

# Template for Requests for Revisions to the DHS Model Questionnaires, Optional Modules, and Biomarkers for DHS-8 (2018-2023)

## Section I. Information about the requesting party

### 1. Is this request being submitted on behalf of a group? If so, please provide the name of the group and the participating parties.

Yes, this request is being submitted on behalf of the Household Water Insecurity Experiences (HWISE) Research Coordination Network. Members include: Sera L Young (Northwestern University), Shalean M Collins (Northwestern University), Godfred O Boateng (Harvard University), Torsten B Neilands (UCSF), Zeina Jamaluddine (American University of Beirut), Joshua D Miller (Northwestern University), Alexandra A Brewis (Arizona State University), Edward A Frongillo (University of South Carolina), Wendy E Jepson (Texas A&M), Hugo Melgar-Quíñonez (McGill University), Roseanne C Schuster (Arizona State University), Justin B Stoler (University of Miami), Amber Wutich (Arizona State University), Ellis Adams (Georgia State University), Farooq Ahmed (University of Washington), Mallika Alexander (Weill Cornell Medicine), Mobolanle Balogun (University of Lagos), Michael Boivin (Michigan State University), Genny Carrillo (Texas A&M), Kelly Chapman (University of Florida), Stroma Cole (University of the West of England), Hassan Eini-Zinab (Shahid Beheshti Medical University), Jorge Escobar-Vargas (Pontificia Universidad Javeriana), Matthew C. Freeman (Emory University), Hala Ghattas (American University of Beirut), Ashley Hagaman (UNC-Chapel Hill), Nicola Hawley (Yale University), Kenneth Maes (Oregon State University), Jyoti Mathad (Cornell Weill Medicine), Patrick Mbullo Owour (Northwestern University), Javier Moran (Universidad Autónoma de Coahuila), Nasrin Omidvar (Shahid Beheshti Medical University), Amber Pearson (Michigan State University), Asher Rosinger (Pennsylvania State University), Luisa Samayoa-Figueroa (McGill University), Ernesto Sánchez-Rodríguez (Universidad Autónoma de Coahuila), Jader Santos (Universidad Autónoma de Coahuila), Marianne V. Santoso (Cornell University), Sonali Srivastava (Anode Governance Lab), Chad Staddon (University of the West of England), Andrea Sullivan (University of Miami), Yihew Tesfaye (Oregon State University), Nathaly Triviño-León (Pontificia Universidad Javeriana), Alex Trowell (University of Amsterdam), Desire Tshala-Katumbay (Oregon Health & Sciences University), Raymond Tutu (Delaware State University), Felipe Uribe-Salas (Universidad Autónoma de Coahuila), and Cassandra Workman (North Carolina State University).

## Section II. Indicator definition and rationale

### 2. Please define the indicator or indicators you are requesting The DHS Program to incorporate. *Multiple indicators derived from a single set of questions should be included in the same submission. (Response required)*

The 12-item Household Water Insecurity Experiences (HWISE) Scale provides a universal, simple measure to comprehensively capture complex, household-level relations between people and water in low- and middle-income countries. The scale uses simply worded questions to probe about household

water access, availability, and use, and can be administered in 3 minutes. The items, when summed together (range: 0-36), are an indicator of household water insecurity.

**3. What is the rationale for measuring this indicator (each of these indicators) in DHS surveys?  
(Response required)**

Human health is predicated on water. **Problems with water availability (shortage, flooding), access (affordability, reliability), and contamination (chemical, pathogens) directly contribute to the global burden of disease.**<sup>1-3</sup> Water-related issues also create the conditions that undermine health by lowering economic productivity;<sup>4,5</sup> triggering and perpetuating domestic, social, inter-communal and political tensions and conflicts;<sup>4</sup> and reinforcing environmental, social, and gender inequities.<sup>5,6</sup> Indeed, **women disproportionately bear the physical and psychological burdens of water acquisition and water-intensive domestic chores, posing both health risks and opportunity costs.**<sup>7,8</sup> These problems are projected to become more frequent and severe due to climate change, unequal resource distributions, and persistent degradation of water quality and infrastructure.<sup>4,9,10</sup> In fact, projected water crises have been identified as one of the most impactful threats to human health and wellbeing.<sup>11</sup> As such, numerous national institutions and international agencies have declared meeting the challenges of declining and inequitable water supplies to be an urgent priority.<sup>4,9</sup>

