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Rapid Methods for Assessing Water, Sanitation and Hygiene (WASH) Services at Refugee Camps in Emergency Settings

Briefing Note

(updated May 2019)

Kenya / Somali Refugees / IFO Camp Dadaab, The nothing but nets malaria survey in IFO. Respondents being interviewed. Nov 2010. © UNHCR/Sarah Hoibak

COVER PHOTO:

Kenya. United Nations High Commissioner for Refugees Filippo Grandi visits the Dadaab refugee camps to assess the situation in the camps and meet with refugee representatives. And aerial view shows part of the Dadaab refugee camps in Kenya. Many of the refugees that talked to the High Commissioner said that they would like to return home to Somalia but that repatriation should be done in a dignified and humane manner. They also voiced their wish for a continued investment by the international community in the Dadaab refugee camps. © UNHCR/Siegfried Modola

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1 INTRODUCTION

1.1 Need for this manual

Water, sanitation, and hygiene (WASH) services are critical for reducing morbidity and mortality during the humanitarian emergencies in refugee settings. The ability to monitor and assess these services during emergencies is essential. Household-based Knowledge Attitudes and Practices (KAP) surveys are used by UNHCR and its partners to inform WASH program design. While this method provides precise (± 5%) estimates of WASH core indicators, it requires a sample size of 360 households (HH) and takes several days to complete with a team of trained surveyors to complete. During acute stages of emergencies, when there is limited time and resources available to collect data and little or no information about the number of households in a camp, there is a need for a rapid assessment method. The random location cluster (RLC) sampling approach presented in this manual is a method that can be used for rapid assessments of WASH services in camps during the early stages of an emergency.

This manual originated from a demand for a sampling approach that could be completed with four to six trained interviewers in a day. Research studies previously commissioned by UNHCR used Monte Carlo simulations to demonstrate that a 60 HH sample size was adequate for rapid assessments of core WASH indicators, even with sampling designs with 20 clusters of 3 households. This research proposed that clusters of households could be selected using random GPS coordinates. However, it was noted that this approach can introduce a bias due to spatial variations in the level of services. For example, households with better access to services may be clustered in the camp center and those lower access to services may be available on the outskirts. To compensate for this bias, it was proposed to use weighting factors based on the estimated population density at each cluster. In 2017, the RLC sampling method was pilot-tested by UNHCR, CDC, and the REACH Initiative at 19 different camp zones in emerging settlements in Bangladesh, Syria, and Iraq. Following this successful pilot study, UNHCR and REACH decided to deploy the use of the RLC sampling method internally for one year to obtain broader feedback. The purpose of this briefing note is to provide guidance on the implementation of this sampling method.

1.2 Target audience

The target audience for this manual includes UNHCR WASH partners involved in camp-based humanitarian WASH response efforts. This manual is intended for these user groups. This manual can be used to prepare for and implement RLC surveys for the rapid assessment of WASH services during emergencies. The manual can also be used for capacity building activities with relevant staff.

1.3 How to use this manual

This manual provides an overview of the RLC sampling approach, including the methodologies for mobile data collection, design effect estimates, and the adjustment for the household density bias. The steps of preparing and completing a survey using the RLC method are described. As such, this manual provides a general guideline. The survey design should be adapted to the context in which you work. Additional tools to complement this manual are available on http://wash.unhcr.org/.

2 OVERVIEW OF RLC WASH SURVEYS

2.1 What is an RLC sample?

An RLC sample stands for Random Location Cluster sample. In this method, households are identified based on randomly generated GPS coordinates within the populated physical boundaries of the camp or zone. To save time, three households closest to each of 20 randomly-generated coordinates are surveyed, forming 20 "clusters" of 3 households.

