A Guide to Conducting Household Surveys for Water Safety Plans

U.S. Centers for Disease Control and Prevention (CDC)

Suggested citation: Centers for Disease Control and Prevention. 2008. A guide to conducting household surveys for Water Safety Plans. Atlanta: U. S. Department of Health and Human Services.

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U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
National Center for Environmental Health
Agency for Toxic Substances and Disease Registry
Division of Emergency and Environmental Health Services

Additional information can be obtained from
Dr. Richard Gelting, PhD
Environmental Engineer
CDC/NCEH/DEEH/EHSB
4770 Buford HWY, NE
Mail stop: F-28
Atlanta, GA 30341
USA
Telephone: 770.488.7067
Fax: 770.488.7310
E-mail: rgelting@cdc.gov

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Introduction

Water Safety Plans are a World Health Organization (WHO) methodology designed to assess and manage risk in drinking water systems. A Water Safety Plan (WSP) aims to identify hazards to drinking water quality that can be introduced at multiple points from the source to the tap. The WSP does not, however, traditionally provide for identifying hazards that could compromise drinking water quality *after* it reaches the household tap, such as contamination associated with water collection, storage, and treatment practices within the home.

A household survey can help researchers to understand the fate of water from the time it reaches the home to the point of consumption. It can provide valuable information about the quality and reliability of water reaching the home and changes to water quality through household storage and treatment. It can also provide information on the prevalence of water-related illnesses, community perceptions and concerns, alternate or supplemental water sources, and customer satisfaction, information that may fall outside the purview of a traditional Water Safety Plan.

A household survey contributes to Module 2 (System Assessment) of the Water Safety Plan, upon which the subsequent steps of hazard identification, consideration of control measures, and development of corrective actions, monitoring, and verification plans are based. Thus, the survey provides valuable information for the WSP team as the team goes

through the process of system evaluation and implementation of changes resulting from the Water Safety Plan.

The aim of this manual is to provide guidance on conducting a household survey as part of a Water Safety Plan for organized piped water supply systems in resource-limited settings. Specific examples intended to guide the planner in designing the survey are provided in the appendices. A summary checklist for survey planning and completion is provided as Appendix A.

Before You Start

Successful implementation of a household survey for a Water Safety Plan requires good background knowledge of the water delivery system, the survey area, and the population in the service area. Before initiating a survey, it will be helpful to gather the information below to help guide questionnaire development and provide supporting information to the report. Some of this data, particularly the data relating to water quality, may already be collected as part of the Water Safety Plan system description (WSP Module 2). Other information may be obtained from health department or surveillance personnel, laboratory personnel, or community health workers.

Population data

- Detailed maps by community or district (some dividable cluster or area with defined boundaries and known population size)
- Most recent census data (for population estimates, preferably by cluster)
- Alternative water sources used (private wells, rivers, springs, bottled water, rain water, etc.), and the uses of alternative sources (e.g., for drinking vs. other household uses)
- Proportion of people working outside of the service area (would consume different water during the day)

Water treatment data

- Treatment processes at the water treatment plant

- Range of turbidity, chlorine residual and pH levels leaving the plant (levels recorded? fluctuations? in compliance with water quality standards?)
- Microbial levels in raw and treated water at plant and/or in distribution network, if available
- Do shut-downs or times of low pressure occur? What are the conditions leading to plant shut-downs?
- Distribution system monitoring records (parameters tested, frequency and locations of testing)
- Other chemical contaminant concerns (pesticides, industrial waste, etc.)
- Arrange to collect treatment plant operations data on each of the survey days (chlorination, pH, and turbidity of finished water).

Health department

- How many hospitals and clinics (public and private) serve the area?
- Is there a surveillance system in place?
- Is there a regional or national estimate for diarrhea incidence or gastrointestinal (GI) disease?
- Have there been any outbreaks or seasonal trends? (especially GI-related)
- Is there a known, suspected, or perceived health problem associated with the water (this may be anecdotal)?

Laboratory

- If microbiology testing is desired, there is a need to identify a laboratory (possibilities may include Ministry of Health [MoH], water utility, private or other laboratory) that will be available for testing during the survey period.
- Does the laboratory have the capacity for microbiological testing (total coliforms, fecal coliforms, *E. coli*)? Does it have appropriate testing equipment and media?
- If so, what methods are used (membrane filtration or multiple tube fermentation)?
- Is the laboratory certified and by whom?
- What is the availability and proximity of the lab? Does it have sufficient personnel to accommodate the additional workload? Hours of operation?
- Understand reporting mechanisms; identify contact person and determine timeliness of reporting
- What is the cost per test?

Safety considerations

- Any safety concerns with sending interviewers to homes?
- Is the region politically stable?
- What is expected acceptability of the survey to the population? Are public service announcements or a meeting with community leaders to inform the community of the survey advisable?

Other considerations

- What are wastewater disposal methods for the area?

- What are possible contamination points of concern to the area, such as farming, commercial industry, etc.?
- Are there GIS capabilities? If so, consider if these would be useful to the survey. Find out if current GIS files exist that could be overlaid with survey data.
- What are local sources and availability of survey team including interview personnel, transportation, field coordinator, etc.?

Time Lines

The time frame for conducting a household survey is highly variable. Completion of pre-survey planning depends upon the ease of obtaining health and population data, water quality data, and maps, as well as on the availability of human resources for gathering information and identifying field personnel.

Similarly, the time to complete field work depends upon the size and experience of the survey team, the complexity of the survey questionnaire and water quality testing methods, and the density of households, among other factors. Roughly, for a survey similar in scope to the examples provided within this guide, field work can be completed in one to three weeks. Depending on the experience of the field team, training should be conducted for one to three days prior to initiating field work (the example provided in Appendix G is for a three-day training).

Time must also be allotted for data cleaning, analysis, and report writing, which could take several weeks, and for presenting and reviewing the data with the WSP team. Because the information from the household survey contributes to Step 2 of the WSP, it should be initiated early in the process, preferably concurrently with other System Assessment activities.

Budget Planning

Below are some guidelines for estimating the household survey budget and some tips for handling payments. Appendix B provides an example of calculating survey costs.

Interview personnel

Interviewers may be paid on a daily basis or per questionnaire. If payment is made on a per questionnaire basis, a small daily base rate should be paid, as well as a small rate for household visits where the interview was not completed, either because of the occupants' not being home or their refusal to participate. This practice will improve adherence to household visitation protocol. Interviewers should be paid a daily rate equivalent to the rate earned on an average fieldwork day for training days.

Field manager

The field manager should be paid at a daily rate slightly higher than the average daily rate of the interviewers.

Transportation

Drivers should be paid a daily rate for a full-time commitment during field work days. A driver should include the cost of gas and phone calls in the quoted rate.

Photocopying costs

Photocopying costs include those for the number of questionnaires needed for the survey as well as for versions to be used for revisions during training days. Also consider the photocopying costs of other documents, including the daily household visitation log, informed consent forms, training agenda, terms of reference for hires, etc.

Phone cards or credit

It is advisable to supply interviewers and the field coordinator with phone cards or some other form of credit to encourage communication regarding protocol issues or security concerns with the field or study coordinator. To avoid overuse, consider either using a daily call log or supplying credit on a daily basis or every 2 days.

Water quality testing

Costs include on-site test kits and the associated reagents test for chlorine or other desired parameters (e.g. turbidity, pH). If microbiology testing is done, include the cost of processing or providing additional supplies to a local laboratory, or obtaining field test kits, such as Del Agua. Collection bottles, labels, and a cooler will also be needed.

Data entry

Data entry should be paid on a daily or per-questionnaire basis. Quality should be spot-checked frequently to ensure careful data entry. If sufficient personnel and financial resources are available, double data entry should be done, where data is entered twice and the completed databases are then compared to identify and correct errors in data entry.