Progress towards equitable and sufficient water has been primarily measured by per capita availability<sup>12</sup> or the proportion of the population with access to safely managed drinking water.<sup>13</sup> These measures have been enormously helpful, e.g. in tracking progress towards the Sustainable Development Goals. However, **existing metrics do not capture the many ways that water can be problematic**, e.g. if available water is safe, accessible, or sufficient for the many uses of water in households (Figure 1). Further, they mask heterogeneity within populations and make it impossible to quantify the individual health, economic, and psychosocial burdens of water problems. In short, our inability to measure the causes and consequences of water on human health in a cross-culturally valid way is a significant scientific gap that has spurred calls for higher resolution data.<sup>3,9</sup>

Household water insecurity, defined as the inability to access and benefit from affordable, adequate, reliable and safe water for wellbeing and a healthy life, is a concept that captures the multiple dimensions of water acquisition and use at the level at which they are experienced.<sup>14</sup> To that end, a number of scales to measure individual- and household-level water insecurity have been developed.<sup>15-19</sup> Because these were each developed to fit a specific local context, however, their scalability, generalizability, and cross-cultural equivalence have not been established.

Thus, there is a distinct need for comparable, reliable, and high-resolution information about exactly who is water insecure, to what extent, and where and when water insecurity occurs. **Therefore, we created the Household Water InSecurity Experiences (HWISE) Scale as the first tool for comparative analysis of household water insecurity. By including the measurement in DHS surveys, researchers and policymakers can 1) better understand the distribution of water insecurity and identify vulnerable**

subpopulations, 2) quantify its impact on health, nutrition, and economic productivity, and 3) use these data to guide the international community’s ambitious development agenda.

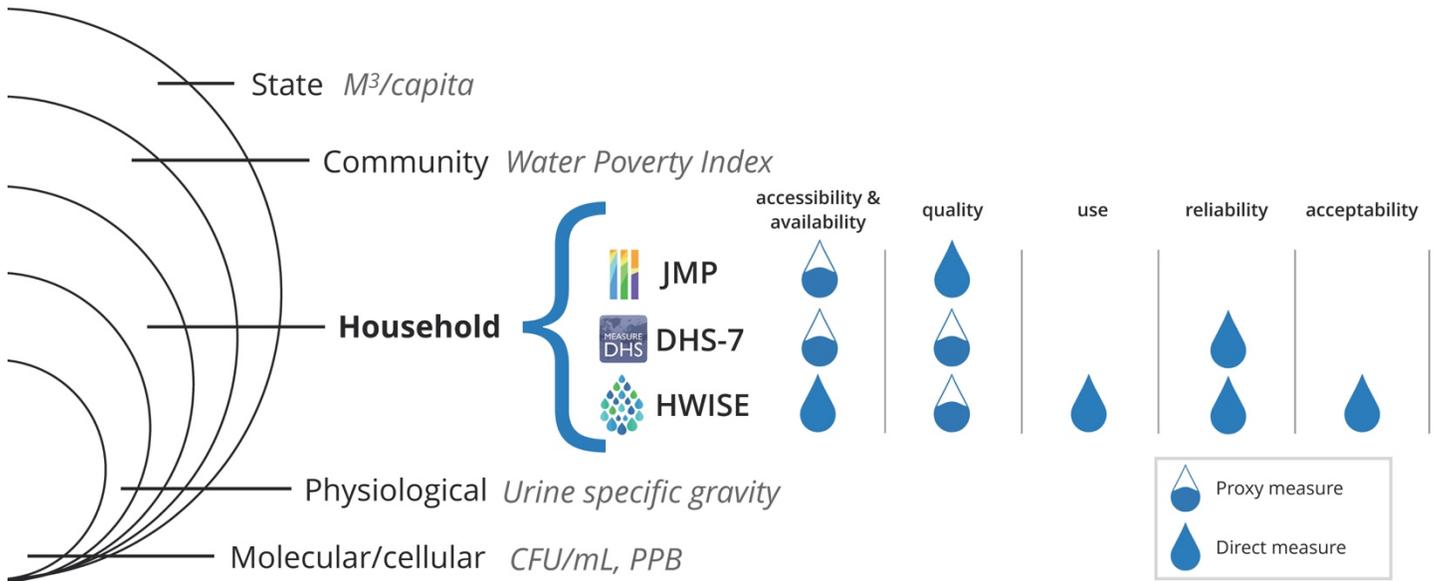


Figure 1. Dimensions of water insecurity measured by DHS-7 and the HWISE Scale.

### Section III. Proposed additions/revisions to the questionnaires or biomarkers

4. Please describe the requested addition or revision.

**4.1. For additions: If you have developed a question or set of questions to measure the indicator(s), please provide them in the space below or in a separate file attached with your submission.**

The set of requested questions are attached to our submission and outlined below.