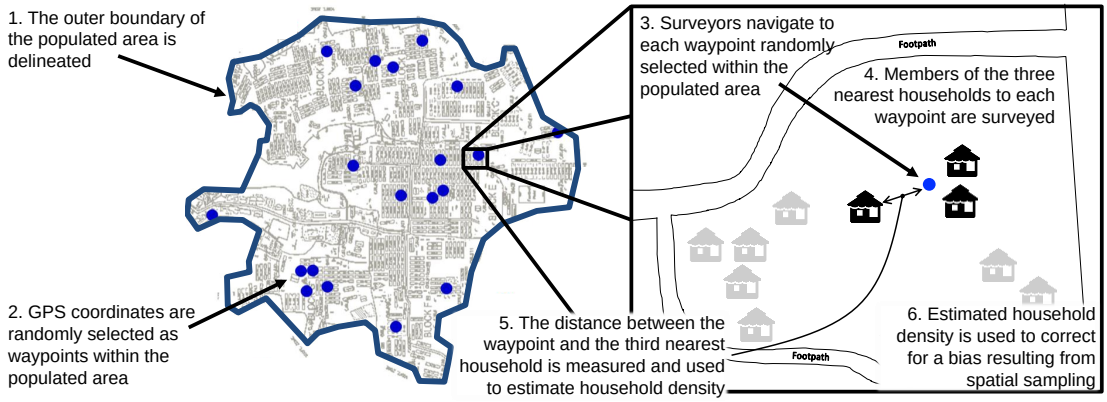

Figure 1. Overview of the RLC sampling method

2.2 Objectives of a rapid assessment

The objectives of a WASH rapid assessment are to obtain a brief snapshot of WASH services at the household level, determine problematic areas for immediate attention, and track progress and compliance with UNHCR WASH standards. The survey is purposefully brief, including only questions related to six core WASH indicators and UNHCR standards for emergencies (Table 1). This brevity reduces the time required to complete the survey by collecting only the most important information. The suggested questions for the RLC survey are provided in Table 2. Additional questions can be included as appropriate, however additional indicators have not been piloted, and the errors associated with RLC sample estimates for other indicators may be different than the errors presented herein.

Table 1. Core indicators for the RLC survey and UNHCR standards during emergencies

No.	Indicator	UNHCR Standard for Emergency Situations
1	Average liters per day of potable water collected per person at the household level	>15 L/p/d
2	Percent of households with at least 10 liters/person potable water storage capacity	>70%
3	Percent of households collecting drinking water from protected/treated sources	>70%
4	Percent of households reporting defecating in a toilet	>60%
5	Percent of households with access to soap	>70%
6	Percent of households with a designated bathing facility	>70%

Many camps/settlements have populations between 5,000 and 150,000 people, with a total of 1,000 to 30,000 households, although this can vary widely for each situation. Camps are often subdivided into several different administrative zones, and in some situations, it is necessary to estimate differences in the level of WASH services for each zone within a camp, in order to target corrective actions for zones with the lowest levels of service. It is important to note that you must

collect 60 HH samples from each zone for which you want to have independent estimates (to make independent decisions to take action).

3 PREPARING FOR THE SURVEY

During an emergency, the resources needed to complete a KAP survey might be better spent addressing immediate needs of the emergency. The RLC sampling method saves time by sampling only 60 HH, but does so at the expense of precision. The KAP survey method (with the recommended 360 HH sample size) gives a margin of error of ±5% (with 95% confidence). The margin of error of the RLC method at the same confidence level ranges from ±13% at best to ±22% at worst (see Box 1).

3.1 Deciding if RLC sampling should be used

Different sampling approaches are appropriate for different situations. In a post-emergency setting, the standard KAP survey method should be followed. During emergencies, systematic "skip interval" sampling is preferable over RLC sampling, but is only possible if the total number of households is known and if households are situated in a clear pattern (e.g. rows), which is common in planned camps. If the situation of households presents challenges for systematic sampling, RLC sampling should be used. The decision tree in Figure 1 can help determine the most appropriate sampling approach.

