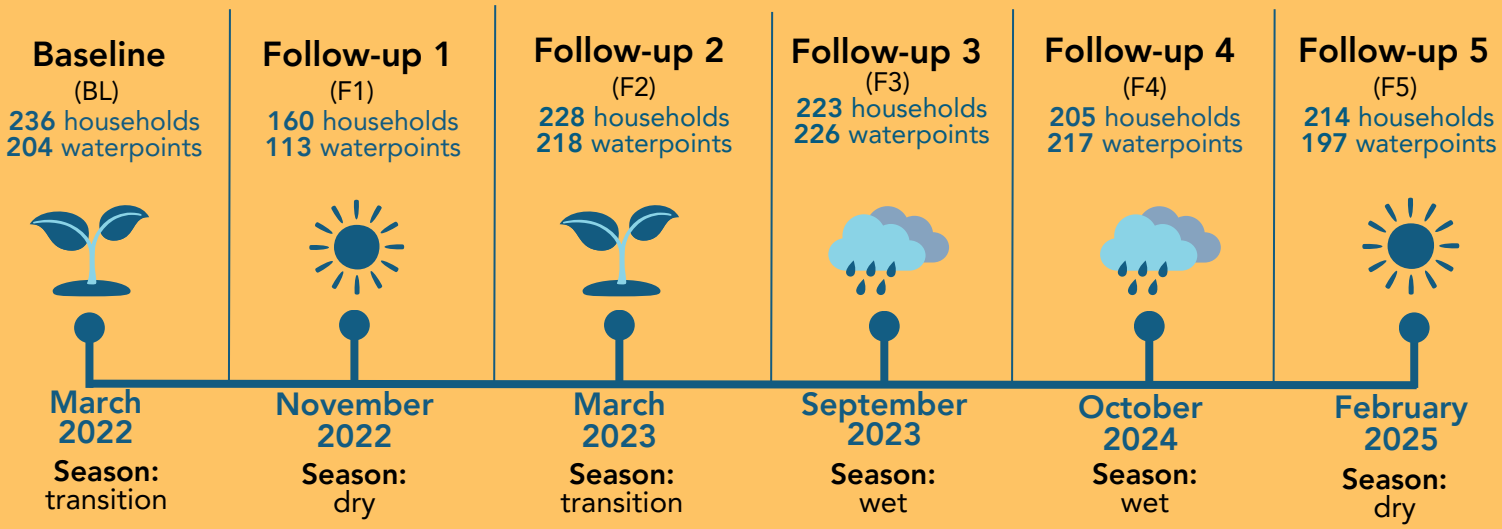
In early 2025, *E. coli* was found in 20% of piped system tap samples and 87% of stored household piped water samples, showing significant quality loss after storage.

While 16% of public tap samples had detectable total chlorine, only 3% met the minimum recommended free chlorine residual (FCR).

No stored household piped water samples had sufficient FCR to protect against recontamination.

Sachet water consistently had low levels of microbial contamination, presenting a safer alternative for drinking water until piped sources are more consistently chlorinated.

DRINKING WATER SAMPLES TESTED IN ASUTIFI NORTH



Across all sampling events, we tested *E. coli* presence in a total of 1,079 piped water samples. This included 548 from public standpipes, 79 from private (on-plot) taps, and 452 from stored household drinking water. Additionally, we tested 337 packaged water samples, primarily sachet water.

BACKGROUND

This research brief focuses on **piped water and packaged water,** the two most common sources of drinking water in Asutifi North district, which were collectively used by 65% of households in February 2025. **Packaged water consumption has increased substantially,** from 7% in late 2022 to 40% in early 2025, while the use of piped water for drinking has decreased since 2022 (from 38% to 25%) (Figure 1).

In contrast, **piped water use in schools has been more consistent over time,** ranging from 41-57% (n=49), with very few schools in Asutifi North using packaged water. **Healthcare facilities reported using a mix of piped water and packaged water**, though our sample size (n=8) was too small to examine temporal trends. The majority of packaged water used in Asutifi North is sachet water, while bottled water is much less common.

