

GLOBAL HOUSEHOLD WATER INSECURITY STUDY (GHWIS)

PROJECT HANDBOOK/FIELDWORK MANUAL



Working definition of household water insecurity

Water insecurity is the inability to access and benefit from affordable, adequate, reliable and safe water for wellbeing and a healthy life
(Jepson et al., 2017)

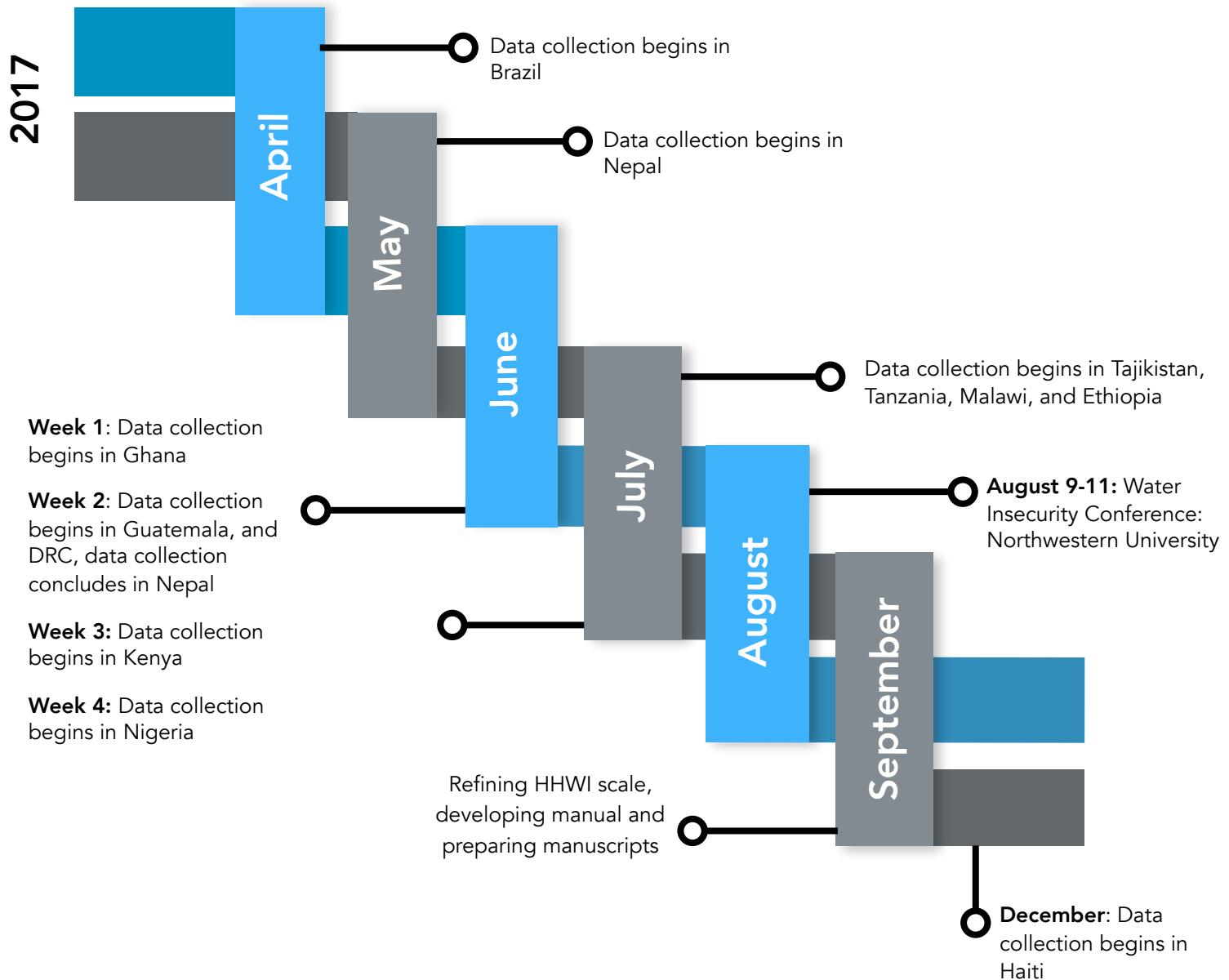


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1. Overall objectives

This manual is meant to provide guidance on data collection and analysis to build a cross-culturally validated household-level water insecurity scale. This scale is important because it can be used to **assess risks** of adverse outcomes associated with household water insecurity, **target scarce resources** to mitigate household water insecurity, and **measure the impacts** of interventions and policies on household water insecurity.

2. Timeline



3. Introduction to Household-Level Water Insecurity

Water is fundamental to health and nutritional wellbeing. Water is needed for personal consumption (drinking, cooking, taking medications), economic productivity (watering livestock and crops, operating businesses), as well as hygiene and sanitation (Figure 1).

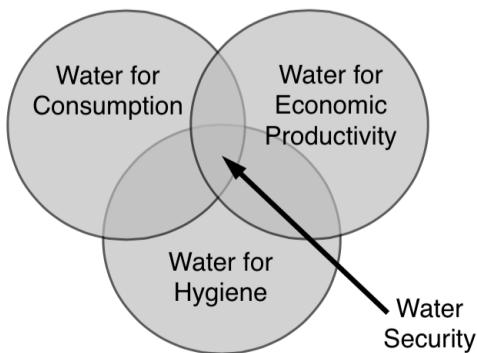


Figure 1. 3 components of water security

Water scarcity is a growing problem. There is widespread agreement that difficulty with regular availability and access to water in sufficient quantity and quality is a serious problem that will only increase, given climactic changes and increased water use (1,2). Four billion people face severe water scarcity for at least 1 month per year, while half a billion people suffer from severe water scarcity year round. (3)

Water insecurity is pivotal to the health of all, but especially women and children. In most parts of the developing world, women bear the physical responsibility and psychological burden of ensuring

adequate household water (4-5). This can be very demanding in terms of time and energy, e.g. walking long distances to water sources, carrying heavy jerrycans. It can also leave women vulnerable to physical and sexual violence en route to remote sources (6-8). Further, water acquisition can leave women less time for other critical responsibilities (which are also often water-intensive and promote health and hygiene), e.g. bathing children, washing clothes. It can also compromise women's ability to care for their children, including the energy and time demands of breastfeeding and clinic visits (9). It can preclude women from engaging in wage-earning activities, and girls from attending school (10). Also of note, pregnant and lactating women have less physical ability to access water, making the need for readily accessible, clean water especially vital during pregnancy and lactation (11).