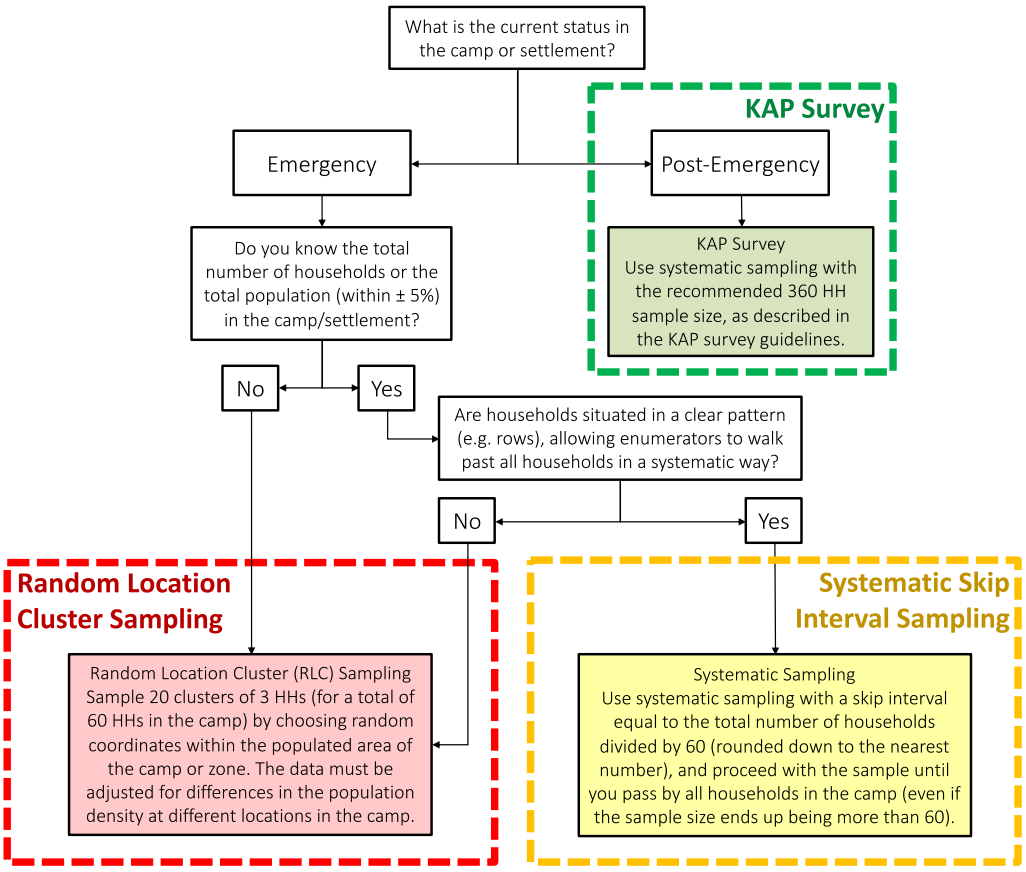

Figure 2. Decision tree to decide when to use the RLC sampling method

BOX 1. MARGIN OF ERROR OF SAMPLE ESTIMATES

What does it mean to have a margin of error of ±18% at 95% confidence?

A **margin of error** of ±18% means that if your RLC survey data indicate that 50% of households from a camp have access to a toilet, the true underlying percentage of households in the entire camp with access to a toilet may be as low as 32% or as high as 68%. The term **95% confidence** means that on average, 95 out of 100 times a survey is completed, the true underlying percentage of households in the entire camp will lie somewhere between the upper and lower limits (*i.e.*, 32% – 68% for example above).

The margins of error for the RLC sampling method differ from question to question, ranging from ±13% and ±22%. The reason for this difference in precision is that the use of clusters introduces what's known as a **design effect**, which is a measure of how similar households within a cluster are to each other, compared to households in other clusters. A design effect of 1.0 means that cluster sampling provides the same precision as simple random sampling. A design effect of 2.0 means that the cluster sample requires twice as many households as a simple random sample to provide the same level of precision. A design effect of 3.0 means that the cluster sample requires three times as many households as a simple random sample to provide the same level of precision. Design effects can be different for each question asked. Pilot testing of the RLC method with 20 clusters of 3 households indicated that the design effects are around 1.5 for some questions and as high as 2.5 for others. The design effect should be estimated each time an RLC sample is collected. More information about the design effects and how they can be estimated is provided in the report from the RLC Pilot Project, available at wash.unhcr.org.

3.2 Defining the boundaries of the populated area

Before starting the RLC survey, it is important to make a quick reconnaissance of the site to define the physical boundaries of the populated area of the camp. The recommended tool to use for defining the boundaries of the populated area of the camp is Geographical Information Systems (GIS) software. A variety of open source GIS software is available for free download and use, for example: QGIS (qgis.org), GRASS GIS (grass.osgeo.org), and gvSIG (gvsig.com). If recent satellite imagery is available and georeferenced, then the satellite images can be used in a GIS software to define the boundary of the populated area remotely. However, it should be noted that in many emergency situations, the population dynamics change so rapidly that satellite images taken several weeks prior to the planned date of an RLC survey may be no longer accurate. It is best to drive or walk the boundary of the populated area one day prior to the implementation of the RLC survey, recording the coordinates of points along the boundary using a GPS unit (some GPS units also allow users to record paths or lines instead of points). GPS points along the populated area boundary can be uploaded into GIS software to draw a polygon around the populated area.