Other costs

Additional items may be needed, such as clipboards or binders for interviewers to use in the field (consider closable plastic binders for wet climates), stationary supplies for posting training materials, pens and pencils, identification badges, etc.

Informed Consent/Human Subjects Protection

Protection of human subjects from possible risks from participating in a survey always needs to be considered. Most international organizations have procedures in place to

ensure such protection, under Institutional Review Board (IRB) guidelines. Before undertaking any survey, check on your organization's human subjects requirements. Obtaining informed consent is necessary to ensure the willing participation of respondents and to help potential participants understand by agreeing (or not agreeing) to take part in the survey not only the voluntary nature of their participation, but what they can expect in terms of time commitment, privacy, and compensation.

Because the surveys for a Water Safety Plan are considered a minimal risk, do not deal with children or special populations, and do not request household or personal identifiers; obtaining verbal consent may be sufficient. A sample informed consent script is provided in Appendix C.

Determining Sample Size

Sample size and sample selection are important concepts to consider when designing any survey. The sample size will determine the *precision* of an estimate, or the likelihood that a survey estimate represents the true value in the population. It also determines the ability to detect a difference between two measures, such as showing that the incidence of diarrhea is lower among members of households who treat their water at home or higher in households who live further away from the water treatment plant or that people who receive 24-hour water service are less likely to store water in a storage tank. Without a sufficient number of subjects, you won't be able to detect an effect that you're looking for.

With too many subjects, you may be using time and resources inefficiently and inconveniencing people unnecessarily.

Sample size is determined by consideration of the following factors:

- Population size
- Frequency of the outcome of interest
- Desired level of confidence
- Available resources—personnel, time, testing capacity, etc.

Sample size can be calculated on the basis of a single outcome variable of interest or on several variables. If the main purpose of the WSP household survey is to determine health outcomes or if there is believed to be a high prevalence of water-related diarrhea in the population, then diarrhea is probably the most appropriate variable on which to base the sample size. If diarrhea is not expected to be a major health issue in the target community, then another health-based variable with water-related etiology or non-health-based variables such as water storage or treatment practices can be used. If the purpose of the survey is strictly descriptive and a specific association is not desired, then the sample size may be estimated by calculating the sample size for several potential outcomes of interest at a desired level of confidence (95% confidence interval is recommended). The method selected should be described in detail in the Methods section of the Survey Report (see Section X, part B for more on writing the survey report). Sample size calculations can be quite complex, although there are software programs designed to do the calculations, given

the required input parameters. A detailed example of one method for calculating sample size by use of a free software program is provided in Appendix D.

Once an appropriate sample size has been determined, an additional ten percent of households should be added to the sample size to allow for refusals, unusable data, or other limitations. If the non-response rate is expected to be higher than usual, then this percentage should be increased.

In some cases it may be of interest to obtain information about specific areas or sub-populations; examples are people not connected to the distribution network, those who live farthest along the distribution line, people in areas in close proximity to a known source of contaminants, those living in areas with frequent water outages, etc. If such data are desired, selected households should be additional to and not included in the calculated survey size. It is important to recognize that the sample size will not be sufficient to allow identification of significant differences between populations (unless the survey is designed to do so from the start), but the sub-sample can be considered a pilot study to identify trends or suspected problems, and it may inform the need for future study.

Appropriate sample sizes always need to be calculated by use of procedures like those described above—there is no single number for sample size that will always work for any survey. It is also important to recognize that sample sizes will be different for different surveys, and a sample size should never be selected simply because it was used for another project.

Survey Design

When planning the survey, it is important to define the survey population or populations—i.e., households that are connected to the water distribution network, households that are not on the network, households within certain geographic boundaries, etc. Once the range of households has been defined, a method for systematically and randomly selecting households must be employed in such a way that every household has an equal chance of being included in the survey.

If a complete listing of households in the survey area is available, then Simple Random Sampling (SRS) can be used. Depending on the size of the population, the survey area should be canvassed to check the accuracy of the list, so that all households are included. In SRS, all households are numbered and then a number between one and the total number of households (N) is selected through a random number generator (one is available in Microsoft Excel: RAND()*N generates a random number between 0 and N). Continue to select households by use of random numbers until the desired sample size is reached.

In most cases, such a list will not be available, and Stratified Systematic Sampling is recommended. For this methodology, you will need to identify the smallest sub-areas within the survey area for which population data are available, such as communities, districts, or voting blocks. These estimates may be obtained from a statistical bureau

(census data), the water utility (customer data), or other sources. If the number of households in each sub-area is not known, it can be estimated by dividing the population by the average number of people per household. The number of households to be included from each sub-area is allocated proportional to size, where, for example, a sub-area containing 6% of the households would be assigned 6% of the sample size. A sample Household Tracking Log that can be used to determine and track the target number of households for each sub-area by use of Stratified Systematic Sampling is provided as Appendix E. This log can assist in schedule planning.

Household Selection

Once the number of households to be surveyed from each sub-area is determined by use of Stratified Systematic Sampling, a plan for selecting households must be determined. To get the *sampling interval*, or the space between each selected household, divide the total number of households by the sample size. Thus, for a town of 6,000 households and a sample size of 500, every 12^{th} house would be visited. If the sampling interval is too great, creating large distances for surveyors to travel between houses, then the sub-area and the sampling interval can be divided by the same factor; for example, half of the sub-area could be covered by visiting every 6^{th} house. (*Note that dividing the sub-area creates a cluster survey design, but that should not greatly affect the randomness of the sample, provided that the areas are relatively homogeneous and the starting point for each sub-area is selected at random*).

To reduce bias of household selection, the first house to be visited should be determined by a random method. One way to do so is to assign a number (1–10) to each interviewer and let the interviewer select the first house on the basis of counting that number from the closest house to the drop-off point. The sampling interval is then used to select subsequent households.

Every effort should be made to include all households selected. If a house is unoccupied at the time of a visit, that house should be revisited later that day or on another day. If the house is permanently vacant, if the occupants decline to participate, or if an adult is not available for interview after multiple attempts, then the next closest household should be visited. The number of non-respondent households should be recorded on a Household Visitation Log Sheet, to be submitted daily to the Survey Coordinator. A sample Household Visitation Log Sheet is provided as Appendix F.

Recruitment and Training of the Survey Team

Composition of the survey team

Competent and experienced interviewers are the most important factor in producing useful, reliable data from a field survey. Interviewers may be recruited through university programs, whose staff may recommend recent graduates or students who have had some experience with community surveys through their programs of study. In

addition, the Census Bureau may be able to provide a list of persons who participated in the census. Local non-governmental organizations (NGOs) or other community organizations may also be able to recommend survey personnel.

When engaging personnel, it is advisable to provide a written contract of responsibilities. Sample job descriptions that can be used for recruitment and employment are provided in Appendix G.

The number of persons needed will depend on the sample size selected, the length of the questionnaire, the density and accessibility of households, transportation accommodations, and the time available to carry out the survey. As a rough guide, for a WSP survey of 400–600 households, the survey team should consist of approximately 8–10 interviewers, a field coordinator, a data entry person, and at least one driver for transportation. The roles of each team member are as follows:

Surveyors/interviewers

Activities of the surveyors include systematically selecting households, administering the questionnaire, conducting water sampling and testing, and maintaining a log of the results of each household visit. The ability to attend a training period should be a requirement for employment. Depending on the location and the availability of cell phone coverage, having a cell phone for use during the survey may also be an employment requirement.

Field coordinator

A field coordinator should be identified. This person should have survey experience and be familiar with the survey communities. The role of the field coordinator will be to manage the daily logistics of site selection, including drop-off and pick-up points for surveyors. The field coordinator will provide the surveyors with daily route maps and determine an efficient strategy for covering the survey area. The field coordinator will also be responsible for completeness and legibility of questionnaires, for clarifying and reporting any ambiguities regarding the data collection, and for addressing any surveyor performance issues that arise, such as tardiness, absence, or poor work. If samples are collected for microbiological testing, the field coordinator will also be responsible for arranging for rapid collection of samples to cold storage and their transport to a laboratory or field testing site.