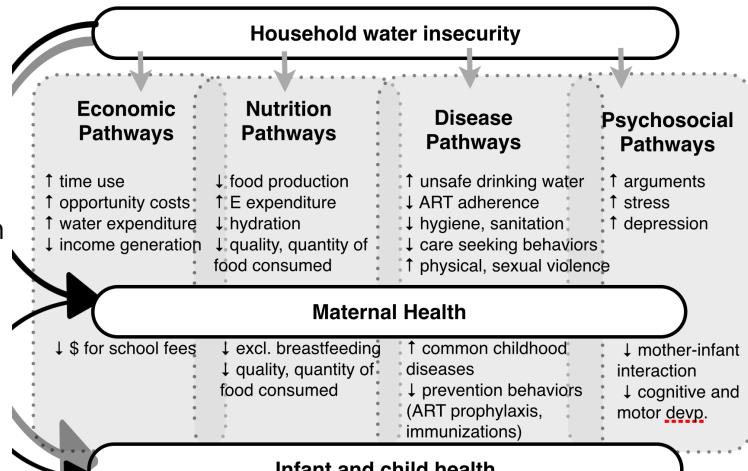


Fig 2. Potential pathways of influence of WI on maternal and child

Currently, we cannot measure water security at the level of the household or individual, i.e. at the endpoint of water use. Although there are myriad national, regional, community, and hydrologic indexes of water availability (12-15), and strong formative work about water access at the level of the household [e.g. from Ethiopia (16), Texas (17), and Bolivia (18)], to our knowledge, there are no validated scales for measuring water access at the household or individual levels globally. Without a comprehensive, validated scale to measure

household WI, we cannot know the prevalence of household WI access, nor empirically test its potential impacts on economic, nutrition, disease, and psychosocial health outcomes (cf. Fig. 1). Therefore, this work is innovative because we will conduct the rigorous psychometric and statistical analyses necessary to transform a list of questions into a rigorously validated scale.

A tool analogous to the household-level food insecurity scales, but to measure water security access at the household level, could be “game-changing”. Indeed, our ability to measure food security access in the household has advanced our understanding of the underlying causes of a range of adverse health outcomes, from HIV acquisition and progression (19) to depression and poorer health (20, 21). It has also been useful for developing interventions and policies to mitigate food insecurity, and has helped to explain why some interventions have not had intended effects (22).

4. Overview of data collection methods

4.1 Sampling

The **gold standard** of participant sampling would be to identify mutually exclusive and exhaustive categories of areas known to be of high, medium, and low water insecurity. A random sampling technique could then be applied to select a sample from the population.

This is the first endeavor to measure household water insecurity, and our assessments are based on information available from a variety of sources, such as, but not limited to: community mapping of water resources/uses/problems, previous surveys on water resources/use/issues, and knowledge of key stakeholders.

We have outlined a few useful steps for sampling below:

1. Choose the number of neighborhoods or interviewer areas for sampling based on informed knowledge of available information about the state of water insecurity.

Develop a criterion for neighborhood selection.

- a. Depending on your desired total sample size, it could be one or more of each type of neighborhood.
- b. If there is a need for unbalanced neighborhood sampling, focus on oversampling high and medium areas of water insecurity to capture more variation.

2. Then, in each neighborhood, interviewers can use any of the following techniques to randomly select participants:

- a. Interviewers should obtain or develop a list of house numbers (if possible) for selected neighborhoods or interviewer areas. Based on this list (i.e. sampling frame), interviewers should select every 2nd, 3rd, or 4th house number on the list until the predefined sample for that neighborhood has been attained.

- b. Alternatively, interviewers can do the WHO random sample walk (i.e. a random number is chosen and interviewers will sample every nth household). For example, if the number 3 is chosen, interviewers would sample every 3rd household.
- c. If this survey is being included as part of a larger assessment, interviewers should follow the sampling protocol defined by their principal investigator and study team.

4.2 Description of Surveys

Approximately 250 participants will be surveyed per site.

Survey data will allow us to understand the impacts of household water insecurity. We expect that water insecurity will have consequences for economic productivity, nutrition, disease, and psychosocial wellbeing. Therefore, we have developed a survey that asks 32 questions about

water insecurity, and other questions about sociodemography, water quality, quantity, accessibility, reliability and utility, food insecurity, perceived stress, and infant feeding (Table 1).

Together, these questions will help us to understand if our 32-question water insecurity tool is valid for use globally, and that it measures the actual experiences of water insecurity, and will allow us to explore the consequences of water insecurity at the household level.

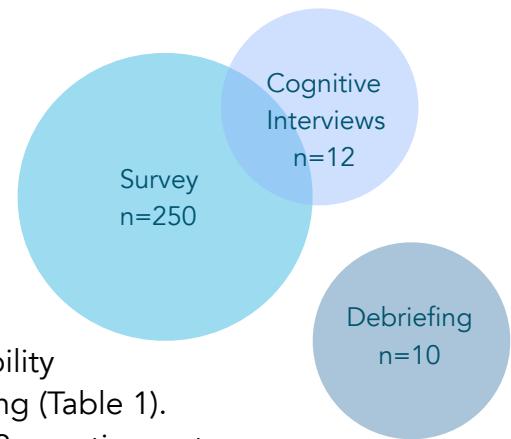


Table 1. Survey questions with rationale

Topic	Brief Description	Rationale
Socio-demography	Household size (# of adults \geq 16 years of age & # of kids \leq 15 years of age)	Participants Characteristics
	Gender of Household head and respondent	
	Age of Household head and respondent	
	Who is responsible for collecting water in the household?	
Water Insecurity Access Scale (WIAS)	32-item scale on household water insecurity	Scale
Water Quality	Source of primary drinking water (WHO categories for improved & unimproved sources)	Variation between groups
	Source of primary non-drinking water (WHO categories for improved & unimproved sources)	
	Assessment of drinking water to be safe or unsafe	
	Participants treating their water	