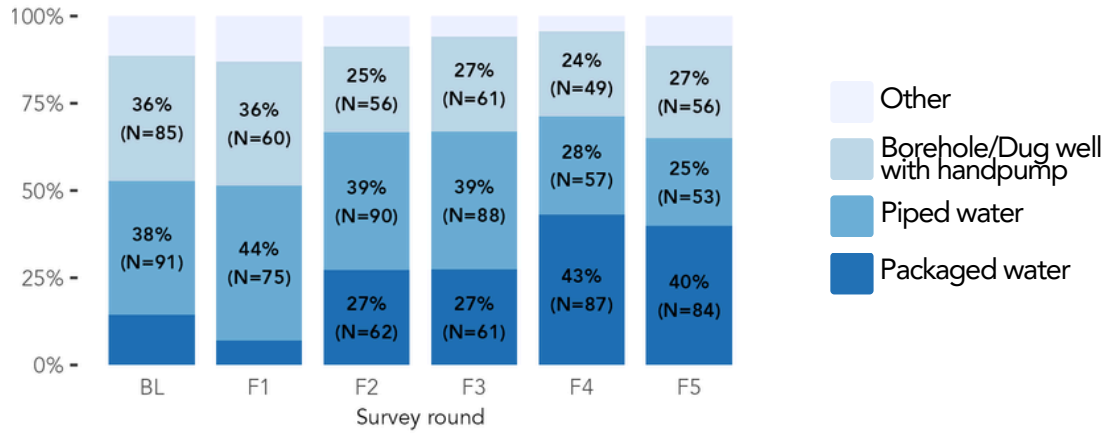


Figure 1: Current drinking water sources of surveyed households at each sampling time in Asutifi North, including packaged water (sachet and bottled), piped water, and other source types.

PIPED WATER SYSTEMS

MICROBIAL WATER QUALITY

In Asutifi North, piped water supplies have been among the safest waterpoint types at all sampling times, though microbial presence varied between sampling events, from a low of 20% to a high of 53% of samples with *E. coli* present. In early 2025 (F5), **20% of piped samples collected directly from taps had *E. coli*** (n=91); however, a much higher proportion **(87%) of piped samples collected from household storage containers** (n=53) **had *E. coli*** (Figure 2). This represents a large deterioration of piped water quality after household storage.

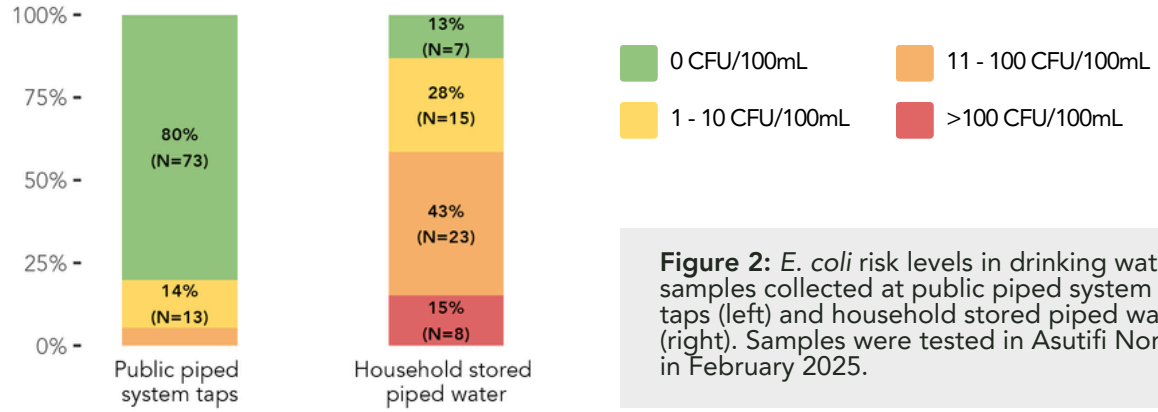


Figure 2: *E. coli* risk levels in drinking water samples collected at public piped system taps (left) and household stored piped water (right). Samples were tested in Asutifi North in February 2025.

CHLORINATION

The presence of total chlorine residual (TCR) indicates that water was treated with a sufficient dose of chlorine to overcome the water's initial chlorine demand, while free chlorine residual (FCR) is the part that remains available to prevent further contamination. **Across all sampling times, free chlorine residuals were very low – with 1% to 15% of sampled taps having the minimum recommended value** of 0.2 mg/L set by the Ghana national drinking water standard (Figure 3).