Data entry

One or two detail-oriented individuals should be hired to enter completed questionnaires into a survey database. It is preferable that data be entered on a daily basis in order to allow for prompt addressing of any ambiguities that may arise. Depending upon the availability of time, personnel, and funds, data should ideally be double-entered (entered by two separate persons), and any differences should be examined in order to minimize entry errors. If double-entry is not possible, then data cleaning prior to analysis will need to be more extensive.

Transportation service

A driver with good familiarity of the survey area will be needed to transport interviewers to and from survey sites. Depending on laboratory arrangements, the driver may also need to transport samples from the field to the laboratory.

Training of surveyors

Training of surveyors and pilot testing of the survey instruments and methods are important tasks for ensuring that the survey design is appropriate to the area and will help to identify any unforeseen problems. Well-informed interviewers will ensure the best possible data quality. Training should address the following topics:

- Description of the survey: why it is being carried out, context of the survey within the Water Safety Plan, how the information will be used
- Review of terms of reference and expectations of hired personnel
- Question-by-question review of the questionnaire to confirm that the questions are appropriate and understandable to the local population and that they are clearly understood by interviewers
- Review of Informed Consent
- Review of household selection methods
- Review of Household Visitation Log Sheet for recording the outcome of visits
- Training on water sampling and testing techniques for chlorine residual
- Training on collection and delivery of samples for microbiological testing

- Role-play of household selection, informed consent, questionnaire administration, and log of visit outcome
- Pilot testing in the field followed by review by coordinator
- Review of survey methods, including household selection, questionnaire, and water sampling following pilot test; make appropriate clarifications or changes

A sample program for training is provided as Appendix H.

Developing the Survey Questionnaire

Information that will be appropriate for most surveys includes (but is not limited to) the following areas:

- Household characteristics/demographics (age, education, socioeconomic status, household size)
- Water sources (for drinking and other uses)
- Consistency and quality of piped water service (pressure problems, breaks in service)
- Household water storage practices (tanks, buckets, pitchers, etc.)
- Household water treatment (bleach, boiling, filters, solar, etc.)
- Perceptions (about water quality, customer satisfaction, health risks)
- Costs of water service (payment system, meters)
- Sanitation and hygiene (toilet type, handwashing, etc.)

- Health problems of household members (diarrhea, skin infections, access to care, etc.)
- Water quality—chlorine residual in delivered and stored household water
- Water quality—microbial contamination of delivered and stored household water

The questionnaire should be developed on the basis of concerns and conditions identified during the pre-planning phase of the survey design (see Section I, "Before You Start"). Adapting the questions to the local context can be accomplished through a question-by-question review with local survey personnel during training. Changes can be confirmed during pilot field testing for clarity of language, cultural appropriateness, and ease of administration. A sample Household Survey Questionnaire, with question-by-question comments, is provided as Appendix I.

Water Quality Testing of Household Sources

Chlorine residual testing

Chlorine residual should be tested at each household visited. For a WSP, it is of interest to compare chlorine residual in water from household taps to chorine residual levels from stored water sources within the household, including household tanks and drinking water containers. Such a comparison allows for a quality assessment of water delivered from the water utility to the home and changes in water quality as a result of home storage and treatment practices. The color wheel test kit is an easy-to-use method for estimating the presence of chlorine residual in household water samples.

Microbiological testing

Testing for total coliforms and fecal coliforms or *E. coli* adds valuable information to a WSP household survey. Most water, particularly from surface water sources, contains coliform bacteria from the environment. While non-fecal coliforms may not in themselves be harmful, they serve as an indicator of inadequate disinfection or of the presence of biofilms or leaks in the distribution system. *E. coli* or fecal coliforms are indicators of recent fecal contamination, and they are pathogenic. Their presence can suggest a lack of chlorination, seepage from latrines, inappropriate storage, or poor hygienic practices.

Testing for coliforms is more complicated than testing for chlorine. Samples must be collected in uncontaminated bottles by personnel trained in sterile sample collection (this should be covered during the training for surveyors). Samples must be kept cold until they are processed, and they must be processed within 24 hours; thus, a system for rapid pick-up and cold storage of samples must be established.

If a local laboratory with the capacity to test for total and fecal coliforms (or *E. coli*) exists, then arrangements may be made with that laboratory. Alternatively, field test kits (such as the Oxfam Del Agua water testing kit) can be used. If a field kit is used, a technician will need to be available to process samples on all survey days. Because microbiological testing is more costly and time-consuming than other testing, a subset of households is generally tested. A system for random selection of households should

be used, such as every 4th and 8th visit of each surveyor, to include approximately 20% of households. This decision may also depend upon the capacity of the laboratory or test method available.

An alternative to the quantitative methods discussed is the hydrogen sulfide (H_2S) paper strip test. This test detects non-coliform fecal bacteria that produce hydrogen sulfide. It can be used as a presence/absence (qualitative) indicator of fecal contamination. The H_2S test method is simple to perform and economical. It does not require special handling; thus, it is well-suited for use in areas without the infrastructure or resources to allow carrying out standard quantitative microbiological tests. Qualitative field tests include the Hach MEL/MPN Total Coliform and *E. coli* Laboratory or membrane filtration using M-Coliblue24® Broth.

Testing other parameters

Depending on the scope and conditions of the survey area, it may be desirable to test for additional parameters, such as turbidity, pH, *Cryptosporidium*, *Giardia*, or certain chemicals. Easy-to-use and relatively inexpensive field test kits exist for turbidity and pH testing. However, only laboratories with specialized testing capabilities can detect the presence of *Cryptosporidium* or *Giardia* cysts in water (Note that these organisms are more easily detected in stool samples; thus, if their presence is suspected, health centers can provide better information than a water utility. Although this data will not confirm that water is the source of infection, a high prevalence of *Cryptosporidium* or *Giardia* infections suggests likely contamination of water supplies. Standard water

disinfection processes, including chlorination, will not destroy *Cryptosporidium*, and such disinfection processes may not be effective against *Giardia* as well). Testing for most chemicals of interest in water also requires specialized laboratory capabilities.

Treated water quality on survey days

Testing the quality of finished water leaving the treatment plant on survey days provides a point of comparison with delivered water quality. Ideally, the treatment plant(s) should be visited daily on survey days, and test results of basic parameters, such as turbidity, chlorine residual, and pH, should be recorded. Alternatively, water quality records from the treatment plant can be retrieved for survey days following the survey.

Data Entry, Analysis and Reporting

Data entry

A database for data entry should be created prior to the start of data collection. As previously stated, data should ideally be entered daily, so that any issues or ambiguities arising during data entry can be addressed while the survey is in process. A number of data management programs can be used for data entry; one such program is Epi Info, recommended because it is user-friendly and available free of charge (http://www.cdc.gov/epiinfo). Because this software is free and available online, it can

be accessed from any location, provided there is access to a computer and an Internet connection.

Data analysis

Data analysis can be performed by use of any preferred statistical software package (Epi Info, SAS, SUDAAN, STATA, and SPSS will produce estimates with confidence intervals; Excel can be used for frequencies and means).

For this type of survey, the unit of analysis for most parameters is the household, with the exception of diarrhea, where individuals—usually either children under 5 or people over 5 years of age—are the unit of analysis. In order to analyze diarrhea in subpopulations, one must calculate the proportion of the population represented by the subpopulation of interest. To determine the two-week prevalence of diarrhea in children under 5, for example, the total number of children under 5 (known from the questionnaire) is divided by the number for which diarrhea in the previous two weeks was reported.

Below are some suggestions for analyses that may be of interest to a WSP survey report. These analyses may not be relevant in all contexts, and there will likely be additional parameters of interest to each WSP survey report.