Water Accessibility	The amount of money spent by the household in water collection	Convergent validity
	Estimate the time spent in collecting water from water source	
	Frequency of water collection	
Water Quantity	Amount of drinking water stored in household (L)	Convergent validity
	Amount of non-drinking water stored in household (L)	
Water Utility	Amount of water drank in a day (L)	Discriminant validity
Water Stability/Reliability	Which of the months in a year do households experience water insecurity?	Variation between groups
	Which times of day do households experience water insecurity?	
Food Insecurity	9-item estimate via Household Food Insecurity Access Scale (HFIAS). Coates, Swindale, & Bilinsky. (2007). <i>Household Food Insecurity Access Scale (HFIAS) for measurement of food access: indicator guide.</i>	Predictive validity of scale
Perceived Stress	4-item Estimate via Cohen's Perceived Stress Scale. Cohen, Kamarck, & Mermelstein. (1994). <i>Perceived stress scale.</i>	Predictive validity of scale
Infant Feeding	1 open-ended question on perceptions of how water insecurity may affect infant & young child feeding	Formative, establish relationship
Socio-Economic Status	Open-ended question about job/work	Predictive validity of scale
	A ladder showing the degree of participants socio-economic status (scaled 1 to 10, with 1 being the best off, most educated, most money, and the most respected job; at the bottom participants with less money, education, least respected jobs)	
	Estimate socioeconomic status via income of participants or household	
Data Quality	4-items on interviewer-assessed quality of responses	Data quality

4.3 Data Collection

We will be collecting data using either paper forms, which will be provided to you, or using a tablet-based application (information on downloading tablet-based forms can be found on page 26). Each participant you survey will have a unique participant identification

number, which will be recorded on the survey. To maintain the confidentiality of our participants, we will not list their names on the interview or survey forms. Each participant will be given a unique identifier, such that he or she will be distinguishable from other participants within study sites and across study sites. Table 2 below shows how participant IDs should be assigned.

Each participant ID should be clearly marked with the **first 2-3 letters of the country** the participant was surveyed in and the number corresponding to the order in which the participant was surveyed. For instance, if you are conducting a survey in Guatemala and you are surveying the first person in that area, the participant ID (PID) will be "GU001", the second person will be "GU002", the third person will be "GU003"...the tenth person will be "GU010", and the hundredth person will be "GU100". **Please include zeros before any single or double digit participant IDs to distinguish them clearly.**

STEP 1: Each interviewer will also have a unique ID to distinguish them from other

Country	Participant Number	Participant ID	Interviewer Number	Interviewer ID
Mexico	001	ME001	001	IME001
Guatemala	005	GU005	002	IGU002
Nepal	007	NE007	003	INE003
Democratic Republic of Congo	152	DRC152	004	IDRC004

interviewers at each site. Interviewer ID will start with an "I", so "IME001" would be interviewer 001 in Mexico. Interviewers will list their interview number, country and region where the survey is occurring, the unique participant ID, language of interview, gender of the participant, participant's place of residence (categorized as rural, peri-urban, or urban) prior to screening and consenting participants. (**see above**)

STEP 2: Using a series of three questions, interviewers will screen participants to determine if they are interested in participating in the study.

- ▶ The first question is "Do you agree to participate in this survey?" If the participant response is "no," thank the person for his or her time and conclude the interview.
- ▶ The second question is "Are you 16 years of age or older?" All participants in this study should be 16 years of age or older. If the participant response is "no," thank the person for his or her time and conclude the interview.
- ▶ The third question is "Would you consider yourself knowledgeable about water acquisition and use within your household?" If the participant response is "no," ask the participant who within their household is most knowledgeable about water acquisition and use and

ask to speak with that person. Once the person most responsible for water acquisition and use is identified, thank the person you have initially spoken with for his or her time and conclude the interview before beginning an interview with the person who is most knowledge about water acquisition and use.

STEP 3: If participants respond “yes” to each of the questions above, proceed with the interview.

4.4 BEGIN SURVEY

Section 1.1. Sociodemography: Part 1

We will begin the interviews with a brief survey of sociodemography. These questions include the participant’s relationship to the head of household, the gender of the head of household, participant’s age, number of children (people 16 years of age and younger) in the household and number of adults (people older than 16 years of age) in the household. We will also ask who within the household is responsible for making sure there is enough water. For this question, ask the participant directly, and if he or she responds that this is a shared responsibility, ask her or him who within the household shares the responsibility and select the responses in the survey that most closely relates to what he or she reported. We will also ask participants what type of home they live in. It is important to note not only the type of home, but also if participants rent, own, or lease the property. If none of the options apply to the person you are interviewing, you can select ‘other’ and write in a response for housing type.

Section 2. Water Insecurity Scale

The 32 water insecurity questions are intended to capture a range of experiences and indicators of water insecurity at the household level. Not all questions will be applicable to all households in your site. In fact, some questions may not be applicable to any households in your site. **While you may be concerned about bothering the participant, please remember that it is very important that all the questions are asked in the same way across all study sites.** This is because when we analyze the data, we can see which questions are least applicable. Then, we can remove any questions that do not apply to create a shorter survey that addresses the most important and applicable aspects of water insecurity across the world.

If the participant displayed annoyance or any other negative indicators of their feelings in this section of the survey or any other, please make note of it at the end in the “Data Quality” section of the survey. To the best of your ability, describe the negative aspects you picked up on, and note whether it was a specific question or what the problem was.

For this series of questions, ask participants how often each of the situations occurred within the past 4 weeks (or one month).

- A **Never**: If a participant says that they never experienced the situation, respond with A "Never"
- B **Rarely**: If a participant says that they experienced the situation 1 or 2 times in the past 4 weeks, choose B "Rarely"
- C **Sometimes**: If the participant says they experienced the situation between 3-10 times in the past month, choose C "Sometimes"
- D **Often**: If the participant says they experienced the situation between 11-20 times in the past month, choose D "Often"
- E **Always**: If the participant says they experienced the situation more than 20 times in the past month, choose E "Always"
- DK **Don't know**: If the participant says they do not know or remember, choose DK "Don't know"
- NA **Not applicable/I don't have this**: In some cases, questions may not be applicable to all participants. For example, some households may not have gardens or animals. In this instance, you would select NA "Not applicable/I don't have this"

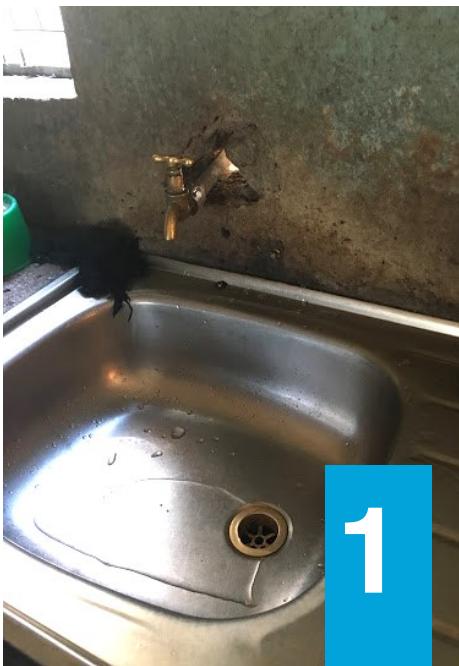
Helpful tip: If participants do not feel confident in their answers, or are having a difficult time responding, probe the participant on the number of times these items have occurred in one week and multiply by four to get a cumulative response.

