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Development of a Women's Empowerment metric for Water, Sanitation, and Hygiene (WE-WASH)

Jessica Heckert, Kalyani Raghunathan, Emily C. Myers, Gayathri Ramani, Simone Faas, Nathaniel Ferguson, Greg Seymour, Hazel Malapit, Flor Paz, Febbie Chiwasa, Joan Chilalika, Jean Kamwaba-Mtethiwa, Gowokani Chijere Chirwa, Abigail Simkoko, Abdallah Chilungo, Rachana Upadhyaya, Meeta S. Pradhan, Nira Joshi, Sanish Shrestha

Poverty, Gender, and Inclusion (PGI), Nutrition, Diets, and Health (NDH), and Natural Resources and Resilience (NRR) units

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AUTHORS

Jessica Heckert (J.Heckert@cgiar.org) is Research Fellow in the Poverty, Gender, and Inclusion Unit of the International Food Policy Research Institute, Washington, DC.

Kalyani Raghunathan (K.Raghunathan@cgiar.org) is Research Fellow in the Poverty, Gender, and Inclusion Unit of the International Food Policy Research Institute, New Delhi, India.

Emily C. Myers (E.C.Myers@cgiar.org) is Senior Research Analyst in the Poverty, Gender, and Inclusion Unit of the International Food Policy Research Institute, Washington, DC.

Gayathri Ramani (G.Ramani@cgiar.org) is Research Analyst in the Nutrition, Diets, and Health Unit of the International Food Policy Research Institute, Washington, DC.

Simone Faas was a Research Analyst in the Poverty, Gender, and Inclusion Unit of the International Food Policy Research Institute, Washington, DC when this work was conducted. She is now a Survey Management Specialist at ICF, Rockville, MD.

Nathaniel Ferguson (N.Ferguson@cgiar.org) is Research Analyst in the Natural Resources and Resilience Unit of the International Food Policy Research Institute, Washington, DC.

Greg Seymour (G.Seymour@cgiar.org) is Research Fellow in the Natural Resources and Resilience Unit of the International Food Policy Research Institute, Washington, DC.

Hazel Malapit (H.Malapit@cgiar.org) is Senior Research Coordinator in the Poverty, Gender, and Inclusion Unit of the International Food Policy Research Institute, Washington, DC.

Flor Paz (F.Paz@cgiar.org) is Research Analyst in the Poverty, Gender, and Inclusion Unit of the International Food Policy Research Institute, Washington, DC.

Febbie Chiwasa (chiwasafebbie@gmail.com) is a master's student of Gender and Development at Lilongwe University of Agriculture and Natural Resources, Lilongwe, Malawi.

Joan Chilalika (jchilalika@gmail.com) is a master's student of Gender and Development at Lilongwe University of Agriculture and Natural Resources, Lilongwe, Malawi.

Jean Kamwaba-Mtethiwa (jmtethiwa@gmail.com) is a Senior Lecturer at Lilongwe University of Agriculture and Natural Resources, Lilongwe, Malawi.

Gowokani Chijere Chirwa (gchirwa@unima.ac.mw) is an Associate Professor of Economics at University of Malawi and Research Director at Tsogolo la Thanzi, Balaka, Malawi.

Abigail Simkoko (abbykendy@gmail.com) is an independent consultant at Tsogolo la Thanzi, Balaka, Malawi.

Abdallah Chilungo (info@tlt.health) is Director at Tsogolo la Thanzi, Balaka, Malawi.

Rachana Upadhyaya (rachna.upadhyaya@gmail.com) is an independent consultant.

Meeta S. Pradhan (meetasp@gmail.com) is Senior Research Scientist at the Institute for Social and Environmental Research–Nepal, Nepal, and Senior Research Fellow at the Southasia Institute of Advanced Studies

Nira Joshi (nirajoshi@newera.com.np) is Deputy Director at New ERA, Katmandu, Nepal

Sanish Shrestha (sanish@newera.com.np) is Data Programming Supervisor at New ERA, Katmandu, Nepal.