3.3 Generating random waypoints

Most GIS software will have some sort of tool that allows for the generation of random points (waypoints) within a polygon based on the selection of random coordinates. For example, QGIS has the "random points inside polygons" feature. The Annex of this briefing note has an explanation of how to

generate random waypoints in QGIS. In addition, tutorials can be found online.[1] The RLC sampling method requires 60 HH to be selected in cluster sizes of three, meaning that 20 random waypoints are needed. However, if the waypoints have to be generated a day or two in advance (for example, if internet is needed to generate the waypoints, but there is no internet at the camp), it is advantageous to generate several "extra" waypoints at the beginning, in case one or more of the waypoints ends up being in unfavorable locations, such as in the middle of a pond or an agricultural field, or in some other non-populated area that can be removed from the populated area boundaries *post hoc* (see Figure 2).

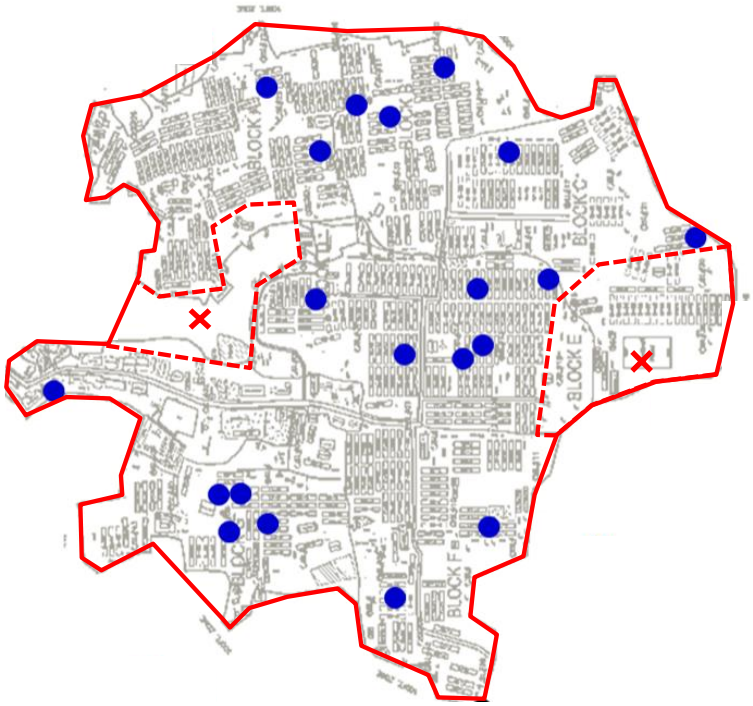

Figure 2. Polygon of the outer boundaries of a camp (solid red lines) with 20 random waypoints generated (blue filled circles); Also shown are two points (red X marks) that can be eliminated from the list of waypoints because they fall within uninhabited areas of the camp (new boundaries of the populated area are delineated with dashed red lines).

3.4 Developing the questionnaire

For the most part, the questionnaire for rapid assessment surveys will be relatively consistent from site to site, with the same general questions included in each survey. However, the wording of the questions may change depending on the implementing organization's perception of the most appropriate way to ask each question, given the geographical and cultural context of the site or the language that the survey is conducted in. Table 2 includes a list of the core set of questions, with some common variations of each question. Survey questions can be modified based on your setting in case the questions at disposition are not appropriate for your survey. Modifications can include changing the phrasing of an existing question to better fit the context/objective, adding a completely new question, or modifying, adding, or deleting answer choices based on the setting. Refugee settings around the world differ much from one to another in terms of WASH services or cultural practices and habits. For example, types of latrines might be different in Asia and in Africa; in some camps water

[1] See http://youtu.be/A-nloh5jYvY or search for "Random Points Inside Polygon" on Youtube or other online video references

might be stored in large household tanks whereas in most camps the population uses in-house recipients. To make the questionnaire as light as possible, it is recommended to remove all answer options that are not relevant in the context of the planned survey. It is also important to try to keep changes to a minimum so as to maintain comparability over time and across different sites.