Further probing for each individual water insecurity question can be found on page 21 of this manual.

Section 3. Water Access: Water Sources

You will notice that the next section covers water access. The first two questions include primary source of drinking water and non-drinking water. For each of these, the water sources we are referring to in the survey are illustrated in the following few pages for reference.

Number	Water Source	Number	Water Source
1	Piped water	9	Small water vendor
2	Stand pipe	10	Tanker truck
3	Borehole/Tube well	11	Bottled water
4	Protected dug well	12	Bagged/sachet water
5	Unprotected dug well	13	Surface water
6	Protected spring	14	Other Person
7	Unprotected spring	15	Other
8	Rainwater collection		



1



Public tap/standpipe: Public water point, has one or more taps constructed from brick, masonry, or concrete

Piped water into dwelling or compound: Water service pipe connected with in house plumbing with 1 or more taps



2



3

Borehole/Tubewell (similar appearance): Constructed by drilling into groundwater supplies and encasing water supply with pipes which prevents pollution of the water source by runoff or surface water



4

Protected dug well: Dug well protected by runoff by a well lining or casing raised above ground level and a platform that diverts spilled water away from the well



5

Unprotected dug well: Dug well that either is not protected from runoff, or is not protected from animal contamination



6

Protected spring: Natural spring is protected from runoff and contamination by a "spring box" constructed of brick, masonry, or concrete built around a spring so that water flows directly out of the box into a pipe or cistern



7

Unprotected spring: Spring without a "spring box" open to contamination from humans and animals



8

Rainwater: Collected or harvested rainwater from roof or ground catchment



9

Small vendor: Water seller transports water into a community using donkey carts, motorbikes, motor vehicles, bicycles, or on foot



10

Tanker truck: Water is brought into a community via a truck and is sold or distributed



11

Bottled water: Purchased bottled water



12

Sachet/bagged water: Purchased water sold in sachets or bags



13

Surface water: Any water located above ground (i.e. rivers, dams, lakes, ponds, streams, canals, and irrigation channels)

14

Section 4.1. Water Access: Water Acquisition

Once you have assessed which water source is being used, we will ask participants how long it will take them to access their water. This includes asking participants how long it takes them to go to their water source, get water (including drawing or pumping water, and waiting in line), and return home. If participants respond that they access water within their house or compound, record this response as "0". We will also ask participants how many trips they make to their indicated water source each week (this does not include any trips within the household or compound).

If the participant responds in hours, multiply the number of hours by 60 minutes to get the correct response. You may also comment at the end of the survey that you recorded this response in hours and the data cleaning team can convert to minutes later.

Section 4.2 Water Access: Water Purchasing and Treatment

We will also ask participants how much money they spend on getting water. Participants will likely respond back using the country's currency, and we will need to record the amount of money they report, but also the unit of currency that they are referencing. This step is important because since there are many sites, we want to ensure that we can understand the relative amount spent in each study site, and we anticipate that this will differ by location.

We will ask participants if they treat their drinking water in any way to make it safer. This question is not meant to stigmatize individuals if they do not treat their water, but rather, to get information on if and how water is treated. If participants do not treat their water, do not pressure them for a response on how they treat their water, or a false response may be given. However, if participants respond that they do treat their water, ask them what the primary treatment method they use is. The survey includes the options for boiling, filtering, and adding chemicals, but participants may use other methods, such as sedimentation. If this is the case, select 'other' and fill in the most appropriate response. If participants are treating water, please ask them how much money they spent treating water in the past 4 weeks. As outlined above, please indicate the currency.

Section 5.1. Water Quantity, Utility, and Stability: Water Storage

We will ask participants how many liters of water they store in their houses for drinking and for other uses. It may be useful to refer to photographs if participants cannot recall how much water they store. For instance, a participant may have three 20L jerrycans (60L in total) at their home for domestic purposes (cooking, cleaning, washing), but may have a smaller 10L container for drinking water storage. We have provided a chart with images that you can use to guide the participant as you review how much water they have stored. This chart is located on page 29. Not all sizes or types of containers are listed in the survey, but these

images may help to facilitate the conversation about how much water participants are storing.

TRAINERS SHOULD USE THEIR BEST JUDGEMENT AND KNOWLEDGE OF WATER STORAGE CONTAINERS IN THE AREA TO RECORD THE AMOUNT OF STORED WATER

Section 5.2. Water Quantity, Utility, and Stability: Water Supply

We will ask participants which months of the year that their households experience water shortage and which months of the year they have plenty of water. This may not apply to every household, and months should only be circled if participants experience water shortage or have an abundance of water. We also ask what times of day households experience water shortages; this question may not apply to everyone, and if the participant you are interviewing does not have specific times of day during which they experience water shortage, this question can be skipped.

Section 6. Food Insecurity

In this survey, we will also ask questions about food insecurity. These questions are similar to water insecurity, and we will be asking about the frequency of each of the experiences within the past 4 weeks (or one month). However, you will notice that options for responses differ from the water insecurity survey, they are below for clarification:

- A Never:** If a participant says that they never experienced the situation, respond with A "Never"
- B Rarely:** If a participant says that they experienced the situation 1 or 2 times in the past 4 weeks, choose B "Rarely"
- C Sometimes:** If the participant says they experienced the situation between 3-10 times in the past month, choose C "Sometimes"
- D Often:** If the participant says they experienced the situation more than 10 times in the past month, choose D "Often"
- DK Don't know:** If the participant says they do not know or remember, choose DK "Don't know"

Section 7. Perceived Stress

In this survey, we also ask participants another type of scale question, the perceived stress scale. In this series of questions, we will ask participants about the number of times they have experienced specific thoughts or feelings within the last four weeks. The timing of the responses is outlined below:

- A Never:** If a participant says that they never experienced the situation, or have experienced the situation 0 times in the last 4 weeks, respond with A "Never"

