

WaSH Policy Research Digest

ISSUE #15, JUNE 2020: MEASURING WATER INSECURITY

Detailed Review of a Recent Publication: An innovative measure of the experience of water insecurity can help identify vulnerable households and evaluate interventions

[Young, S.L., Boateng, G.O., et al., on behalf of the HWISE Research Coordination Network. \(2019\). The Household Water InSecurity Experiences \(HWISE\) Scale: development and validation of a household water insecurity measure for low-income and middle-income countries. *BMJ Global Health* 4:e001750.](#)

In their recent paper, Young et al. describe a new tool called the Household Water InSecurity Experiences (HWISE) Scale, which is similar to experiential indices of food insecurity (Ballard et al., 2013). It seeks to go beyond the established Sustainable Development Goal (SDG) global metrics which refer to the type and level of water service used by households (WHO and UNICEF, 2019), and focuses on the extent to which people are able to satisfactorily meet different water needs.

A critical step in developing any index is the selection and optimization of questions to be used. In their paper, the HWISE team members describe how they developed a long list of candidate questions about perceptions and experiences of water problems and stresses, and tested these in 23 low- and middle-income countries. The authors have done a commendable job of using objective and quantitative tools to narrow this long list of candidate questions to a core set of 12 items that comparably measure critical elements of water insecurity (see box, next page). For each experience, respondents are asked about the frequency with which it occurred in the last month (“never” to “always”). Responses are summed to create a water insecurity score.

The global SDG Indicator 6.1.1, “Proportion of population using safely managed drinking water services,” provides information on the types of supplies that people use and whether they are accessible on premises, available when needed and free from contamination (WHO and UNICEF, 2017). The HWISE Scale complements this indicator by focusing on perceptions of the reliability, acceptability and adequacy of water supplies for multiple uses, such as drinking, cooking, handwashing, personal hygiene and laundry. It also seeks to capture feelings of anxiety, shame and anger associated with water insecurity.

Key Policy and Programmatic Takeaways

- Water insecurity severely undermines livelihoods and well-being and therefore should be widely assessed.
- Tools such as the HWISE Scale can provide insights into perceptions of the availability, accessibility, use and reliability of water at the household and individual levels. These insights complement established metrics used for national and global WaSH monitoring.
- Researchers and project managers could use tools such as the HWISE Scale to identify those most affected by water insecurity, reveal inequalities between and within households, and evaluate the impacts of interventions designed to improve water security.

One of the strengths of the HWISE Scale is that it asks more detailed questions about the extent to which existing services meet a range of household needs than is possible in most comprehensive national household surveys, censuses and administrative reports. For example, the SDG indicator simply records whether at any time in the last month the household did not have sufficient quantities of water when needed, whereas the HWISE Scale assesses the frequency of interruptions and their impact on specific water uses.

A weakness of the HWISE Scale is that it does not include information on water quality, which is among the normative criteria of the human right to safe drinking water and an important component of household water security. It is

challenging to incorporate direct testing of water quality in household surveys, and subjective measures of water safety or quality are of limited use.

The HWISE Scale also does not distinguish between households that lack any kind of service and those that use services insufficient to meet their needs (e.g., water is inaccessible, unavailable or of poor quality). Another important limitation of this scale, and of aggregate measures in general, is that it does not provide much insight into the underlying causes of household water insecurity and whether the barriers to utilizing services are primarily physical ability (e.g., the elderly and those with disabilities), economic (e.g., high cost of water) or social (e.g., lower castes and ethnic minorities facing discrimination). The solutions to each of these problems are quite different and thus the HWISE Scale on its own may have limited utility for informing policy.

The scale undoubtedly has potential as a tool for research and project evaluation. Following the limited health gains found in recent high-profile randomized control trials (Humphrey et al., 2019), interest is growing in measuring the indirect contribution of water, sanitation and hygiene (WaSH) services to health through increased well-being. Program interventions may well improve household water security and well-being irrespective of whether they reduce diarrheal disease or malnutrition. Household water insecurity is also likely to disproportionately affect some individuals (e.g., children, women, older people, those with physical impairments) more than others. Because the HWISE Scale can be applied at both the household level and the individual level, it could be a powerful tool for revealing such inequalities and evaluating attempts to reduce them.