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ABSTRACT

There is a growing focus on gender-sensitive approaches and women's empowerment in the water, sanitation, and hygiene sectors. At the same time, there is a lack of metrics to measure women's empowerment in the WASH sector. Such metrics are important for understanding the types of programmatic interventions that are most needed for addressing women's empowerment, as well as for assessing their impacts on women's empowerment. In this report, we describe the development of a Women's Empowerment metrics for Water, Sanitation, and Hygiene (WE-WASH). We collected data from individual women and men in 812 households in Malawi and 826 households in Nepal. Using the data, we develop 14 indicators and establish cutoff thresholds (i.e., whether the individual is empowered) in the areas of intrinsic, instrumental, and collective agency in WASH; instrumental and intrinsic agency in menstrual hygiene management; and the empowerment environment (or resources for empowerment). In each country, we observe differences in empowerment levels between women and men, that favor men on most outcomes. Notably, in both countries, we find that women are much less likely than men to contribute to WASH infrastructure decisions, and most women are spending an undue amount of time contributing to WASH-related labor. In Nepal especially, agency related to menstrual hygiene management is also a substantial area of disempowerment for women.

Keywords: water, sanitation, and hygiene sector; women's empowerment; metrics; Malawi; Nepal

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ACRONYMS

ARISE	Agency, Resources, and Institutional Structures for Sanitation-related Empowerment
CAPI	Computer assisted personal interviewing
CFA	Confirmatory factor analysis
CFI	Comparative fit index
DHS	Demographic and Health Survey
DNC	Did not converge
EFA	Exploratory factor analysis
EWI	Empowerment in Water, Sanitation, and Hygiene Index
GDP	Gross Domestic Product
HDI	Human Development Index
LMIC	Low- and middle- income countries
LUANAR	Lilongwe University of Agriculture and Natural Resources
pro-WEAI	Project-level Women's Empowerment in Agriculture Index
PSU	Primary sampling unit
SDG	Sustainable Development Goals
RBE	Reach-Benefit-Empower
RMSEA	Root mean squared error of approximation
TLI	Tucker-Lewis index
TLT	Tsogolo la Thanzi (Healthy Future)
WASH	Water, sanitation, and hygiene
WE-WASH	Women's Empowerment in Water, Sanitation, and Hygiene
WEAI	Women's Empowerment in Agriculture Index
WENI	Women's Empowerment in Nutrition Index
WELI	Women's Empowerment in Livestock Index
WHO-UNICEF JMP	World Health Organization-United Nations Children's Fund Joint Monitoring Programme

INTRODUCTION

The COVID-19 pandemic made a compelling public health case for investing in water, sanitation, and hygiene (WASH) services. When effective, these services can reduce the incidence of infectious disease and limit healthcare burdens through reduced morbidity and improved health; in addition, WASH behaviors and environments have been shown to influence a range of other well-being outcomes, including mental health, nutritional status, and child growth and development (Caruso et al., 2022). Although there are increasing number of studies that examine gender-related factors in WASH, few of these focus specifically on women's empowerment. There is, however, a growing literature focused on the links between gender-based violence and WASH and issues related to menstrual hygiene management among schoolgirls and to a lesser extent, working women (Fisher et al., 2017). The recognition of access to water and sanitation as a human right in 2010 and the subsequent adoption of the Sustainable Development Goals (SDGs) – of which SDG 6 aims to "ensure availability and sustainable management of water and sanitation for all" (General Assembly of the United Nations, 2015) – is an explicit acknowledgement of the importance of WASH (Amebelu et al., 2021).

Also embedded in SDG 6 is a focus on equity, with specific targets that include "universal and equitable access to safe and affordable drinking water" (Target 6.1) and "adequate and equitable sanitation and hygiene for all" with specific mention of the needs of women and girls (Target 6.2). Additionally, Target 6.b focuses on the value of the collective through "the participation of local communities" in improving WASH conditions, an opportunity for the collective voices of both women and men. This is important; recent experiences show that access to WASH-related services and knowledge of appropriate WASH behaviors is highly inequitable (Ekumah et al., 2020; Howard et al., 2020), and persistent inequalities in water, sanitation, and hygiene outcomes disadvantage women and girls (Caruso et al. 2015; Amebelu et al., 2021). Often these inequalities are rooted in gender norms related to caregiving and the distribution of household labor (Caruso et al., 2015).

