# 1. Executive Summary

This sampling plan outlines the methodology for conducting baseline household and water point surveys across three ChlorAction pilot countries: Chad, Somalia, and Nigeria. The surveys aim to measure the uptake of chlorinated water in project sites, with the primary indicator being the presence of properly chlorinated water in households (Free Residual Chlorine [FRC] 0.2–0.5 mg/L). The survey tools also gather critical information on secondary, but related indicators pertaining to access to sanitation facilities, hygiene practices, trends in diarrheal disease, and healthcare seeking behaviors, among others, in project sites. The plan employs a harmonized project-wide sampling approach, which is then tailored to each country context to ensure 1) adequate statistical power and precision to detect key changes to in the use of safe, chlorinated water (project-level), and 2) survey representation across all communities to gain sufficient insight for programmatic design and decision-making.

# 2. Harmonized Sampling Methodology and Key Considerations

## 2.1 Household WASH KAP Survey Primary Indicator

The main condition of interest is the presence of properly chlorinated water in households, defined as water with FRC levels between 0.2 and 0.5 mg/L.

## 2.2 Household WASH KAP Survey Core Sampling Parameters

* **Confidence Level:** 95% (Z = 1.96)
* **Margin of Error:** ±5% at project level
* **Expected Response Rate:** 85%
* **Statistical Power:** Adequate power to detect 10 percentage point changes from baseline to endline at project-level.

NOTE: this sampling achieves acceptable statistical precision and power **at project-level** (i.e. within each pilot country), NOT at site-level.

## 2.3 Household WASH KAP Survey Sample Size Calculation

Sample sizes were calculated using the standard formula for proportions, with adjustments for statistical power requirements where applicable:

*n = (Z² × p × (1-p)) / d²*

Where baseline prevalence (p) varies by country, based on prior programming history and survey data. Given large population sizes, finite population corrections were minimal. Additional surveys added to the calculated sample size in Nigeria and Somalia to guarantee a minimum level of programmatic insight will be available for all project sites (modified proportional allocation to account for account for dramatic difference is community size).

## 2.4 Water Point Surveys

Water point surveys employ exhaustive sampling:

* **Chad:** 52 water points across 7 camps
* **Somalia:** 50 water points across 29 communities
* **Nigeria:** 320 water points across 93 communities

# 3. Chad Sampling Plan (HH KAP)

## 3.1 Context

* **Total population:** 75,142 households across 7 refugee camps
* **Population range:** 5,930 to 13,632 households per camp
* **Assumed baseline prevalence:** 50% (based on most recent IRC KAP survey)

## 3.2 Sampling Strategy

Proportional allocation across all camps. With a relatively even distribution of populations and only 7 camps, proportional allocation ensures adequate representation at each site while maintaining statistical efficiency.

## 3.3 Sample Size Calculations

* **Target completed surveys:** 384 households
* **Households to approach (85% RR):** 456 households
* **Sample per camp:** Range from 30 to 70 households

## 3.4 Statistical Power

* **Project-level margin of error:** ±5% (95% CI)
* **Power:** Adequate to detect 10 percentage point change (50% → 60%)
* **Camp-level precision:** Margins of error range from ±9% to ±18% per camp

## 3.5 Sample Allocation by Camp

| **Camp** | **Households** | **% of Total** | **Sample** | **To Approach** |
| --- | --- | --- | --- | --- |
| Aboutegue | 12,033 | 16.0% | 62 | 73 |
| Allacha | 12,581 | 16.7% | 64 | 76 |
| Mietche | 10,596 | 14.1% | 54 | 64 |
| Arkoum | 13,468 | 17.9% | 69 | 82 |
| Farchana | 6,902 | 9.2% | 35 | 42 |
| Treguine | 5,930 | 7.9% | 30 | 36 |
| Bredjing | 13,632 | 18.1% | 70 | 83 |
| **TOTAL** | **75,142** | **100%** | **384** | **456** |

# 4. Somalia Sampling Plan (HH KAP)

## 4.1 Context

* **Total population:** 130,428 households across 29 communities
* **Population range:** 295 to 42,615 households per community
* **Assumed baseline prevalence:** 13% (based on previous WASH programming)

## 4.2 Sampling Strategy

Modified proportional allocation with minimum 5 households per community. Given the extreme variation in community sizes and the need for programmatic insights across all sites, this approach ensures every community contributes meaningful data while maintaining statistical power at the project level.