- Basic description of the water utility, service, and consumer population

- Description of target area (rural vs. urban, socioeconomic status, specific challenges related to water acquisition, industry, etc.)
- Demographic characteristics of survey respondents: age, gender, family size, education, etc.
- Proportion of population connected to municipal water system
- Water sources (tap, well, rainwater collection, etc.)
- Consistency of water service; breaks in service or pressure
- Alternative water sources used when system is not functioning
- Water storage practices in tanks and drinking water containers
- Cleaning, maintenance, and handling of stored water vessels
- Home treatment methods used by respondents
- Costs of water service or of purchasing other water
- Types of sanitation used
- Prevalence of diarrheal illness, reported for <5 years of age and >5 years
- Access to care and use of health facilities
- Respondent's perceptions about water quality and service
- Other community concerns (to understand importance of water issues relative to other issues)
- Any significant associations between diarrhea and other variables, including water source, home treatment, residual chlorine in tap, tank, or drinking water, presence of coliform bacteria, sanitation type, etc. (best to use a logistic regression model)
- Any other potentially water-related illness

- Reporting and comparison of chlorine residual results for tap, tank, and drinking water samples
- Reporting and comparison of total and fecal coliform (or *E. coli*) presence in tap, tank, and drinking water samples
- Comparison of chlorine results for paired samples from the same household (tap vs. tank, tap vs. drinking containers, or tank vs. drinking containers)
- Comparison of microbiology results for paired samples within households (tap vs. tank, tap vs. drinking containers, or tank vs. drinking containers)
- Analysis and comparison of above parameters by community or area

In addition to conducting the analysis, it is helpful to provide maps of the survey area that show the survey communities, water sources, water treatment plants, and any other relevant features. A detailed description of survey methods used should be provided, and any limitations to the survey design or analysis should also be discussed. Clear conclusions and recommendations should be drawn, including a discussion of the implications of the most important survey results. These conclusions will serve as the basis for hazard identification for the WSP and provide guidance on final recommendations, although the WSP should present results based on a more comprehensive analysis that includes the household survey.

Reporting and presentation of results

Reporting of survey results should roughly follow the survey instrument, describing demographics, water sources and service, including alternative water sources,

household storage and treatment practices, sanitation and hygiene, costs, community concerns and health. Water quality results—chlorine residual, microbiology, or other—should be reported separately for samples taken directly from the tap, from household storage tanks, or from drinking water containers, and the results should be compared to identify differences in chlorine residual or coliform contamination.

The full household survey report should be included as an appendix to the WSP. The information contained within should be discussed as part of the WSP System Description (Module 2). The hazards and recommendations identified through the household survey will be incorporated into the hazards identification and subsequent steps of the WSP.

Results should be presented to the appropriate parties, including the water utility, the MOH, and members of other organizations involved in the WSP.

Alternatives to a Household Survey

A household survey such as the one described in this manual is a relatively time- and resource-intensive endeavor. In cases where resource limitations preclude a household survey, other methods may be used to obtain information about household-level concerns and the fate of water that might not be otherwise revealed through the WSP. Alternatives to a household survey include focus groups or interviews with key informants; results of

such methods should be combined with water quality sampling at multiple points along the distribution network.

Appendices

The Appendices below provide specific examples to assist in carrying out the steps described. Note that some examples may not be relevant to the existing circumstances or objectives of your proposed survey; in all cases, these examples will have to be adapted to meet the needs of the proposed survey.

Appendix A- Section-by- Section Summary Survey Planning Checklist

1. ☐ Obtain population, water treatment, laboratory and health data, as well as maps for survey planning
2. ☐ Acquire test kits for on-site chlorine testing
3. ☐ Determine water quality testing methods or identify laboratory for microbiology or other testing
4. ☐ Design a survey budget estimate
5. ☐ Develop survey forms:
    a. Informed consent/Human subjects considerations
    b. Survey questionnaire
    c. Household visitation log
    d. Protocol for non-respondents
6. ☐ Calculate sample size
7. ☐ Identify and hire personnel:
    a. Surveyors/interviewers
    b. Field coordinator
    c. Driver(s) with transportation
    d. Data entry person(s)
8. ☐ Conduct personnel training to cover:
    a. Household selection techniques
    b. Interview techniques
    c. Finalizing the survey instrument
    d. Chlorine residual testing
    e. Sample collection for microbiology or other testing
    f. Daily route planning (Field coordinator)
    g. Pilot testing
9. ☐ Carry out data collection and data entry
10. ☐ Analyze and report data
11. ☐ Present survey results to appropriate parties

Appendix B- Sample Budget Estimate for WSP Household Survey

NOTE: This is an example from a low-resource setting provided for illustration only; estimates should be based on actual costs in the area where the survey will be conducted

Interview personnel	
a. Target # of households: 535 (calculated as in Section V)	
b. Estimated # of surveyors: 8	
c. Base daily rate for surveyors: $5*	
d. Payment per completed questionnaire: $2	
e. Estimated # of visits completed per person per day: 10	
f. Estimated # of days to complete survey (a/[b x c]): 7	
g. Estimated daily rate for surveyor: (c + [d*e]): $25	
h. Payment to surveyors on survey days (b*f*g):	$1400.00
Payment to surveyors on training days (b*g*3 days):	$600.00
Field manager	
$30/day for 7 survey days + 3 training days	$300.00
Transportation	
$60/day for 7 survey days + ½ training day	$450.00
Data entry	
$20/day for 7 days	$140.00
Chlorine test kits	
$60/kit * 8 surveyors	$480.00
Microbiology field test kit supplies	
Filters, medium, labels, etc.	$500.00
Phone cards	
$1/surveyor/day $4/field coordinator/day	$84.00
Other	
Photocopying, clip boards, pens, cool box, incidentals	$300.00
TOTAL	**$4.254.00**

*Amounts are in USD

Appendix C- Sample Informed Consent for WSP Household Survey

Ask to speak with female head of household (if not available, male head of household is ok).

"Hello, my name is _____ and I am working with the (*agency/ies carrying out the survey*). We are conducting a survey to get a better understanding of water use practices, the consistency of water service, community concerns, and health in (*City/town location of WSP*).

Your house was selected at random. The survey is anonymous and we will not collect any names or addresses. The questions in the interview do not ask anything private and you can choose not to answer any question. Participation in the survey is completely voluntary. You are under no obligation to participate, but your responses will help us to understand the potential issues relating to water service in (*City/town*). The survey should take about 20 minutes. We will also collect samples of your tap and drinking water for testing. Would you like to participate?

If you have any questions later, you can contact the (*provide telephone number of appropriate contact, e.g. health department, water utility, etc.*) at (provide *correct local phone #*)."

If "no", thank the respondent and go to the next house (check "choose not to participate" box on log sheet). If "yes", begin questionnaire below.