**For each of the following, response categories include: never (0 times in the last 4 weeks), rarely (1–2 times in the last 4 weeks), sometimes (3–10 times in the last 4 weeks), often (11-20 times in the last 4 weeks), always (more than 20 times in the last 4 weeks), don’t know, and not applicable/I don’t have this.**

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?

2. In the last 4 weeks, how frequently has your main water source been **interrupted** or limited (e.g. water pressure, less water than expected, river dried up)?

3. In the last 4 weeks, how frequently has there not been enough water to **wash clothes**?

4. In the last 4 weeks, how frequently have you or anyone in your household had to <b>change schedules or plans</b> due to problems with your water situation? Activities that may have been interrupted include caring for others, doing household chores, agricultural work, income-generating activities, etc.
5. In the last 4 weeks, how frequently have you or anyone in your household had to <b>change what was being eaten</b> because there were problems with water (e.g. for washing foods, cooking, etc.)?
6. In the last 4 weeks, how frequently have you or anyone in your household had to go without <b>washing hands</b> after dirty activities (e.g., defecating or changing diapers, cleaning animal dung) because of problems with water?
7. In the last 4 weeks, how frequently have you or anyone in your household had to go without <b>washing their body</b> because of problems with water (e.g. not enough water, dirty, unsafe)?
8. In the last 4 weeks, how frequently has there not been <b>as much water to drink</b> as you would like for you or anyone in your household?
9. In the last 4 weeks, how frequently did you or anyone in your household feel <b>angry</b> about your water situation?
10. In the last 4 weeks, how frequently have you or anyone in your household gone to <b>sleep thirsty</b> because there wasn't any water to drink?
11. In the last 4 weeks, how frequently has there been <b>no useable or drinkable water</b> whatsoever in your household?
12. In the last 4 weeks, how frequently have problems with water caused you or anyone in your household to <b>feel ashamed/excluded/stigmatized</b> ?

**4.1.1 If requesting multiple questions, please specify the relative priority of each new question.**

In order to generate an equivalent household water insecurity indicator that is comparable across all sites, all 12 items should be asked.

**5. Can any related questions be deleted from the questionnaire to make room for the proposed new content? If so please specify which questions using the DHS-7 question numbers.**

The HWISE Scale does not obviate the need for existing metrics in the DHS-7, but would provide extremely valuable information that complements these measures. The current DHS questionnaire only asks about water source (which can be used to comment on water quality) and time to source (a component of accessibility), but does not measure whether there is enough water for household activities (e.g. preparing and cooking foods). With these limited data, a household that has an on-site water source would be considered water secure, although the water they use may be contaminated and of insufficient quantity, having important implications for health, economic productivity, and household decision making. The HWISE Scale could therefore fill this data gap by providing information on water availability, accessibility, sufficiency, and use.

**6. What are the implications of these requested changes on measurement of trends using DHS data?**

The HWISE Scale would provide actionable household-level information about water sufficiency, accessibility, and use. Given that water insecurity is a linchpin in human health disparities and the structural dynamics of poverty and economic development,<sup>2,4,6,9,13,17</sup> these data could be transformative in many arenas. Specifically, the indicator permits **comparative studies** that quantify the multidimensional nature of water insecurity with higher resolution than currently possible, allowing for the identification of global inequities, as well as vulnerable sub-populations within communities. The indicator has the potential to **identify determinants** of water insecurity and **assess the health, economic, psychosocial consequences** of household water insecurity. **Preliminary findings demonstrate that household water insecurity is associated with greater stress, depression, food insecurity, missed school, increased intimate partner violence, increased pregnancy-related complications, and poor infant feeding practices, especially among women of reproductive age with HIV.**<sup>16,20-24</sup>

The indicator could also be used to **monitor trends** in water insecurity over time, including how it is shaped by macro-level social, economic and political shifts; climatic variability; and local shocks, such as extreme weather events or contamination. These data can, in turn, be **used to select the most impactful, cost-effective water-related programs, technologies, and policies**. The scale is also appropriate for adoption in both community-led self-evaluation efforts and for large-scale monitoring and evaluation. **Indeed, the HWISE Scale was implemented alongside DHS questions in Dhaka and Chakaria, Bangladesh, and is now being used to understand the relationships between water insecurity, migration behavior, and health.**

## Section IV. Indicator calculation

**7. Indicate how to calculate the indicator(s). Include detailed definitions of the numerator and denominator of each individual indicator. If you have developed a tabulation plan for the indicator(s), please attach a file including the suggested table(s) with your submission.**

HWISE Scale scores are calculated by summing responses to each question, using four response categories [“never” (scored as 0), “rarely” (scored as 1), “sometimes” (scored as 2), “often/always” (scored as 3)].<sup>20</sup> Scores range from 0-36, where higher scores indicate greater insecurity. In the scale paper, we have established a cut-off, such that households with scores  $\geq 12$  are considered water insecure.