Table 2. Core set of questions for the RLC WASH survey, grouped by indicator

Questions	Variations (alternative phrasings for questions)	Instructions for XLS Programmers and Surveyors
General preliminary questions		
What is the name of the camp or zone being assessed?		
Enter the waypoint number used to identify this household. Re-enter the waypoint number.		**XLS Programmer:** Use unique three-digit numbers for each waypoint.
Enter the household number.		**XLS Programmer:** Number the households 1, 2, 3, etc. If one (or more) of the first three households must be skipped due to non-response or other reasons, the replacement household(s) should use a unique number (starting with 4, 5, etc.)
Record the household's GPS coordinates		
How many people live and slept in this house last night?		
Introduction and Consent Statement		
Hello, I am on a team that is working with UNHCR. We are doing an assessment on water, sanitaiton, and hygiene in this camp. The survey usually takes 10 minutes to complete. Any information that you provide will be kept anonymous. This is voluntary and you can choose not to answer any or all of the questions if you want; you may also choose to quit at any point. However, we hope that you will participate since your views are important. Participation in the survey does not have any impact on whether you or your family receive assistance. Do you have any questions? May I begin now?		
1. Average number of liters per day of potable water collected per person at the household level **2. Percent of households with at least 10 liters/person potable water storage capacity** **3. Percent of households collecting drinking water from protected or treated sources***		
What is the principal source of drinking water for members of your household? If other, please specify.	Variation (replaces a/b/c): How many containers do you have to COLLECT and STORE drinking water for your house? Could you show me them one-by-one? REPEAT: What is the type of container? What is the volume of the container? Is the container protected? Number of journeys made with the container for the collection of water YESTERDAY.	**Surveyor:** Add the cumulative volume of all protected containers and all unprotected containers. The following are considered protected or treated sources: public taps/standpipes, handpumps/boreholes, piped connections, protected springs, water sellers/kiosks, tanker trucks, bottled water/sachets. The following are not considered protected or treated: unprotected wells, surface water (lake, pond, and river), unprotected springs, rainwater collection.
What is the total volume of containers or tanks you have to COLLECT and STORE drinking water for your house? Could you show me all of them one by one?		
What is the total number of journeys made with containers for the collecting of DRINKING water YESTERDAY?		
Calculate the total volume of drinking water collected.		**Surveyor:** Add up the cumulative volume of drinking water collected based on the volume of the containers and the number of journeys made with each container during a day.
Do you treat your water before drinking it now? How do you usually treat your drinking water now?	Variation: Did you treat your water today before drinking it? How did you treat it?	
4. Percent of households reporting defecating in a toilet		

Questions	Variations (alternative phrasings for questions)	Instructions for XLS Programmers and Surveyors
Where do you and your household members usually go to defecate? if other, please specify.	Variation: Where do you and your household members usually go to the toilet? If other, please specify.	
5. Percent of households with soap for handwashing		
Could you please show me the soap or other rubbing agent you have in the household?		**Surveyor:** Was it presented within one minute?
6. Percent of households with a designated bathing facility		
Please show me the facility where you and your family members bathe.		**Surveyor:** Do they have a designated bathing facility?
General questions for the estimation of the household density correction factor		
Can the horizontal distance between the waypoint and the third nearest household be measured easily?		
If yes: What is the horizontal distance in meters between the third nearest household and the cluster GPS waypoint used to identify this household?		**Surveyor:** If the distance is longer than 100 m, do not measure it, enter 999 or see if there is a portion of the camp that can be eliminated from the inhabited area (see Figure 2). How was this distance measured? (GPS, digital meter, tape measure, approximated visually)
If no: Record the GPS coordinates of the waypoint and the third nearest household.		

The use of mobile devices to collect survey information is highly encouraged. To facilitate the task of partner organizations, both in deploying the WASH KAP and in data collection, we have set up a mobile version of the form compatible with related analysis tools. A preview of this form can be found on UNHCR's website: http://wash.unhcr.org/. Using mobile devices to implement the survey has many advantages, such as increasing data quality, increasing the speed of data collection and analysis, avoiding double entry of data and associated loss of time, capturing GPS points or photos using the same tool, managing multi-lingual environments more easily, integrating data collection with pre-programmed data analysis scripts, and many more. Mobile devices should not be used if the security situation is uncertain and bringing smartphones or tablets could be risky for the surveyors, or if the time required to buy the phones, set up the system, etc. will not outweigh the time saved on data entry.

3.5 Pre-testing and training survey team members

Prior to implementation, the survey must be pre-tested during a pilot test. This will help the survey team familiarize themselves with the questionnaire and check the appropriateness of the questions. This pre-test is especially important if mobile data collection devices are used, as it is the last opportunity to evaluate the content of the survey before deployment. It is crucial to run the pre-test in a situation that is as close to the real one as possible (ideally done with refugees of the same camp that are not in the sampling). It will also be a good way to test the surveyors' standard operating procedures to check the surveyors' behaviors (proper introductions, consent demand, explanations, and required observations) to avoid any bad habits that may be harder to notice and change after deployment. The pilot debrief session is essential for all to get off to a good start.