Appendix D- Method for Calculating Sample Size for a WSP Household Survey

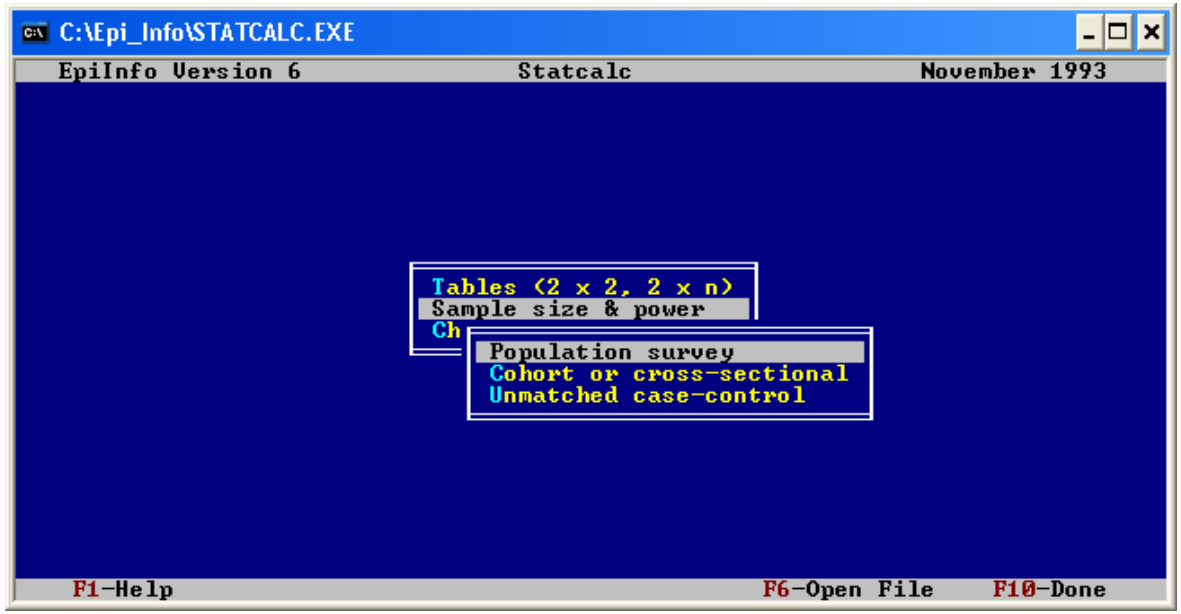
One relatively simple method for calculating survey size is to use the "sample size and power" calculator for a "population survey" in the StatCalc function of Epi Info (this free software can be downloaded from the CDC website: http://www.cdc.gov/epiinfo/). The StatCalc option is found under the "Utilities" heading. The program will prompt for entry of (1) the population size, (2) the expected frequency of the outcome variable you select, and (3) the "worst acceptable result".

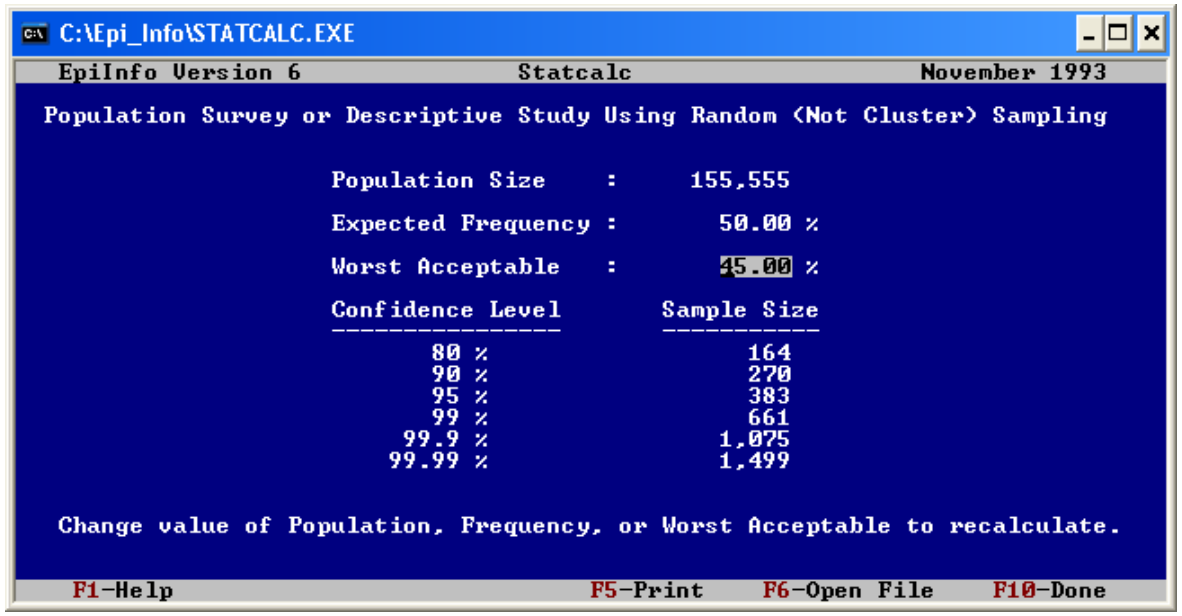
Population size will usually be known, or it can be obtained from the census bureau, the Ministry of Health, or other governmental or non-governmental agency.

For estimation of the expected frequency of a health-based outcome variable (like diarrhea), clinic, hospital, or surveillance data should be used, where available. Published studies or country estimates can also be used if they are related to a population comparable to the survey population.

The "worst acceptable result" defines the limit within which a difference can be determined. For example, for a household survey in a developing country with diarrhea prevalence estimated at 15%, it is reasonable to define a difference between the observed and expected values when a value that is 5 percentage points higher or lower than the expected value is observed—in this case, a prevalence of 20% or 10%. The standard confidence limit used is 95% (alpha = 0.05). In other words, if a "worst acceptable result" of 10% is put into the model, assuming a 15% expected prevalence of diarrhea, we are asking how many subjects would need to be included in the survey in order to detect a difference of diarrheal prevalence in the surveyed population of at least 5% from the expected prevalence based on country data, with 95% confidence and 80% power.

The Epi Info screens below provide an example of calculating sample size for a population of 155,555, with an expected diarrhea frequency of 50% (this assumes a worst-case scenario), in order to detect a difference of five percentage points from the expected value (entering 45% or 55% would give the same value). The sample size, given these values and a 95% confidence limit from the chart below, is 383 households. Adding approximately 10% to account for non-respondents (increase if a greater number of non-respondents is expected), the target should be 422 households.


C:\Epi_Info\STATCALC.EXE
EpiInfo Version 6
Statcalc
November 1993
Tables (2 x 2, 2 x n)
Sample size & power
Ch
Population survey
Cohort or cross-sectional
Unmatched case-control
F1-Help
F6-Open File
F10-Done


C:\Epi_Info\STATCALC.EXE
EpiInfo Version 6
Statcalc
November 1993
Population Survey or Descriptive Study Using Random (Not Cluster) Sampling
Population Size : 155,555
Expected Frequency : 50.00 %
Worst Acceptable : 45.00 %
Confidence Level
Sample Size
80 % 164
90 % 270
95 % 383
99 % 661
99.9 % 1,075
99.99 % 1,499
Change value of Population, Frequency, or Worst Acceptable to recalculate.
F1-Help
F5-Print
F6-Open File
F10-Done

Appendix E- Sample Household (HH) Tracking Log

Once the sample size has been determined, the table below can be used to calculate target household visits for each sub-area (community, ward, or other division). It is also a tool for tracking household visits and for planning surveyors' daily routes. This tracking sheet is most easily managed if it is copied into an Excel spreadsheet and set up so that calculations are made within the tracking sheet and updated automatically as new data are entered.
The factors that go into the tracking log (table headings) are defined as follows:

Community: Define the most useful division of areas, usually the smallest, based upon available population data and the availability of maps. These subdivisions may be called communities, wards, blocks, etc.

Number of HHs in community: If the number of households is unknown, but the population size is known, divide the population size by the estimated average household size.

Percent of total # of HHs: Divide the number of households in each sub-area by the total sample size (i.e., the total # of households).

Sampling interval: Divide the total number of households by the sample size. If the distance between houses is too great to walk, then the area and the sampling interval can be divided by half. (Note that it is preferable to maintain the full sampling interval).

Target # of HHs to sample: Multiply the number of HHs in the community by the percent of total HHs to get the target number of HHs that should be visited in each community. This will provide a guide for planning the schedules of surveyors.

Days 1–X: At the end of each survey day, record the number of completed household visits.

Actual # of HHs sampled: Record the total number of households visited in each community or WTP service area. This should be similar to the target number, but it may differ slightly as a result of surveyor error, uncertainly about community boundaries, poorly drawn maps, or large differences in observed versus reported population sizes.

Special populations of interest: If special populations are of interest, such as those not connected to the municipal water distribution network, those households should be additional to the calculated sample size.