Improving gender-equitable access to WASH services and environments is, therefore, key to achieving SDG 6, while also meeting SDG 5 that aims to "achieve gender equality and empower women." As we embark upon designing WASH programs that are gender sensitive and contribute to the goals of empowering women and increasing gender quality, we need to be able to measure women's empowerment in the context of WASH. This paper outlines our approach to developing one such set of metrics, based on validation surveys conducted in Nepal and Malawi. The Women's Empowerment in WASH (WE-WASH) indicators we propose are rooted in feminist theories of empowerment and draw on previous work developing similar indices in the context of agriculture (Alkire & Foster, 2011; Kabeer, 1999; Malapit et al., 2019), which we review below. The indicators are designed so that WASH projects

with specific empowerment objectives can select from among the 14 indicators to use those that best align with project goals.

WASH interventions in low- and middle- income countries (LMICs) often target women as key actors for achieving project outcomes and many aim to improve the quality of women's lives; fewer, however, have a specific focus on empowering women (Sinharoy et al., 2023). Notably, a systematic review concluded that the WASH sector has a very limited focus specifically on empowering women, despite its efforts to reach and benefit them (Caruso et al., 2022).

When framing gender-sensitive approaches, whether these be program strategies or indicators for measuring outcomes, it is useful to conceptualize them using the Reach-Benefit-Empower framework (Johnson et al., 2018). Within this framework, "reach" focuses on whether activities include women, and reach indicators are those that measure women's and men's inclusion in activities and policies. For a WASH menstrual hygiene intervention, for example, these might include the number of women and girls who attended informational sessions. "Benefit", on the other hand, focuses on improving one's circumstances. Benefit indicators for the same type of intervention might include the proportion of women and girls using improved menstrual hygiene products. Finally, "empowerment" focused projects refer to those that aim to increase the ability to make strategic life choices and put these choices into action. Empowerment indicators might include whether women and girls can go where they normally go and engage in normal activities while menstruating. In a review of gender-sensitive WASH indicators that have been used in the peer-reviewed literature, grey literature, and toolkits from organizations operating in WASH, only around 10% of the 162 indicators identified specifically measured empowerment (Myers et al., 2022). The remaining indicators focused only on measuring reach (56%) and benefit (33%),[1] which are important WASH-related outcomes, but are not specifically focused on empowerment.

The WE-WASH indicators proposed herein focus on measuring empowerment itself, not just reach and benefit. We frame indicators of intrinsic (power within), instrumental (power to) and collective (power with) forms of agency (Malapit et al., 2019; Rowlands, 1995, 1997). For each indicator, we develop thresholds defining whether an individual is empowered on that indicator and refine these using data from both Nepal and Malawi. Importantly, as with other women's empowerment measures that we describe below, the WE-WASH index collects data from a woman and man within the same household, thereby permitting intra-household comparisons across indicators.

We now turn to a discussion of existing approaches to measuring women's empowerment and situate our index within those measures.

[1] Remaining 1% due to rounding.

Approaches to measuring women's empowerment in WASH

Since Kabeer's (1999) influential work conceptualizing women's empowerment and its measurement, there has been an increased focus on the development of women's empowerment metrics. Early approaches often used single proxy measures that were assumed to be highly correlated with empowerment, such as women's education or age at marriage, but did not measure empowerment directly (Heckert & Fabic, 2013). Over time, a limited number of general decision-making questions were often included in surveys and used to measure women's empowerment generally, though these did not focus on different domains of women's empowerment (Kishor & Subaiya, 2008).