Before conducting the survey, the surveyors need to be trained on the purpose and objectives of the RLC survey, the roles and responsibilities of the surveyors, the rationale for each question, the use of mobile data collection devices (if applicable), the selection of households (using the random GPS locations), interviewing techniques and common errors (e.g. do not read out instructions, just the

question exactly as it is formulated). Surveyors should also review each question of the questionnaire to see whether they are clear or if they need to be reworded. They should review the use of the GPS unit to find the waypoints generated randomly, and they should feel comfortable measuring the distance in meters between the waypoint and the third nearest household.

4 IMPLEMENTING THE RLC METHOD

4.1 Finding the waypoints

Enter each pair of coordinates, one at a time, as waypoints into the phone or GPS unit. If you sort the points first by latitude, then by longitude, it will make it easier to walk to them in order (without having to cross-cross the camp several times). Or you can use navigation applications on the mobile device to navegate to the waypoints. Various free aplications can be used for ofline navegation (e.g. Avenza).

Once you enter a waypoint, navigate until you arrive at the specified point. Suppose the waypoints are labeled 101 – 120. When you arrive at waypoint 101, find and survey the nearest three households. Then, measure the distance between waypoint 101 and the third-nearest household to that waypoint.

BOX 2. RULES FOR MEASURING THE DISTANCE TO THE THIRD NEAREST HOUSEHOLD

1. Measure from the waypoint to the nearest edge of the closest household or shelter.
2. If there is some physical barrier preventing the measurement of this distance (another household or a wall), estimate the distance using another means, and make a note of the method used.
3. If the distance to the third nearest household appears to be longer than 100 m, do not measure it. See if there is a portion of the camp that can be eliminated from the area of interest (the inhabited area). If this area cannot be eliminated, then enter 999 m as the distance and continue with the survey.

4.2 Conducting the surveys

The survey manager will distribute the list of random GPS coordinates to the team(s) of surveyors at the start of the day. Each surveyors will aim to survey 12 – 15 households per day (i.e. 4 – 5 waypoints per day). When the team arrives in the camp/site at the assigned location, the team members should first meet with the area leader (block/section leader) to inform her or him that the data collection will start. After this formality, the surveyors will proceed to finding the first waypoint and interviewing the first three households. Upon arriving at the household, the surveyors will knock on the door and introduce themselves and the purpose of the visit. The surveyor will request for the appropriate respondent or household member. That will generally be the head of household, or an adult family member who can provide WASH information on his or her behalf. Individuals that are around but that are not directly participating in the survey should be kindly asked to leave, for enhanced privacy of the respondent.

If the appropriate person is available, the surveyors should first explain why this particular household was randomly selected and assure the household that information will be kept private and anonymous. The surveyors should then explain the study procedures and ask the potential participant

if he or she is willing to provide informed verbal consent for participating in the survey. If the person agrees to participate, then data collection can begin using the data collection tool. If the person refuses to participate, record the refusal, close the form and move on. The informed consent process should follow the protcol approved in country.

If the appropriate person is not available, the surveyors should ask if it is possible to arrange a return visit. If the person does not agree to a return visit, record the refusal, close the form, and move on. If the appropriate person is not available at the particular moment (e.g. very busy) or no one is home, the household should be revisited later. Each eligible household shall be visited at least two times (each subsequent call at least two hours apart). If there is no success after two visits, that household will be recorded as non-responding and the next closest household will be surveyed to replace the non-responding household. If a household is reported as being abandoned (neighbors report that no one has lived there for more than a month or inhabitants have been repatriated), then no subsequent visits are needed and the next closest household will be surveyed in replacement of the abandoned household.

5 ANALYZING AND REPORTING THE RESULTS

The analysis of data from the RLC survey rapid assessments is different from the analysis of data from other surveying methods (such as the KAP survey), because it requires 1) adjusting the values for the bias introduced by differences in household density, and 2) correcting the margin of error due to the design effect caused by intracluster correlation.