- B** **Rarely:** If a participant says that they experienced the situation 1 or 2 times in the past 4 weeks, choose B "Rarely"
- C** **Sometimes:** If the participant says they experienced the situation between 3-10 times in the past 4 weeks, choose C "Sometimes"
- D** **Fairly Often:** If the participant says they experienced the situation 11-20 times in the past 4 weeks, choose D "Fairly Often"
- E** **Often:** If the participant says they experienced the situation more than 20 times in the past 4 weeks, choose E "Often"
- DK** **Don't know:** If the participant says they do not know or remember, choose DK "Don't know"

Section 8. Infant feeding

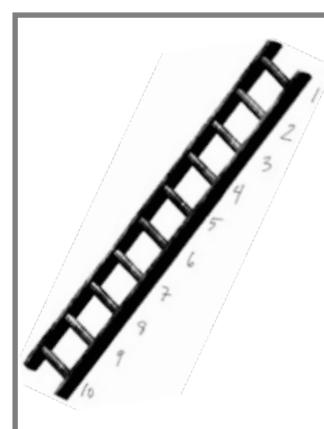
We are interested in learning if and how water insecurity affects the feeding of infants and young children (up to 12 months). Infant and young child feeding can include breastfeeding, feeding breastmilk from a cup or another way than at the breast, and the other types of food that children are fed at that age (i.e. porridge, soups, rice, etc.). We are interested in the ways that water insecurity may impact how infants are fed- from how getting/fetching water may change how much time mothers have to care for their children, how a lack of water may make certain foods harder to prepare, or may affect the quality or quantity of foods that are available, or any other things that participants may tell us.

The best way to explore all the possibilities of how water may affect infant feeding, is to ask an open-ended question: "*Can you tell me some ways that the water situation here affects how infants (under 12 months of age) are fed?*" We would like you to prompt for three ways, so ask "Is there another way that your water situation affects infant or young child feeding?" as a follow-up to the first and second response, until you receive three responses, or if the participant tells you they have no more ways. If the participant insists they do not know of any or more ways, please move on to the next section.

For this question and all other open-ended questions, please try to write word-for-word what the participant says.

Section 1.2. Sociodemography: Part 2

In the survey, we have included a second set of sociodemographic questions. You will notice that we have included a ladder (seen below) with numbers along the side rails. This ladder is meant to be a visual tool, much like the water containers, to help participants think through their responses. In the question with the ladder, please ask participants to think of the ladder as the socioeconomic



standing of people in their community, with the people who are the best off at the top and the people who are the worst off at the bottom and ask them to touch the rung that most closely corresponds to how they view their socioeconomic standing.

Section 10. Data quality

At the end of each interview, we will ask how data collection went. We will first ask about the receptiveness of the respondent to each question by asking if the respondent showed any signs of mistrust, dishonesty, fear of you or the study, hostility, anger, or resentment, or evasion or trying to avoid answering. These questions will not be a reflection on you as the interviewer, but will help us to understand how the data collection process went and if participants feel comfortable with interviewers and surveys. We will also ask if there were any interruptions or distractions and how you would rank the overall quality of the data. If you have any concerns about the data collected, please list these concerns here with as much detail as possible. We want to ensure that our interviewers and study participants feel comfortable throughout the data collection process.

4.5 Cognitive Interviews

Pre-testing allows us to determine if questions are well understood and received by study participants at all research sites. There are a few ways to pre-test survey questions. The qualitative methods of pretesting ask the participant to **describe how** they would answer the question.

The cognitive interview, or “Think aloud” approach, is one of the qualitative pre-testing methods. In a cognitive interview, the participant is asked to think aloud as they answer each question, so that the researcher can hear their thought process, to know how the participant is understanding and responding to the question.

Another qualitative method of pre-testing is the “tell me about” approach, where the survey question is asked as an open-ended question. This way, the participant responds to the question in their own words so that the researcher can evaluate whether or not the survey question can capture the experiences described in the open-ended response.

We are conducting both types qualitative pre-testing interviews on the water insecurity scale in order to compare how these methods work in different countries and contexts and determine which is more effective. For each of the 32 water insecurity survey questions, first the qualitative variation of the question will be asked. Then the actual survey question will be asked. Finally, the participant will be asked “Did you understand the question?” and “How confident were you in your response?” The response options are “mostly” and

"completely confident", as we expect participants who answered to somewhat understand and feel confident in their answer.

Approximately **12 key informants** will be interviewed at each site using 2 methods:



Think aloud

We will ask each participant to describe what they think about when they hear and respond to each of the 32 water insecurity questions



"Tell me about"

We will ask each participant to respond to the open-ended version of the 32 water insecurity survey questions and describe their experiences with water

4.6 Debriefing

Since the goal of this study is for the water insecurity survey to be used around the world, we want to know how well it works in different contexts. Therefore, up to **10 interviewers from each site** will be debriefed after completion of the surveys or cognitive interviews to determine how survey questions were understood and received by participants.

Interviewers will be interviewed on where they conducted interviews (urban, rural, peri-urban areas), if the debriefing is occurring post-survey or post-cognitive interviewing, how many surveys (approximately) the interviewer completed, the primary language of the surveys, and questions specific to the water insecurity scale. These include which of the 32 water insecurity questions worked best or were not well understood and why, which question was the most important to understand water insecurity in the specific region, and questions the interviewer wished we would have asked to better understand water insecurity.

5. Study Sites

Acatenago, Guatemala: Arizona State University: Dr. Amber Wutich, Dr. Roseanne Schuster, & Dr. Johnathan Maupin

Kathmandu, Nepal: Arizona State University: Dr. Amber Wutich, Dr. Roseanne Schuster, Dr. Ashley Hagaman

Dushanbe, Tajikstan: Arizona State University: Dr. Amber Wutich, Dr. Roseanne Schuster, Monet Niesluchowski

Brazil: Texas A&M University: Dr. Wendy Jepson

Singida, Tanzania: Northwestern & Cornell Universities: Dr. Sera Young, Vicky Santoso

Merida, Mexico: Michigan State University: Dr. Amber Pearson

Arua, Uganda: Michigan State University: Dr. Amber Pearson

Kahemba, Democratic Republic of Congo: Michigan State University: Dr. Michael Boivin, Dr. Desire Tshala, Ann Hoffman

Lagos, Nigeria: Northwestern University: Dr. Bolanle Balogun, Dr. Shannon Galvin

Accra, Ghana: University of Miami: Dr. Justin Stoler, Delaware State University: Dr. Raymond Tutu