**8. Is the indicator useful when measured at the national level, or is it useful only when disaggregated to specific subnational areas, such as endemicity zones or project intervention regions?**

*For each indicator, select one of the three options by clicking in the appropriate box.*

	Useful <u>only</u> for subnational endemicity zones or project intervention regions. A	Useful at both national and subnational regions, as sample size allows.	Useful only at the national level. Subnational estimates are not needed.
Indicator			

	single estimate at the national level is <u>not</u> meaningful.		
Household water insecurity, measured with the HWISE Scale	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

**Section V. Prior testing of the proposed question(s)**

**9. Have the proposed questions undergone any formal validation, i.e., have the questions been tested against a “gold standard” to assess their accuracy? If yes, please describe how well or poorly the questions performed and/or provide a publication or report of the validation exercise (or a link).**

We developed and validated the 12-item Household Water InSecurity Experiences (HWISE) Scale based on data from 8,127 households in 28 sites in 23 low- and middle-income countries.<sup>20,25</sup> We established equivalence, i.e. measurement invariance, across sites. We did this using alignment optimization, which requires configural invariance, i.e. that the latent factor is associated with the same items across sites.<sup>26,27</sup> Configural invariance was assessed using multi-group confirmatory factor analysis.<sup>26</sup> Using the alignment optimization technique, the scale was considered approximately invariant if up to 25% of the items’ parameters were non-invariant and did not compromise the reliability of mean comparison across sites.

Construct validity was established for individual and pooled sites. Predictive construct validity was assessed by determining if HWISE Scale scores predicted food insecurity, perceived stress, satisfaction with water situation, and perceived water standing in the community, using random coefficient models to account for variation by site. Convergent construct validity was tested by examining the association between HWISE Scale scores and time to water source. Discriminant construct validity was tested using differentiation between “known groups”, i.e. groups known to have different water situations, such as those who have been injured while acquiring water versus those who have not. Multiple tests of validity were necessitated because there is no gold standard metric of water insecurity.

**10. Have the questions undergone any other kind of testing, e.g., cognitive testing, pilot testing. If so, please describe the results of the testing and/or provide a publication or report of the findings (or a link).**

Content validity (i.e., if items adequately measure the domain of interest) was assessed in the first eight sites through cognitive interviews with 12 purposively selected individuals.<sup>25</sup> Participants were asked to ‘think aloud’ or ‘tell [the enumerator] about’ their understanding of each of the water insecurity items as they completed the pilot survey. Interviewers recorded any issues and probed in detail on each as participants responded to the items.

Face validity was assessed at each of the 28 sites.<sup>25</sup> First, the survey was translated from English into the language(s) of implementation and then back-translated. Then, enumerators, the predominance of whom were recruited from the target population, pretested surveys with one another to ensure that questions were appropriate to the setting, that the concept of water insecurity was understood and that translations were consistent with local dialects, that is, that they were linguistically and culturally appropriate translations.

Site leads debriefed enumerators after each day of data collection and recorded all the details as project field notes to further ensure face validity. Debriefs were centered on experiences in the community, survey questions that were difficult to administer and any other problems encountered. At the end of data collection for the site, enumerators engaged in a final debrief. Site leads were also interviewed at the end of study activities by members of the HWISE RCN regarding their experiences with project implementation, perceptions of questions by enumerators and participants and any additional topics that should be included or excluded in the final survey. These debriefing interviews with site leads provided additional feedback to iteratively improve training and item refinement.

## Section VI. Other considerations

### **11. Please provide information relevant to the kinds of questions below, and/or anything else you wish to share with us about this indicator (these indicators).**

Data for this indicator are currently being used for monitoring and evaluation efforts by Oxfam, WaterAid, Action Against Hunger, Last Mile Health, UNICEF, and Water Witness International. We have also been in regular contact with leaders at UNESCO-IHP and The Nature Conservancy who plan to use the Scale for tracking progress towards their project goals. Further, individuals at USAID are interested in using the HWISE Scale to identify vulnerable populations and target resources to these communities.

By implementing the HWISE Scale in nationally-representative DHS surveys, it will be possible to monitor and evaluate water insecurity across time, identify vulnerable and at-risk populations for maximally effective resource allocation, and measure the effectiveness of water-related policies and interventions. A globally accepted indicator for household water insecurity can contribute to an evidence base for clinical and public health recommendations regarding access to equitable and sufficient water.

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