## 4.3 Sample Size Calculations

* **Target completed surveys:** 228 households
* **Households to approach (85% RR):** 284 households
* **Sample per community:** Range from 5 to 32 households

## 4.4 Statistical Power

* **Project-level margin of error:** ±6.5% (95% CI)
* **Power:** Adequate to detect 10 percentage point change (13% → 23%)
* **Community-level precision:** Directional insights; wide confidence intervals at individual community level

## 4.5 Top Communities by Sample Size

| **Community** | **Total HH** | **Sample** | **To Approach** |
| --- | --- | --- | --- |
| Dhusamareb town | 42,615 | 32 | 38 |
| Adado town | 21,263 | 19 | 23 |
| Abudwak town | 20,000 | 18 | 22 |
| Guriel town | 15,948 | 15 | 18 |
| Galkayo town | 10,200 | 11 | 13 |
| 24 additional communities | 20,402 | 133 | 170 |
| **TOTAL (29 communities)** | **130,428** | **228** | **284** |

# 5. Nigeria Sampling Plan (HH KAP)

## 5.1 Context

* **Total population:** 239,784 households across 93 communities
* **Population range:** 259 to 17,000 households per community
* **Assumed baseline prevalence:** 15% (based on previous WASH programming)

## 5.2 Sampling Strategy

Modified proportional allocation with minimum 8 households per community. The large number of communities (93) necessitates a higher minimum to ensure meaningful data collection at each site while the proportional component maintains statistical representativeness.

## 5.3 Sample Size Calculations

* **Target completed surveys:** 759 households
* **Households to approach (85% RR):** 893 households
* **Sample per community:** Range from 8 to 16 households

## 5.4 Statistical Power

* **Project-level margin of error:** ±1.13% (95% CI)
* **Power:** Exceptional - significantly exceeds minimum requirements
* **Community-level precision:** Approximately ±17-22% per community

## 5.5 Top Communities by Sample Size

| **Community** | **Total HH** | **Sample** | **% of Total** |
| --- | --- | --- | --- |
| General Hospital | 17,000 | 16 | 7.09% |
| Nassarawo | 11,402 | 11 | 4.76% |
| Jambutu | 10,290 | 10 | 4.29% |
| Water Board IDP camp | 9,392 | 9 | 3.92% |
| Gipaima | 8,950 | 9 | 3.73% |
| 88 additional communities | 192,750 | 714 | 76.2% |
| **TOTAL (93 communities)** | **239,784** | **759** | **100%** |

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# 6. Summary

## 6.1 Comparative Overview

| **Metric** | **Chad** | **Somalia** | **Nigeria** |
| --- | --- | --- | --- |
| Communities/camps | 7 | 29 | 93 |
| Total households | 75,142 | 130,428 | 239,784 |
| Baseline prevalence | 50% | 13% | 15% |
| Completed surveys | 384 | 228 | 759 |
| To approach | 456 | 284 | 893 |
| Project MoE | ±5.0% | ±6.5% | ±1.13% |

## 6.2 Notes

* **Response rate monitoring:** Response rates, as well as reasons for non-response will need to be tracked closely. If rates fall below 85%, additional households will be approached to maintain target sample sizes. If response rates are uneven between communities, additional analysis will be conducted to determine potential biase(s).
* **Random selection:** systematic random sampling will be used within each community/camp to ensure unbiased household selection.
* **Power for change detection:** All three countries have adequate sample sizes to detect 10 percentage point changes from baseline to endline.
* **Interpretation:** Community-level results provide directional insights only. Project-level aggregation yields robust statistical conclusions.