Bahirdar, Ethiopia: Oregon State University: Dr. Kenneth Maes, Yihenew Tesfaye

Lilongwe, Malawi: Georgia State University: Dr. Ellis Adams

Seme sub-county: Pamoja Community-Based Organization: Patrick Mbullo

Leogane and Gressier, Haiti: University of Florida: Kelly Chapman

6. Appendices

6.1. Additional Probing Questions for the Water Insecurity Access Scale

1. **WIAS 1:** In the last 4 weeks, how frequently did you or anyone in your household worry you would not have enough water for all of your household needs?
 - a. Your household needs could include washing clothes, bathing yourself and/or your children, watering animals, washing dishes and utensils, cleaning your home, or other things your household needs water for.
 - b. In this question, we are wondering more about the worry about not having enough water than about the activities that you may not have water for.
2. **WIAS 2:** In the last 4 weeks, how frequently have you or anyone in your household worried about the safety of the person getting water for your household? By getting, I mean: traveling to, collecting the water, and returning with the water?
 - a. This question may not apply if you do not have to leave your home to get water. In many places, people have to travel, either by foot, by bicycle, by vehicle, or by other means, to get their water, and we would like to know if they worry about the safety of the person who is responsible for traveling to get water for the household to use.
3. **WIAS 3:** In the last 4 weeks, how frequently have you or anyone in your household thought of leaving [name of town] because there was no water there?
 - a. In some places, people move from towns and communities where there is no water to towns and communities where there is more water available.
4. **WIAS 4:** In the last 4 weeks, how frequently has your household water supply from your main water source been interrupted?
 - a. By interrupted, we mean that your water could have been turned off by the government or company that provides it, or stopped flowing due to issues with the supply or supplier, or that a storage tank now contains no water, or that the vendor you use to purchase water regularly is not available, or that there is a drought you have to use another source to get water.
5. **WIAS 5:** In the last 4 weeks, how frequently has your household not had enough water for your garden, crops, or fruit trees?
 - a. This question may not apply if you do not grow a garden, crops, or trees. Gardens, crops, or fruit trees includes any plants that you grow, and that you may not have enough water for.
6. **WIAS 6:** In the last 4 weeks, how frequently has your household not had enough water to give to your animals and poultry?
 - a. This question may not apply if you do not have animals, livestock, or poultry. Animals and poultry mean any animals or livestock you may have, such as chickens, cattle, pigs, goats, sheep, alpacas, etc. that you may not have enough water for.

7. **WIAS 7:** In the last 4 weeks, how frequently has the time spent getting water prevented you or anyone in your household from earning money (e.g. engaging in paid work, economic activities)?
- This question refers to the time spent either getting water from a source, waiting in line to purchase water, or other activities you may engage in related to getting water that prevent you from being able to go to work, stay at work, or force you to choose between getting water and earning money.
8. **WIAS 8:** In the last 4 weeks, how frequently have you or anyone in your household lacked money needed to buy water?
- Buying water refers to paying for any water—water that is piped into your house, water delivered to a tank in your house or compound, or buying water in containers to take home. In households where people buy water, we would like to know how often you have not been able to buy water because you lacked money. For example, in some places, people sometimes have to choose between food and water, and this can make buying water more difficult.
9. **WIAS 9:** In the last 4 weeks, how frequently did you or anyone in your household want to buy water but there was nowhere to buy it from?
- This question refers to the place where you buy water, if you buy water. In some places, during dry season or if there is another interruption in the water supply, it is not possible to purchase water from a preferred vendor or place.
10. **WIAS 10:** In the last 4 weeks, how frequently has the time spent getting water prevented you or anyone in your household from caring for children in the household?
- This question may not apply if you do not have children in your household. In some places, household members will need to leave their children with older children, a neighbor, or alone while they go to get water or wait for water.
11. **WIAS 11:** In the last 4 weeks, how frequently has the time spent getting water prevented you or anyone in your household from doing household chores (such as cooking, preparing food, washing clothes, etc.)?
- In some places, household members will not be able to do their daily tasks because they have to travel to get water, or they have to wait for water delivery, or other things that interrupt their planned activities.
12. **WIAS 12:** In the last 4 weeks, how frequently did the children in your household miss school because they were getting water?
- This question may not apply if you do not have children. In some places, children will miss school because they have to travel to water sources to get water and/or had to wait in order to get water. Missing school means that they were not able to attend school on a particular day or a number of days because they had gone to get water.
13. **WIAS 13:** In the last 4 weeks, how frequently has there not been enough water in the household to wash clothes?
- This question refers only to water used for washing clothes. Sometimes households will have water for other activities, but may not have enough to wash clothes.

14. WIAS 14: In the last 4 weeks, how frequently have you or anyone in your household had to change what was being eaten because there wasn't enough water (e.g. for washing foods, cooking, etc.)?

a. This question refers to water only used for cooking. In some places, people use water to wash and prepare foods and for the process of cooking. This question means that your household may have wanted a different kind of food, but that you could not eat it and had to choose something else because you did not have enough water.

15. WIAS 15: In the last 4 weeks, how frequently have you or anyone in your household had to go without washing hands after dirty activities (e.g., defecating or changing diapers, smearing animal dung) because you didn't have enough water?

a. This question refers to water for washing hands. Sometimes you may need to engage in dirty/unclean activities, like changing diapers, using a toilet, smearing mud or dung on walls or floors to insulate your home, cleaning, or taking care of animals and you may not have enough water after to wash your hands.

16. WIAS 16: In the last 4 weeks, how frequently have you or anyone in your household not had enough water to wash the faces and hands of children in your household?

a. This question may not apply if you do not have children. In many places, children wash their faces and hands before school and bedtime, and mothers wash the faces of the young babies, but sometimes there may not be enough water to do this.

17. WIAS 17: In the last 4 weeks, how frequently have you or anyone in your household had to go without washing their body because there wasn't enough water?

a. This question refers to water for bathing. Sometimes household members need to bathe, but there isn't enough water to do this.

18. WIAS 18: In the last 4 weeks, how frequently has your or anyone in your household's day been interrupted by your water situation, including getting or distributing water within the household?

a. This question refers to your day being interrupted by problems with water. In some places, people have to travel to get water, and this takes time and can interrupt plans.

19. WIAS 19: In the last 4 weeks, how frequently have problems with water prevented you or anyone in your household from attending social events (i.e. church, funerals, community gatherings, etc.)?

a. This question refers to any problems with water that prevents anyone in your household from going to community meetings, going for prayer/church, going for funerals and weddings. By problems with water, for example, you may not have enough water to bathe and do not feel clean enough to go, or that you may have to go and get water, which prevents you from being able to prepare or attend social events, or that there may be other problems with water that prevent you from going to social events.