It would also be interesting to explore correlations between the HWISE Scale data on perceptions of household water insecurity and conventional water service indicators used for national and global monitoring, such as the type of water supply used, the time and effort required to collect water from off-site sources, and the availability and quality of water used.

In summary, this paper describes a welcome innovation; the HWISE Scale complements established metrics used for national and global monitoring and provides valuable insights into household perceptions of the reliability, acceptability and adequacy of domestic water supplies. If it could be applied and tested in other settings, including as part of project evaluations,

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Literature Review: Definitions and methods for measuring household water insecurity

The concept of household water insecurity has emerged as a powerful way to better “understand the interactions among water’s various characteristics and functions” (Webb, 1998). Water insecurity severely undermines livelihoods and well-being, yet there are persistent and growing threats to water quality, quantity and accessibility that threaten human health

The 12 Questions of the HWISE Scale

Responses range from “never” to “always.”

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?

... has your main water source been **interrupted** or limited (e.g., water pressure, less water than expected, river dried up)?

... have problems with water meant that **clothes** could not be washed?

... have you or anyone in your household had to **change schedules** or plans due to problems with your water situation? (Activities that may have been interrupted include caring for others, doing household chores, agricultural work, generating income, etc.)

... have you or anyone in your household had to **change what was being eaten** because there were problems with water (e.g., for washing food, cooking, etc.)?

... have you or anyone in your household had to go without **washing hands** after dirty activities (e.g., defecating or changing diapers, cleaning animal dung) because of problems with water?

... have you or anyone in your household had to go without **washing their body** because of problems with water (e.g., not enough water, dirty, unsafe)?

... has there not been as **much water to drink** as you would like for you or anyone in your household?

... did you or anyone in your household feel **angry** about your water situation?

... have you or anyone in your household gone to **sleep thirsty** because there wasn’t any water to drink?

... has there been **no useable or drinkable water** whatsoever in your household?

... have problems with water caused you or anyone in your household to feel **ashamed/excluded/stigmatized**?

it could yield valuable information about the effectiveness of different interventions. This level of granularity would be most informative and useful at the local scale, but with time and experience the scale may evolve and be further simplified and applied at the national scale, as has happened with the measures of food insecurity that inspired its development.

(Prüss-Ustün et al., 2014), economic productivity (World Economic Forum, 2019) and political stability (Gleick and Iceland, 2018).

Numerous international agencies and governments have therefore identified reducing water insecurity as a top priority. Unfortunately, multiple, and sometimes divergent, approaches to

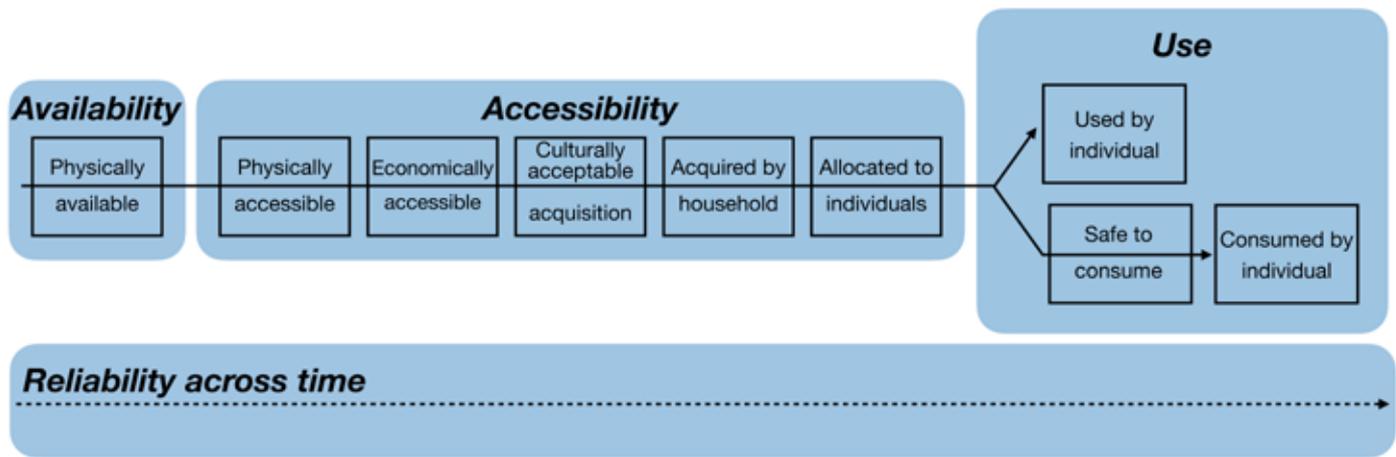


Figure 1. Conceptual framework of the four domains of water insecurity: availability, accessibility, use and reliability