Sample Household Log Sheet for stratified Systematic Sampling

Sampling interval: 12

Community/sub-area	Number of HHs in community	Percent of total # of HHs	Target # of HHs to sample	Day 1 12/6	Day 2 12/7	Day 3 12/8	Day 4 12/10	Day 5 12/11	Day 6 12/12	Day 7 12/13	Actual # of HHs sampled
WTP Service Area A											
Adelwood	150	0.0255	13	14	-	-	-	-	-	-	14
Bravinia	100	0.0170	9	9	-	-	-	-	-	-	9
Chapelle	100	0.0170	9	-	9	-	-	-	-	-	9
Davinsport	180	0.0306	15	-	-	15					15
Eastham	320	0.0544	27		-	27	-	-	-	-	27
Fairfield	450	0.0766	38	43	-	-	-	-	-	-	43
Garfield	80	0.0137	7	-	7	-	-	-	-	-	7
Hansboro	240	0.0409	20	-	22	-	-	-	-	-	22
Inman	77	0.0131	7	-	7	-	-	-	-	-	7
subtotal:	***1697***	***0.2901***	***144***								***153***
WTP Service Area B											
Jansport	390	0.0664	33	33	-	-	-	-	-	-	33
Kirkland	140	0.0238	12	-	12	-	-	-	-	-	12
La Porte	36	0.0061	3	-	5	-	-	-	-	-	5
Maynard	63	0.0107	5	-	5	-	-	-	-	-	5
Nottingshire	100	0.0170	9	-	9	-	-	-	-	-	9
Overbrook	100	0.0170	9	-	10	-	-	-	-	-	10
Pendelton	35	0.0060	3	-	3	-	-	-	-	-	3

subtotal:	***864***	***0.1470***	***74***								***77***
WTP Service Area C											
Quartzton	380	0.0646	32	-	-	17	15	-	-	-	32
Ravenswood	200	0.0340	17	-	-	16	-	-	-	-	16
Silvertown	260	0.0442	22	-	-		22	-	-	-	22
Tallytown	200	0.0340	17	-	-	17	-	-	-	-	17
Ulnar Bend	120	0.0204	10	-	-	-	10	-	-	-	10
Victory Hill	420	0.0715	36	-	-	-	24	12	-	-	36
West Pen	95	0.0162	8	-	-	-	-	8	-	-	8
Xavierville	220	0.0374	19	-	-	-	9	11	-	-	20
Yawes	380	0.0647	32	-	-	-	-	22	10	-	32
Zellertown	380	0.0647	32	-	-	-	-	32	-	-	32
Allen's Alley	340	0.0579	29	-	-	-	-	-	28	-	28
Boxer Bend	320	0.0545	27	-	-	-	-	-	27	-	27
	331		***28***								
subtotal:	***5***	***0.5641***	***2***								***280***
Total sample size (# of HHs)	**5876**	**100**	**50 0**	**99**	**89**	**92**	**80**	**84**	**66**	**99**	**510**
HHs not connected to WTP distribution network											
Bluebell squatter area	150		21							21	
W. Shore squatter area	30		4							4	
Tennison new housing development	80		11							11	
W. end of La Porte	30		4							4	
Total additional HHs	**290**	**0.1379**								**40**	**40**

Appendix F- Sample Daily Household Visitation Log Sheet

INTERVIEWER NAME: _____ TODAY'S DATE: _____

#	HH ID#	COMMUNITY	HH ADDRESS/LOCATION	TIME VISIT 1	TIME VISIT 2	INTERVIEW COMPLETE? Y/N	INTERVIEW REFUSED? Y/N	HOUSE VACANT? Y/N	MICRO-BIOLOGY SAMPLE? Y/N
1									
2									
3									
4									
5									
6									
7									
8									
9									
10	Etc ↓								

Appendix G- Sample contracts for survey personnel

NOTE: Information in italics provides examples only; this information should be modified to reflect conditions for the actual survey being done.

1. Surveyors/Interviewers

Surveyors should have prior experience in questionnaire administration. Responsibilities of the surveyors are to visit households according to survey protocol, administer informed consent, administer questionnaires, and conduct water sampling and testing. Surveyors should be available to work *Monday–Friday* from *8am to* approximately *6pm* and Saturdays from *9am to 5pm*. Mandatory *3-day* training will be conducted prior to carrying out the survey to review household selection, questionnaire administration, and water testing and collection techniques. Data collection will begin on *December 3* and continue through approximately *December 10*, depending upon the rate of completion. Surveyors must be available for the entire training and survey period unless special arrangements are made in advance.

Interviewers will be paid a flat daily rate of *$5*, plus an additional *$2* per completed questionnaire. They will be compensated *$20/day* for training days. They will be provided *$2 per day* for use of their cell phone.

Breaks, including lunch, will be at the discretion of the interviewer. The survey vehicle will be available for pickup and transport throughout the day.

I agree to the conditions for employment described above:

_____	_____	_____
Name (printed)	Signature	Date

2. Field Coordinator

The field coordinator must have prior survey experience and be familiar with the survey communities. The role of the field coordinator will be to manage the logistics of site selection, including drop-off and pick-up points for interviewers, coordination with the survey vehicle, mapping the areas, providing the interviewers with daily route maps, and determining an efficient strategy for covering the survey area. The field coordinator will also be responsible for completeness and legibility of questionnaires and for clarifying and reporting any ambiguities regarding the data collection to the survey coordinator. In addition, the field coordinator will address any personnel issues that arise, such as tardiness, absence, or poor performance.

The Field Coordinator will be compensated at the rate of *$25* on 3 training days and a flat daily rate of *$30* thereafter. He/she will also be reimbursed *$4/day* for use of a personal cell phone. The coordinator must be available for the entire training and survey period unless special arrangements are made in advance.

I agree to the conditions for employment described above:

_____	_____	_____
Name (printed)	Signature	Date

3. Data Entry

Responsibilities of the data entry person are to enter completed questionnaires into a survey database. This person must have access to a computer and be able to download Epi Info (free software) from the CDC website, www.cdc.gov/epiinfo. Data may be entered on a daily basis or every few days, but the entry must be completed on the day following the last day of data collection.

The data entry person will be compensated at the rate of *$140* at the completion of data entry, or approximately $*0.25*/questionnaire. This figure is based on approximately *500* questionnaires and will be adjusted accordingly if there is more than a 10% increase or decrease in the expected sample size.

I agree to the conditions for employment described above:

_____	_____	_____
Name (printed)	Signature	Date

4. Driver

The driver must possess a vehicle that can seat *12* passengers and that is in compliance with all safety and legal regulations. He/she must be familiar with the survey area and roads. Driver responsibilities include transporting the survey team members from survey headquarters to their respective daily drop-off locations and returning them to the survey base at the end of each day. The driver will retrieve water samples throughout the day, for samples need to be kept cold and the cooler will be kept in the survey vehicle. It is important that the driver be reachable by cell phone and available to the survey team at all times.

The driver's services will be needed on *Wednesday December 3rd* from 1 to 4pm and on subsequent days from *8am* until the time of drop-off *(~7pm),* including Saturdays. The survey is expected to extend through *Thursday December 13th*.

$60 per day will be paid for transportation services on regular days, and *$40* will be paid on the training day. This includes costs associated with the vehicle, driver, gasoline, and cell phone.

I agree to the conditions for employment described above:

_____	_____	_____
Name (printed)	Signature	Date

Appendix H- Sample WSP Household Survey Training Program

Day 1:

- Introductions
- Discuss survey context (WSP) and purpose
- Review terms of reference and expectations of interviewers
- Review questionnaire (study coordinator will make appropriate changes for review on Day 2)
- Water testing practicum 1—learn water sample collection and testing techniques for measuring chlorine residual

Day 2:

- Review revised version of questionnaire
- Role play of questionnaire administration
- Review household selection and survey methods
- Review household visitation log sheet
- Water testing practicum 2—learn water sampling and handling techniques for microbiological sample collection

Day 3:

- Pilot study—half-day field practicum (this data will not be included in actual survey)
- Review of practicum, troubleshooting, questions
- Final edits to questionnaire

Appendix I- Survey Instrument for a WSP Household Survey

The following sample questionnaire was designed based upon the conditions and issues of potential concern that were revealed through pre-survey planning. It was used as a template for various household surveys for WSPs in resource-limited settings with an organized piped water supply system in the Caribbean and Latin America. Population size of the surveyed areas ranged from 30,000 to 120,000. Most households received water directly to their homes from a piped water supply system. Others had yard or shared taps, or they used water from rivers or rain. For each target area, there were areas that were not connected to the municipal water system or that had unauthorized connections. Storage in household storage tanks and secondary treatment within the home were common as a result of frequent interruptions in water service and pressure.