20. WIAS 20: In the last 4 weeks, how frequently did you or anyone in your household want to treat your water, but couldn't? By treat, I mean boiling, using chemicals to treat, or other ways you make your water safe to use or drink.

- a. This question refers to treating water. In many places, water is treated in a way to make it safer to use for drinking, cooking, and other uses, but sometimes households cannot treat their water in the way that they would like.
21. **WIAS 21:** In the last 4 weeks, how frequently have you or anyone in your household drank water that tasted bad?
- a. This question refers to your water taste. In some places, people do not have access to different types of water sources, and sometimes have to drink water that they do not think tastes good. Tasting bad may mean that the water tastes salty, bitter, sour, or spoiled, and/or that it may have dirt in it.
22. **WIAS 22:** In the last 4 weeks, how frequently have you or anyone in your household actually drank water that you thought was unsafe?
- a. This question refers to your water safety. In some places, people have to drink water that they do not think is safe to drink. This could be because they do not have access to or cannot afford different types of water sources, or are unable to treat their water before it is consumed.
23. **WIAS 23:** In the last 4 weeks, how frequently have you or anyone in your household asked to borrow water from other people?
- a. This question refers to getting water from other people. In some places, people borrow water for their family members, neighbors, and friends if they do not have enough of it for their household.
- 23a. **WIAS 23a:** From whom?
- a. If you borrowed water, from whom did you borrow it from?
- 23b. **WIAS 23b:** What were you expected to give in return?
- a. If you borrowed water from someone, did they expect you to give something back to them for it? In some places, people will borrow water and share water later or share food or money in exchange.
24. **WAIS 24:** In the last 4 weeks, how frequently have you or anyone in your household loaned water to anyone?
- a. This question refers to giving water to other people. In some places, people give water to their family members, neighbors, and friends if they have enough to share.
25. **WIAS 25:** In the last 4 weeks, how frequently did you or anyone in your household have problems with water that caused difficulties with neighbors or others in the community?
- a. This question refers to any difficulties you may have with your neighbors, friends and community members because of water. For example, in some places, people have to wait in line for a very long time before they can buy water and this can cause arguments. Also, sometimes some people may have more power or control over the water access or distribution than others, and this can also cause problems.
26. **WIAS 26:** In the last 4 weeks, how frequently did you or anyone in your household have problems with water that caused difficulties within your household?
- a. This question refers to any difficulties you may have with other people in your household because of water. For example, in some places, household members will

have arguments about how much water should be used, how much money is paid for water, and who gets to choose how water is used.

27. WIAS 27: In the last 4 weeks, how frequently did you or anyone in your household feel upset about your water situation?

- a. This question refers to any negative emotions you have because of water. By upset, we mean you can feel angry, sad, worried, frustrated, or concerned about your household water situation. By situation, we mean how you get water, not having enough water, not having enough of the kinds of water you prefer, being worried about the quality of your water, water issues affecting your life and schedule, and anything else related to getting and using water that can cause you to feel upset.

28. WIAS 28: In the last 4 weeks, how frequently has there not been as much water to drink as you would like for you or anyone in your household?

- a. This question refers to drinking water in your household. In some places, there is not always enough water for everyone to drink as much as they would like.

29. WIAS 29: In the last 4 weeks, how frequently have you or anyone in your household not had enough water to take medications?

- a. In some places, there is not enough water for everyone to take their medications as their doctor has prescribed or to boil medicinal or traditional herbs.

30. WIAS 30: In the last 4 weeks, how frequently have you or anyone in your household not gotten water where you wanted to because you were too sick or weak to get water?

- a. This question refers to feeling bodily sickness or weakness that prevents you from getting water from where you would like to get it from. In some places, when people are sick they are not able to travel to get water from the place (source) that they would like.

31. WIAS 31: In the last 4 weeks, how frequently have you or anyone in your household gone to sleep thirsty?

- a. This question refers to not having enough water to drink in your household and feeling thirsty when you are going to sleep. For example, people can go many hours without drinking water because they do not have enough, or because they are saving it for other household members or other uses., or for other reasons. People who may really want to drink water before they go to sleep may not have access to any.

32. WIAS 32: In the last 4 weeks, how frequently has there been no water whatsoever in your household?

- a. This question refers to not having any water at all in your household. For example, in some places, people do not have enough storage to keep water or are unable to get enough water to be able to use it for their needs with some remaining for storage.

6.2. Instructions for Downloading Forms in ODK



1. INTRODUCTION

- A. This guide is prepared for users of the Open Data Kit App. It assumes the user has downloaded the app and installed it on an Android device. It also assumes that the user has been provided account information by the System Administrator.

2. CONNECTING TO THE SERVER

- A. Click the three stacked squares and select "General Settings"



- B. Select "Username" and enter the provided username: yrg.mcn@gmail.com
- C. Select "Password" and enter the provided password: W4ter2017
- D. Select "Configure Platform Settings" and enter the provided aggregate address into the "URL": <https://global-ethnohydrology-study.appspot.com>

 ODK Collect > General Settings

ODK Collect
Tap to visit <http://opendatakit.org>

SERVER SETTINGS

Platform
ODK Aggregate

2. Configure platform settings

Google account

1. Username
pith.moromo@gmail.com

Password

BEFORE YOU PROCEED: Please make sure that 'Delete after send' in General Settings has been disabled. This is very important! If this is not disabled, it is possible that data could be lost!

3. RETRIEVING FORMS

- From the Main Menu, select "Get Blank Form"
- Select each form that you would like to download
- Click "Get Selected" to download the forms

 ODK Collect > Get Blank Form

Form 6 Complete ID: f6_v14	<input type="checkbox"/>
Form 7 v1 ID: f7v1	<input type="checkbox"/>
Form 7 v2 ID: f7v2	<input type="checkbox"/>
Form 7 v3 ID: f7v3	<input checked="" type="checkbox"/>
Visit 6 Pii En Ngima ID: Form 6	<input type="checkbox"/>
Visit 6 Pii En Ngima Final ID: Form 6 Final	<input type="checkbox"/>
Visit 6 Pii En Ngima v10 ID: Form 6 v10	<input type="checkbox"/>
test ID: test	<input type="checkbox"/>

Toggle All

Refresh

Get Selected

4. COLLECTING DATA

- A. From the Main Menu, select “Fill Blank Form”
- B. Begin entering data - swipe left and right to move between questions
- C. Once at the end of the form, mark it as finalized and selected “Save Form and Exit”

The screenshot shows the ODK Collect application interface. At the top, there is a header bar with the text "ODK Collect > Form 7 v3". On the right side of the header are three icons: a file icon, a gear icon, and a three-dot menu icon. Below the header, a message "You are at the end of Form 7 v3." is displayed. Underneath this message, there is a section labeled "Name this form" with the value "Form 7 v3". A checkbox labeled "Mark form as finalized" is checked. At the bottom of the screen, there is a large red rectangular box highlighting a "Save Form and Exit" button.