both definition and measurement have complicated this effort. Specifically, the many conceptualizations of water security and insecurity vary considerably in terms of their emphasis on ecosystem well-being, sustainability, governance, infrastructure, production and agricultural needs, human capabilities, and sociocultural relations with water (Garrick and Hall, 2014; Jepson et al., 2017). Definitions also differ in their level of analysis, with emphasis ranging from the national to individual and water-source level.

Just as there are numerous definitions of water insecurity, there are many ways of assessing it. Indicators of water insecurity include regional estimates of total and per capita water availability, community-level infrastructure, individual markers of hydration, and water quality assessments. These indicators can generally be mapped onto four domains of water insecurity (Figure 1): water availability (is water present?), accessibility (can one get to it?), use (can one drink, bathe, irrigate, etc., with it?) and reliability (does availability, access or use vary over time?). In general, domains to the left in Figure 1 are necessary, but not sufficient, for water security at the subsequent step. These domains can be assessed by drawing on information at the national, regional, household, individual and/or water-source levels—that is, at macro or micro levels.

Water insecurity is most often quantified by measuring water availability. Per capita water availability is typically estimated using direct hydrological measurements (flow gauges) and remotely sensed imagery (satellite data) (Liu et al., 2017). Physical and economic access to water can be measured in a number of ways, including the proportion of income spent on water (Teodoro, 2018). Further, water quality can be assessed via numerous indicators: physical (e.g., turbidity), chemical (e.g., fluoride or heavy metals) or microbiological (e.g., *E. coli*) (Thomas et al., 2018). Reliability of water across time has typically been measured using hydraulic flow data (i.e., availability) and service cost (i.e., economic accessibility) (Xu and Powell, 1991), such that reliability of water collection and use is not known. Composites of the above data are at the core of well-known metrics such as the Asian Development Bank's Water Security Index (Sun et al., 2016).

In contrast, few indicators have been developed to assess experiences with water access and use in the household, meaning that less is known about sufficiency of water for consumption, production or hygiene, or about the variation in access and use by gender, ethnicity, age, or geography. As such, it is difficult to assess gaps between more objective indicators of water availability and the perceptions and experiences of households.

The WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP) developed a drinking water ladder to measure the type and level of household water service, ranging from “surface water” at the bottom to “safely managed water” at the top (WHO and UNICEF, 2017). Although the JMP does not claim that the estimates it produces are a measure of water insecurity, they are sometimes used as such (Garrick and Hall, 2014). The HWISE Scale, described in the detailed review in this Digest, is designed to specifically measure experiences of water insecurity related to availability, accessibility, use and reliability at the level of both households and individuals in low- and middle-income countries.

The measurement of food insecurity demonstrates the value of experiential indicators of access and use. Post-World War I, food insecurity was assessed using food availability via national- and regional-level food balance sheets (Jones et al., 2013), analogous to currently available measures of per capita water availability. In the last 25 years, scales based on actual experience, such as the Food Insecurity Experiences Scale (Ballard et al., 2013), have provided a globally comparable measure for monitoring and evaluating household and individual food insecurity (SDG Indicator 2.1.2). Measures of accessibility and use of food (instead of measures of availability) provided unmistakable evidence that food insecurity is prevalent in many parts of the world and ultimately served as tools to help monitor and mitigate it (Perez-Escamilla et al., 2017).

The measurement of water insecurity at the household or individual level, as proposed by the HWISE Scale, is likely similarly critical for addressing the global water crisis. It can generate empirical data on who, exactly, may be left behind in terms of water security. This evidence can be used to best

address water needs, improve our understanding of how water insecurity is impacted by environmental and infrastructural changes, inform aid allocation, guide research, facilitate evaluation of development programs, and inform government policy across diverse sectors (Young et al., 2019). Indeed,

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