Some questions contained in this sample may not be relevant to a given setting, or there may be other pertinent information that is not included here. Questions that will not contribute to the report should not be included. Notes on survey questions are embedded in the questionnaire in blue print. Alternatives for some questions are also provided. If, for example, surveyors are typically invited into the home during the survey, some questions may be replaced by direct observation. These alternative questions are also embedded in the text in blue print.

Household Water Use and Health Survey for a Water Safety Plan

Administer informed consent. If subject agrees to participate, proceed to questionnaire.

HH#: ___ ___ ___ ___ ___ ___ Date of interview: ____/____/___
Visit# Survey day Interviewer#
DD MM YY

THIS IS ONE SUGGESTION FOR CREATING A UNIQUE HOUSEHOLD IDENTIFICATION NUMBER. ASSIGN EACH INTERVIEWER A NUMBER TO BE USED FOR THIS CODING SYSTEM.

Community: _____

Water treatment plant service area: ☐ WTP A ☐ WTP B ☐ WTP C

IF MORE THAN ONE WATER TREATMENT PLANT SERVES THE SURVEY AREA, IT IS IMPORTANT TO NOTE THE WATER TREATMENT PLANT SERVICE AREA OF THE HOME.

Location/Description of house if need to return:

_____ _____

NOTE THAT THIS INFORMATION SHOULD NOT BE RETAINED IN THE DATABASE; IT IS ONLY FOR USE BY THE SURVEYOR FOR LOCATION OF A HOUSE THAT NEEDS TO BE REVISITED.

A. HOUSEHOLD CHARACTERISTICS

1. *Age of respondent (yrs)* a. ☐ 18-29 b. ☐ 30-39 c. ☐ 40-49 d. ☐ 50+
   ADJUST AGE CATEGORIES AS DESIRED.
2. *Gender of respondent* a. ☐ Female b. ☐ Male
3. How many people, including you, live in this household? _____
4. This house is……? (*Tick one*)
   a. ☐ Owned b. ☐ Rented/Leased c. ☐ Rent-free
   d. ☐ Informal settlement (squatter) e. ☐ Other_____
   ADJUST HOUSING OPTIONS AS APPROPRIATE
5. What is the highest level of education completed by the female head of household?
   a. ☐ None b. ☐ Primary c. ☐ Secondary d. ☐ Vocational
   e. ☐ College /University f. ☐ Don't know g. ☐ N/A
   ADJUST EDUCATION OPTIONS TO REFLECT LOCAL EDUCATION SYSTEM

B. WATER USE PRACTICES

6. Where do you get the water you use at home? (*Include water for all purposes—drinking, cooking, cleaning, garden, etc. Record all answers*)

   a. ☐ Household tap
   b. ☐ Private tap in yard
   c. ☐ Public/shared standpipe
   d. ☐ Neighbor's tap
   e. ☐ Purchased bottled water
   f. ☐ Rain water collection
   g. ☐ River/Stream/Creek
   h. ☐ Spring
   i. ☐ Refilling Station
   j. ☐ Other (*specify*) _____

   LIST APPLICABLE AND MOST ANTICIPATED RESPONSES ONLY

7. Does your tap provide water 24 hours a day? ☐Y ☐N ☐No tap
   (***If** No **Tap, skip to #12***)
8. *If no*, for how many hours a day on average are you ***without*** water? ____ hrs.
9. Are there times when the water pressure is low? ☐Y ☐N
10. Have there been periods in the past year with no tap water service for several days at a time? ☐Y ☐N
11. When there is no water or the pressure is low, where do you get your water? (*Tick **all** that apply*)
    a. ☐ Water stored in tank
    b. ☐ Water stored in drum or bucket
    c. ☐ Rain water
    d. ☐ Well
    e. ☐ Creek/river/spring
    f. ☐ Purchase bottled water
    g. ☐ Receive trucked water
    h. ☐ Do nothing/wait for water to return
    i. ☐ Other (*specify*) _____

    LIST APPLICABLE AND MOST ANTICIPATED RESPONSES ONLY
12. Do you consider your water shortages to be a … ? (*Read options)*
    a. ☐ Big problem b. ☐ Somewhat of a problem c. ☐ No problem
13. Do you have a water storage tank? ☐Y ☐N (***If No, skip to #19***)

    ASK THE FOLLOWING QUESTIONS IF THERE IS HEAVY RELIANCE ON HOUSEHOLD STORAGE TANKS IN THE STUDY COMMUNITY.
14. *If Yes,* is tank… a. ☐ Elevated b. ☐ Ground level c. ☐ Underground
15. Does your tap water pass through the tank?
    ☐Y ☐N ☐Sometimes (valve) ☐Don't know ☐No tap

    THIS IS IMPORTANT IN ANALYSIS BECAUSE SOME TAP WATER SAMPLES WILL HAVE SPENT RESIDENCE TIME IN A STORAGE TANK; THEREFORE, WHEN COMPARING WATER QUALITY TEST RESULTS BETWEEN DIFFERENT SOURCES (WATER COMING FROM THE TAP VS. A TANK OR DRINKING WATER CONTAINER, E.G.), SAMPLES THAT HAVE PASSED THROUGH A TANK SHOULD BE CONSIDERED TANK SAMPLES (EVEN IF THEY HAVE BEEN TAKEN FROM THE TAP).
16. When was the last time your tank was cleaned (read options)?
    a. ☐ <3 mos b. ☐ 3-12 mos c. ☐ 1-5 yrs
    d. ☐ >5 yrs/never e. ☐ Don't know
17. Do you add chlorine or bleach to your tank?
    ☐ Y ☐ N (***If No, skip to #19***) ☐ Don't know
18. When was the last time you added chlorine or bleach?
    a. ☐ < 2 wks. ago b. ☐ 2-4 wks. ago c. ☐ > 1 month ago
19. How much do you pay per month for water service? _____ dollars/mo

    ADJUST FOR LOCAL CURRENCY
20. How much do you pay per month for other water? _____ dollars/mo *ADJUST FOR LOCAL CURRENCY*
21. Do you think that the water from your tap is safe to drink?
    a. ☐Yes (always/most of the time) (***If Yes, skip to #23***)
    b. ☐No
    c. ☐Not sure/sometimes
    d. ☐No tap
22. *If not Yes*, why not? (*Do not read responses. Tick all that are mentioned*)
    a. ☐ Water's appearance (dirty/cloudy/color/particles)

b. ☐ Bugs/worms/bacteria
c. ☐ Chemical or pesticide contamination (do not include chlorine)
d. ☐ Too much chlorine
e. ☐ Tastes or smells bad (incl. chlorine)… of what? _____
f. ☐ Makes me ill/bothers stomach
g. ☐ Heard through media coverage or word of mouth
h. ☐ Other (sp*ecify*) _____

23. Where do you get your water for ***drinking*** at home? (*Read options and tick all that apply*)
a. ☐ Direct from tap (household, yard or standpipe)
b. ☐ Household storage tank or barrel
c. ☐ Well
d. ☐ Rain water collection
e. ☐ River/creek
f. ☐ Spring
g. ☐ Purchase bottled water
h. ☐ Other (*specify*) _____