5. SENDING FINALIZED FORMS

- A. From the Main Menu, select “Send Finalized Form”
 - B. Select the forms you would like to send
 - C. Click “Send Selected”
- D. SEND FINALIZED FORMS AT THE END OF EVERY DAY**
- E. If you have sent a form to the server, and the form no longer exists in the aggregate, please notify GHWIS Northwestern staff immediately and the form will be re-uploaded to the aggregate. You can then visit “Send finalized forms” and toggle on “View all sent and unsent forms” using the general menu (3 vertical dots) and then re-send the forms.

The screenshot shows the ODK Collect application interface. At the top, there is a header bar with the text "ODK Collect > Send Finalized Form". On the right side of the header are three icons: a file icon, a gear icon, and a three-dot menu icon. Below the header, a message "Practice" is displayed, followed by the text "Finalized on Sat, Mar 19, 2016 at 11:45". To the right of this text is a checked checkbox. At the bottom of the screen, there is a large red rectangular box highlighting a "Send Selected" button.

6.3. Water Storage Container Guide

TRAINERS SHOULD USE THEIR BEST JUDGEMENT AND KNOWLEDGE OF WATER STORAGE CONTAINERS IN THE AREA TO RECORD WATER STORAGE.

Plastic Bottle	Jerry Can	Barrel	Sim Tank
 0.5 L	 5 L	 150 L	 200 L
 1L	 10 L	 200 L	 500 L
 15 L	 18 L	 600 L	 5,000 L
 20 L	 20 L	 2,000 L	 13,5000 L

7. References

1. Department of Defense. 2014 Climate Change Adaptation Roadmap. 2014 Oct 10;:1–20.
2. Bakker K. Water management. Water security: research challenges and opportunities. *Science*. 2012 Aug 24;337(6097):914–5.
3. Mekonnen, M. M., & Hoekstra, A. Y. (2016). Four billion people facing severe water scarcity. *Science Advances*, 2(2), e1500323–e1500323. <http://doi.org/10.1126/sciadv.1500323>
4. Jones AD, Ngure FM, Pelto G, Young SL. What Are We Assessing When We Measure Food Security? A Compendium and Review of Current Metrics. *Adv Nutr*. 2013 Sep 13;4(5):481–505.
5. UN-DESA, UN-Water. Gender-Disaggregated Data on Water and Sanitation. Expert Group Meeting. United Nations Headquarters. 2009 Mar 31;:1–25.
6. Tandon N. Biopolitics, climate change and water security: impact, vulnerability and adaptation issues for women. *Agenda*. 2007 Aug 14;:1–17.
7. Reddy BS, Snehalatha M. Sanitation and Personal Hygiene: What Does It Mean to Poor and Vulnerable Women? *Indian Journal of Gender Studies*. 2011 Sep 18(3):381–404.
8. Kevany K, Huisings D. A review of progress in empowerment of women in rural water management decision-making processes. *Journal of Cleaner Production*. Elsevier Ltd; 2013 Dec 1;60(C):53–64.
9. Wutich A, Brewis A. Food, Water, and Scarcity. *Curr. Anthropology*. 2014 Aug;55(4):444–68.
10. Wahaj R, Cleveringa R. Gender & water. *Intl. Fund for Agricultural Development*; 2007.
11. UNHCR, UN HABITAT, WHO. The Right to Water. Fact Sheet No. 35. [Internet]. 2010. 61 p. Available from: <http://www.ohchr.org/documents/publications/factsheet35en.pdf>
12. Falkenmark M, Lundqvist J, Widstrand C. Macro-scale water scarcity requires micro-scale approaches. Aspects of vulnerability in semi-arid development. *Natural Resources Forum*. 1989 Nov;13(4):258–67.
13. Rijsberman FR. Water scarcity: Fact or fiction? *Agricultural Water Management*. 2006 Feb; 80(1-3):5–22.
14. Sullivan CA, Meigh JR, et al. The Water Poverty Index: Development and application at the community scale. *Natural Resources Forum*. 2003 Aug 5;:189–99.
15. Global Water Partnership. Assessing water security with appropriate indicators [Internet]. Stockholm; 2012. 120 p. Available from: http://www.gwp.org/Global/ToolBox/Publications/P763_GWP_Proceedings_Paper.pdf
16. Stevenson EGJ, Greene LE, Maes KC, Ambelu A, Tesfaye YA, Rheingans R, et al. Water insecurity in 3 dimensions: an anthropological perspective on water and women's psychosocial distress in Ethiopia. *Soc Sci Med*. 2012 Jul;75(2):392–400.
17. Jepson, W. Measuring no-win waterscapes: Experience-based scales and classification approaches to assess household water security in *Colonias* on the US-Mexico Border. *Geoforum*. 2014 (51):107-120.

- 18.Hadley, C, Wutich, A. Experience-based measures of food and water security: Biocultural approaches to grounded measures of insecurity. *Human Organization*. 2009; 68 (4).
19. Weiser SD, Young SL, Cohen CR, Kushel MB, Tsai AC, Tien PC, et al. Conceptual framework for understanding the bidirectional links between food insecurity and HIV/AIDS. *Am J Clin Nutr*. 2011 Dec;94(6):1729S–39S.
- 20.Cole SM, Tembo G. The effect of food insecurity on mental health: panel evidence from rural Zambia. *Soc Sci Med*. 2011 Oct;73(7):1071–9.
- 21.Vozoris NT, Tarasuk VS. Household food insufficiency is associated with poorer health. *J Nutr*. 2003 Jan;133(1):120–6.
- 22.Jones AD, Ngure FM, Pelto G, Young SL. What Are We Assessing When We Measure Food Security? A Compendium and Review of Current Metrics. *Adv Nutr*. 2013 Sep 13;4(5):481–505.