DEFINITION

Chlorine demand *is the amount of chlorine required to disinfect a water supply to the desired level. Organic matter and other dissolved substances increase the chlorine demand: they react with chlorine, leaving less available to inactivate pathogens, which means that a larger chlorine dose is required to achieve the same amount of disinfection.*

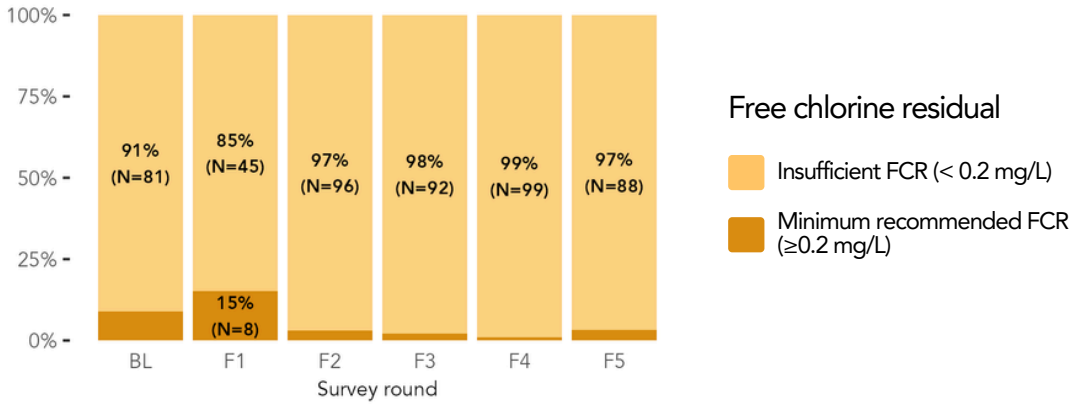


Figure 3: Free chlorine residual (FCR) of public piped water taps at each sampling time in Asutifi North (n=526 across all visits).

In February 2025 (F5), 16% of piped water samples had detectable total chlorine (TCR ≥0.1 mg/L), indicating those piped supplies were being treated with sufficient chlorine for some disinfection to occur. However, **only 3% had the minimum recommended FCR (≥0.2 mg/L), indicating that most had insufficient chlorine for continued protection** (n=91). Further, at households with stored piped water, **no stored household samples had FCR ≥0.2 mg/L** (n=53) (Figure 4). This indicates **households' stored water was no longer protected against recontamination.** This explains the increase in *E. coli* contamination in stored household water as compared to samples collected directly from taps, as seen in Figure 2.

The World Health Organization's Guidelines for drinking-water quality for small water supplies recommends a free chorine residual of 0.5 mg/L for public water supplies that will be transported and stored in households. Across all sampling rounds, less than 1% of samples from piped supplies met that recommended level.

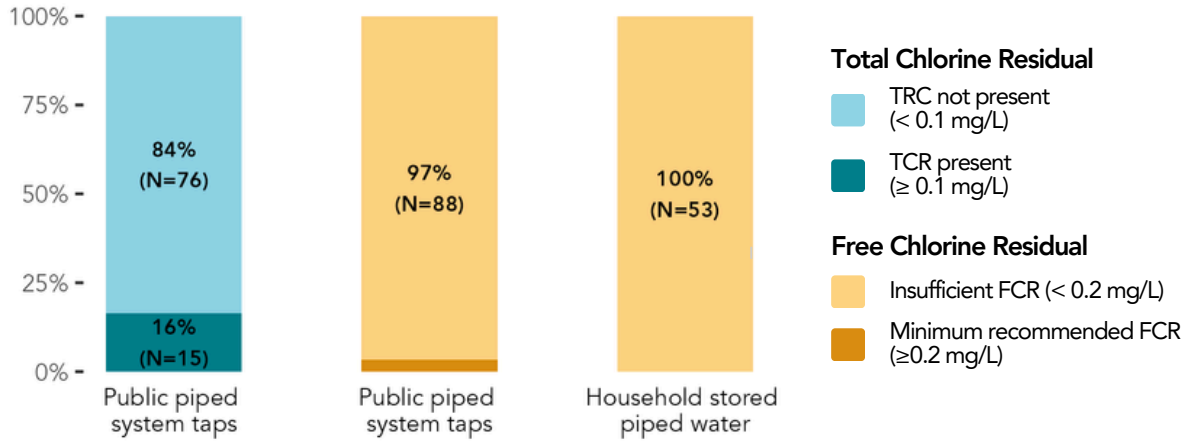


Figure 4: Public piped system tap samples with detectable total chlorine (TCR ≥0.1 mg/L, left) and minimum recommended free chlorine residual (FCR ≥0.2 mg/L, center), along with minimum levels of free chlorine residual (FCR ≥0.2 mg/L) in stored household piped water (right). Samples were tested in Asutifi North in February 2025.