5.1 Estimating household density

Estimate the household density at each waypoint based on the area of a circle defined by a radius equal to the distance between the waypoint and the third nearest household. The calculation can be performed as shown below, where 3.14 is the value of *pi*, and L is the length (*e.g.*, in meters) between the waypoint and the third nearest household to that waypoint.

$$\text{Household Density} = \frac{3}{3.14 \times L^2}$$

5.2 Adjusting for the bias associated with household density

At the end of the survey, before the data are analyzed, the values recorded for each household should be weighted by the relative density of households in the corresponding cluster. The weighting factors are calculated as the estimated household density divided by the average household density in the camp (the average of the 20 estimated household density values from each waypoint). For example, suppose the estimated densities of households at waypoints 101 – 120 were 5, 10, or 15, as shown in Table 3. In this example, the households near the less densely-populated waypoints were more likely to have toilets than the households in the more densely-populated waypoints. But, they are also more likely to get chosen from a randomly-selected GPS point, so the overall average of 50% was adjusted down to 45%, which is the average of the adjusted survey responses (note that 0.45 = 45%).

Table 3. Example calculation of weighting factors for the adjustment of survey responses due to differences in household density

Waypoint		101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	Avg
Estimated HH Density (HH/ha)		5	5	5	5	5	5	10	10	10	10	10	10	10	10	15	15	15	15	15	15	10
Weighting Factor (HH density / overall avg HH density)		5/10 = 0.5	0.5	.0.5	0.5	0.5	0.5	10/10 = 1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	15/10 = 1.5	1.5	1.5	1.5	1.5	1.5	- - -
Survey Response (unadjusted) Where do you go to defecate? 1: toilet 0: no toilet	HH1	1	1	0	1	1	1	1	0	0	1	1	0	1	0	0	0	1	0	0	0	**30/60 = 50%**
	HH2	0	1	1	1	1	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0	
	HH3	1	1	1	1	1	0	1	1	1	1	0	0	0	1	1	0	0	0	0	1	
Adjusted Survey Response (unadjusted value * weighting factor)	HH1	1*0.5 = 0.5	0.5	0	0.5	0.5	0.5	1*1 = 1.0	0	0	1	1	0	1	0	0	0	1.5	0	0	0	**Adj. Avg: 0.42 (42%)**
	HH2	0	0.5	0.5	0.5	0.5	0	0	1	1	1	0	0	0	0	1.5*1 = 1.5	0	0	0	0	0	
	HH3	0.5	0.5	0.5	0.5	0.5	0	1	1	1	1	0	0	0	1	1.5	0	0	0	0	1.5	

5.3 Accounting for the margins of error

Table 4 summarizes the anticipated margins of error for each WASH indicator for 60 HH samples collected using the RLC sampling method. These margins of error have been adjusted based on the design effects observed at the 19 sites from Bangladesh, Iraq, and Syria that were part of the pilot study. The margins of error shown in Table 4 are also within the range of the values estimated in simulations done previously based on data from three camps in Ethiopia (UNHCR, 2017). In the future, design effects can be estimated from the data collected each time an RLC survey is completed. Monitoring the design effect in future rapid assessments can be done to ensure that the recommended margins of error are within a reasonable range, and it also may result in the decrease of the 95% confidence intervals associated with the estimated values shown in Table 4.

Table 4. Core indicators for the rapid assessment, as well as estimated design effects, and estimated margins of error for 60 HH samples collected using the RLC method

No.	Core WASH Indicator	UNHCR Standard	Estimated Design Effect (95% CI)	Estimated Margin of Error* (95% CI)
1	Average liters per day of potable water collected per person at the household level	>15 L/p/d	2.3 (2.2, 2.4)	±5.2 (1.8, 8.7)
2	Percent of households with at least 10 liters/person potable water storage capacity	>70%	1.2 (1.1, 1.3)	±13% (10%, 15%)
3	Percent of households collecting drinking water from protected/treated sources	>70%	1.8 (1.2, 2.4)	±17% (8%, 23%)
4	Percent of households reporting defecating in a toilet	>60%	2.2 (1.8, 2.6)	±18% (11%, 24%)
5	Percent of households with access to soap	>70%	1.3 (1.2, 1.5)	±13% (9%, 17%)
6	Percent of households with a designated bathing facility	>70%	1.5 (1.3, 1.7)	±14% (9%, 18%)

* For percentage indicators, the margin of error changes depending on the estimated value, with the largest margin of error occurring at an estimate of 50%, and smaller margins of error occurring at higher or lower estimated percentages. The values listed in this table correspond with the estimated margins of error at the level of the UNHCR standard (60% or 70%, depending on the indicator).