LIST APPLICABLE AND MOST ANTICIPATED RESPONSES ONLY

24. Do you normally treat your drinking water at home? ☐ Y ☐ N (***If No, skip to #26***)
25. *If Yes,* How do you normally treat it? (*Tick* ***all*** *that apply*)
a. ☐ Boil
b. ☐ Filter (e.g. Brita, Pur)
c. ☐ Add chlorine or bleach
d. ☐ Solar disinfection
e. ☐ Other (*specify*) _____
26. Do you normally keep drinking water in a drinking water container?
☐Y ☐N (***If No, skip to #28***)
27. In what sort of container do you normally store your drinking water?
a. ☐ Closed container (e.g., bottle, narrow-neck jug)
b. ☐ Open container (e.g., pitcher, bucket, pan)
c. ☐ Other (*specify*) _____

ALTERNATIVE QUESTION (REPLACES #26 AND #27):

CAN YOU PLEASE GIVE ME A CUP OF DRINKING WATER? (*OBSERVE WHERE WATER IS STORED*)

A. IS THE DRINKING WATER CONTAINER KEPT COVERED?
B. HOW DOES RESPONDENT SERVE THE WATER?
i. USES A CUP FOR DIPPING (HANDS MAY TOUCH WATER)
ii. USES A LADEL (LONG HANDLE, HANDS DON'T TOUCH WATER
iii. POURS IT OR TURNS SPIGOT ON CONTAINER
iv. OTHER (*SPECIFY*) _____

C. HYGIENE AND SANITATION

28. When you wash your hands, how often do you use soap? (*Read options*)
a. ☐ Always/almost always b. ☐ Sometimes c. ☐ Never/almost never

ALTERNATIVE QUESTION (REPLACES #28):

C. IS THERE A PLACE FOR HAND WASHING? ☐ Y ☐ N

D. IF YES, IS SOAP OBSERVED AT HAND WASHING LOCATION?
☐ Y ☐ N

29. What kind of toilet facility do you use?
a. ☐ Flush toilet to sewer system
b. ☐ Flush toilet to septic tank
c. ☐ Pit latrine
d. ☐ Other (*specify*) _____

LIST APPLICABLE AND MOST ANTICIPATED RESPONSES ONLY

30. *If pit latrine*, how many people use the latrine on a regular basis? _____

31. How do you dispose of your solid waste? (*Tick all that apply*)
a. ☐ Collected
b. ☐ Burn
c. ☐ Bury
d. ☐ Dump
e. ☐ Compost
f. ☐ Other (*specify*) _____

LIST APPLICABLE AND MOST ANTICIPATED RESPONSES ONLY

D. HEALTH AND COMMUNITY CONCERNS

32. How many children under age 5 live here? _____ (*If zero, skip to #40*)

33. Has this child/have these children had diarrhea **in the past 2 weeks**?
(*Diarrhea refers to ≥3 loose or watery stools in a 24-hour period)*
☐Y ☐N (***if No, skip to #36***)

If yes, what was done about it?

CHILD 1 (33.)	**CHILD 2** (34.)	**CHILD 3** (35.)	
☐	☐	☐	a. Taken to hospital/ health center
☐	☐	☐	b. Taken to private clinic
☐	☐	☐	c. Purchased meds/ORS at pharmacy (*no facility visit*)
☐	☐	☐	d. Home remedy, *specify* _____
☐	☐	☐	e. No action/Went away on its own

36. Has this child had any other illness in the past 2 weeks?
☐Y ☐N (***if No, skip to #40***) *If yes*, specify:

CHILD 1 (37.)	**CHILD 2** (38.)	**CHILD 3** (39.)	
☐	☐	☐	a. Skin infection
☐	☐	☐	b. Respiratory infection
☐	☐	☐	c. Accident/Injury
☐	☐	☐	d. Other, *specify*: _____

40. Has any other household member (≥ age 5) had diarrhea **in the past 2 weeks**?
(*Diarrhea refers to ≥3 loose or watery stools in a 24-hour period)*
☐Y ☐N (***if No, skip to #44***)

If yes, what was done about it?

PERSON 1 (41.)	**PERSON 2** (42.)	**PERSON 3** (43.)	
☐	☐	☐	a. Taken to hospital/ health center
☐	☐	☐	b. Taken to private clinic

☐ ☐ ☐ c. Purchased meds/ORS at pharmacy (*no facility visit*)
☐ ☐ ☐ d. Home remedy, *specify* _____
☐ ☐ ☐ e. No action/Went away on its own

44. Has any other household member (≥ age 5) had any other illness in the past 2 weeks?
☐Y ☐N (***If no, skip to #48***) *If yes*, specify:

PERSON 1 (45.)	**PERSON 2** (46.)	**PERSON 3** (47.)	
☐	☐	☐	a. Skin infection
☐	☐	☐	b. Respiratory infection
☐	☐	☐	c. Accident/Injury
☐	☐	☐	d. Other, *specify*: _____
☐	☐	☐	e. Other, *specify*: _____

48. For the following questions, please indicate whether you consider these issues to be "a big problem", "somewhat of a problem", or "not a problem":

a. Water quality or quantity:
☐ A big problem ☐ Somewhat of a problem ☐ Not a problem
b. Rubbish or pollution:
☐ A big problem ☐ Somewhat of a problem ☐ Not a problem
c. Crime or violence:
☐ A big problem ☐ Somewhat of a problem ☐ Not a problem
d. Diarrhea or stomach ailment:
☐ A big problem ☐ Somewhat of a problem ☐ Not a problem
e. Mosquitoes or malaria:
☐ A big problem ☐ Somewhat of a problem ☐ Not a problem
f. HIV/AIDS:
☐ A big problem ☐ Somewhat of a problem ☐ Not a problem
g. Other chronic diseases (Diabetes/Cancer/Hypertension):
☐ A big problem ☐ Somewhat of a problem ☐ Not a problem
h. Respiratory illnesses:
☐ A big problem ☐ Somewhat of a problem ☐ Not a problem
i. Skin infections:
☐ A big problem ☐ Somewhat of a problem ☐ Not a problem

50. Are there any other major health problems or environmental concerns for (*this community*)? *specify* _____

IDENTIFY 6–10 COMMUNITY CONCERNS THROUGH DISCUSSION WITH LOCAL PERSONNEL, HEALTH DEPARTMENT, MEDIA SOURCES, ETC., AND LIST MOST ANTICIPATED RESPONSES

E. TEST RESULTS

Was sample collected?

51. ☐ Free CHLORINE ***direct from tap*** …….....Result: _____
52. ☐ Free CHLORINE ***from tank*****……**...Result: _____
53. ☐ Free CHLORINE ***from drinking water container***……....Result: _____

(54.) *Ask about the source of* ***this*** *drinking water container sample (may need to probe)*

a. ☐ Untreated tap water d. ☐ Storage tank

b. ☐ Boiled tap water e. ☐ Other (specify) _____
c. ☐ Tap water with chlorine or bleach

WHEN ANALYZING THIS DATA, IT IS OF INTEREST TO COMPARE WATER IN DRINKING WATER CONTAINERS FROM DIFFERENT SOURCES.

Collect the following samples in sterile plastic bottles and label it with household ID#, date, and "TAP" or "DWC". Sample must be kept cold. Call for immediate sample pick-up.

	Y	N	
55.	☐	☐	Sample collected from ***tap*** for MICROBIOLOGY TESTING
56.	☐	☐	Sample collected from ***drinking water container*** for MICROBIOLOGY TESTING

QUESTIONS 55 AND 56 ASSUME THAT SAMPLES ARE BEING EVALUATED FOR COLIFORM BACTERIA USING A LOCAL LABORATORY OR DEL AGUA FIELD TEST KIT. SHOULD BE CHANGED ACCORIDINGLY IF A DIFFERENT METHOD IS USED OR IF MICROBIOLOGICAL TESTING IS NOT DONE.

Thank you very much for taking part in this interview