ON-PLOT PIPED WATER

Across all sampling times, nearly one in five households (19%) had an on-plot piped water connection, though fewer (10%) stated that was their current drinking water source. The vast majority of households drinking water from their on-plot tap (82%, n=114) still stored their drinking water in the home. This may be because piped systems don't always provide water at all times (33% of taps were reported to have intermittent supply) or that households find having water inside the home more convenient. **Storing on-plot piped water had a noticeable effect on microbial quality:** presence of *E. coli* increased from 41% at on-plot taps to 82% in household stored drinking water. Households with on-plot piped connections had lower water quality at the tap than households relying on public standpipes (41% vs 20% with *E. coli*), and equally poor stored water quality.

SACHET WATER

MICROBIAL WATER QUALITY

Packaged water consistently had the lowest *E. coli* levels among all water sources, with only 6% of packaged water samples in February 2025 (F5) having detectable *E. coli* (Figure 5). This proportion was similar to other sampling events, with 10% of all packaged water samples collected since 2022 having tested positive for *E. coli* (n=337). **Contamination was present across many different sachet water brands.** Of 17 brands with more than five samples tested since 2023 (when we started collecting the brand names), eleven sachet water brands (65%) had detectable *E. coli* at least once (Table 1).

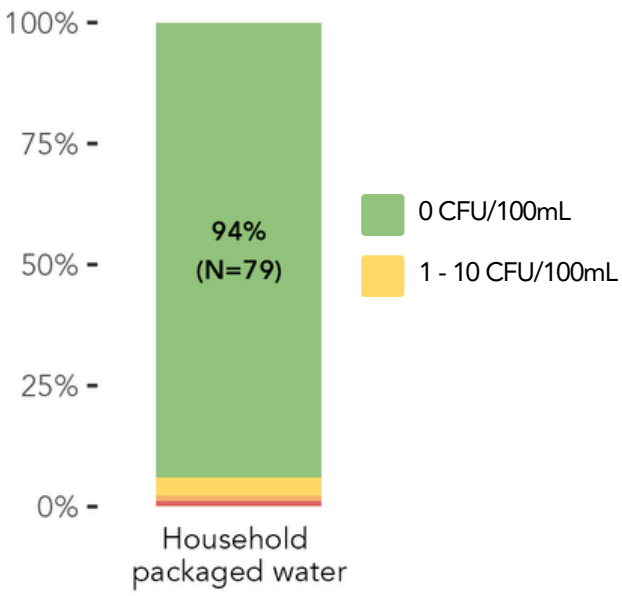


Figure 5. *E. coli* risk levels in packaged water samples (sachet and bottled water) collected from households. Samples were tested in Asutifi North in February 2025.

Table 1: Sachet water samples collected from households in Asutifi North district from 2023-2025 (when brand names were collected). *E. coli* results are presented for brands with more than five samples.

Sachet water brand	Number of samples tested	% samples with positive *E. coli* *(>0 CFU/100mL)*
Apple Ice	6	0%
EA lyfe	8	0%
IZAY K.	9	0%
Omega One	7	0%
Salvation	6	0%
Voltic Cool Pac	8	0%
Ako	20	5%
Jay Ice	29	7%
Top Safe	32	9%
Aces	19	11%
Robee	9	11%
The Hammers	14	14%
Cool	19	16%
Eurovic	12	17%
Topline	6	17%
Everwell	27	19%
Purity	8	25%

RECOMMENDATIONS

All piped water supplies should be chlorinated.

Chlorination should be done more consistently and at higher levels to ensure free chlorine residual stays above 0.2 mg/L throughout piped networks.

Unless chlorination of piped supplies improves substantially, sachet water is the safest option to preserve water quality during household storage.