The following section (*Interpreting the results*) contains instructions about how to apply the margins of error to the adjusted indicator values to assess the quality of the WASH services (with respect to the UNHCR Standards) and to make an informed decision about whether or not an intervention needed to improve the WASH service.

5.4 Interpreting the results

As illustrated in Box 1 above, a margin of error of ±18% means that if the adjusted RLC survey data indicate that 45% of households from a camp have access to a toilet, the true underlying percentage of households in the entire camp with access to a toilet may be as low as 27% or as high as 63%. These lower and upper limits are known as the **confidence interval** (specifically, the 95% confidence interval). RLC survey results can be reported with a color coding system based on the estimated value of each indicator minus the margin of error, relative to the UNHCR standard. Table 5 shows examples if the adjusted average values for percent of households reporting defecating in a toilet were 40%, 55%, or 80%.

Table 5. Color coding system for showing results from the RLC WASH survey rapid assessment

Color	When to use this color	Example for Indicator 4: % of HH reporting defecating in a toilet	What it means
Green	When the confidence interval is completely above the UNHCR standard	Adjusted Avg. = 80% (margin of error ±18%) 80% – 18% = 62% 62% > 60%	There is 95% confidence that the population is in compliance with the UNHCR standard.
Yellow	When the UNHCR standard is within the confidence interval of the sample estimate	Adjusted Avg. = 55% (margin of error ±18%) 55% – 18% = 37%; 55% + 18% = 73% 37% < 60% < 73%	The population may or may not be in compliance with the UNHCR standard. Recommend to continue monitoring the situation.
Red	When the confidence interval is completely below the UNHCR standard	Adjusted Avg. = 40% (margin of error ±18%) 40% + 18% = 58% 58% < 60%	There is 95% confidence that the population is NOT in compliance with the UNHCR standard. Corrective action is needed.

Annex

Below is a brief explanation of the process for creating a georeferenced pdf of the survey area with 30 randomly generated waypoints. This pdf can then be loaded in to a handheld device which can be used in the field to navigate to the waypoints to collect the data. This process is described further in a document called "Steps for Generating Random Waypoints Using QGIS" which is available on wash.unhcr.org. In addition there are explanatory videos on UNHCR's WASH Youtube channel.

Step #1 – Load Google Maps Layer

- Web > OpenLayers Plugin > Google Maps > Google Satellite

Step #2 – Zoom to the area you would like to survey

Step #3 – Create a New Shapefile Polygon

- Layer > Create Layer > New Shapefile Layer
- Select the 'Polygon' option and click OK…
- Save the new polygon shapefile layer as a file…

Step #4 – Draw the Polygon Points

- Select the new polygon layer in the side panel.
- Click the toggle editing button (looks like a pencil).
- Draw the polygon boundary points. Click the right mouse button to finish.

Step #5 – Adjust Transparency

- Right click on the shapefile layer in the left panel and choose properties..
- Under the 'style' tab, click 'simple fill' and set the fill color to transparent.

Step #6 – Adjust Random Points

- Click Vector > Research Tools > Random Points Inside Polygons
- Set the number of points to the sampling strategy (e,g. 30 x 2 would require 30 waypoints)

Step #7 – Change the Color of the Points and Add Number Labels

- Right click on the 'random points' layer in the left panel and choose properties..
- Under the 'Style' tab choose an appropriate color for the points.
- Under the 'labels' tab select 'Show labels for this layer' and then select 'Label with' and choose 'ID' from the dropdown.

Step #8 – Publish a Geo-Referenced PDF Map using Print Composer

- Zoom the map so the polygon fills the browser.
- Click Project > New Print Composer
- Give the new Map a name..
- In the print composer click the 'Add New Map' icon on the left hand side.
- Draw a rectangle on the page to insert the map..
- Save the map as a Geo-Referenced PDF by clicking 'Print Composer' > 'Export as PDF'

Step #9 – Load the Avenza Maps App onto Your Smartphone

Step #10 – Copy the Geo Referenced PDF onto Your Smartphone

Step #11 – Open Avenza Maps App and Import the Geo-Referenced PDF

- Click the large 'PLUS' button in the bottom right corner to import a PDF..
- Add Map > From Device Storage
- Finally open the imported map..
- The map will show your current location in relation to the 30 random sampling points.

Rapid Methods for Assessing Water, Sanitation and Hygiene (WASH) Services at Refugee Camps in Emergency Settings

Briefing Note