More recently, there have been increased efforts to develop more nuanced and often sector-specific indices and scales. One of the earlier indices of this kind was the Women's Empowerment in Agriculture Index (WEAI), a novel approach to measuring empowerment and inclusion in the agricultural sector that was developed using the Alkire-Foster methodology, a headcount-based approach used in the development of multi-dimensional poverty indices (Alkire et al., 2013; Alkire & Foster, 2011). Building on the development of the WEAI, additional indices have been developed to address specific needs, including, for example, the project-level WEAI (pro-WEAI) (Malapit et al., 2019), the Women's Empowerment in Nutrition Index (WENI) (Narayanan et al., 2019), and the Women's Empowerment in Livestock Index (WELI) (Galiè et al., 2018). Other approaches have also focused on the development of scales with robust psychometric properties to measure women's empowerment, such as the Women's Agency Scale 61 (Yount et al., 2020). Although these metrics have the benefit of being multidimensional and thus covering a broad range of empowerment domains, their length and complexity, along with strong recommendations to include the full instruments, may have discouraged their uptake.

In comparison, there has been limited focus on approaches for measuring women's empowerment in the WASH sector specifically. One recent exception is the Empowerment in WASH Index (EWI) (Dickin et al., 2021). Data for the EWI is collected from one man and one woman from each household, and the approach to index construction is identical to that of the WEAI and pro-WEAI. Some of the EWI indicators are general empowerment indicators that are drawn directly from the WEAI or pro-WEAI indicators (e.g., work balance, group membership). Other indicators are analogous to WEAI indicators, but adapted for WASH, including, for example input into WASH decisions and WASH expenditures. Others still are specific to WASH, such as measuring access to and sharing of information on WASH rights and responsibilities. The EWI was fielded in Burkina Faso, and the established cutoffs are based on the data from that pilot. While the EWI has the advantage of taking a comprehensive view of empowerment while specifically focusing on WASH components, the instrument is time consuming to administer and requires that the entire module be administered to calculate indicators, which fails to meet the growing demand for more concise instruments. Additionally, the established cut-offs are based on

data from only one context. Adapting this instrument to other (especially non-African) contexts may require a revision of existing indicators or the addition of new indicators that better suit the context being studied.

Another recent addition to WASH empowerment measures are the Agency, Resources, and Institutional Structures for Sanitation-related Empowerment (ARISE) scales, which are a set of 16 sub-domain specific scales and six indices designed to measure empowerment as it relates to sanitation (Sinharoy et al., 2023). Notably, the development of these scales included rigorous psychometric validation in urban areas of Uganda and India. ARISE includes 10 scales on resources (health, bodily integrity, safety and security, privacy, financial and productive assets, social capital, time, knowledge, and two scales on critical consciousness), four related to agency (leadership, decision making, collective action, and freedom of movement), and two related to institutional structures (norms and relations). While the ARISE scales are an important contribution, their development has so far been limited to urban areas and the scales are only administered to women, not men, thus limiting intrahousehold comparisons. Additionally, for scales to have strong psychometric properties, they must ask multiple questions that aim to measure the same domain from different perspectives. The disadvantages of this approach are both the length of the resulting questionnaire as well as what respondents often perceive to be a high degree of repetition in the items, which has often been found to frustrate respondents.

Objectives

Given the limitations of previous approaches to measuring WASH-related empowerment, in this work we set out to develop indicators of women's and men's agency in the WASH sector. In the following sections, we describe the 14 WE-WASH indicators and our approach to developing them. We begin by describing the development of the module, data collection, and analysis. We then outline each indicator and compare empowerment headcounts by country and gender, as well as by individual characteristics. We conclude with recommendations for the use of these indicators and for further work on their development.

METHODS

We used a multistage approach to develop the WE-WASH questionnaire and its indicators. In doing so, we drew on prior approaches that have been successfully used in the development of women's empowerment indicators. We began by drafting the WE-WASH questionnaire to include multiple aspects of agency (instrumental, intrinsic, and collective) and to cover different areas of WASH programming. At the same time, we critically reviewed existing gender-sensitive and empowerment-related indicators (Myers et al., 2022) and further revised the WE-WASH questionnaire based on findings from this review. We then conducted cognitive interviewing in Nepal[2] to identify potential sources of error in how respondents interpret and respond to questions. We revised the questionnaire based on the cognitive interview findings, and on feedback received from our local partners in Malawi and Nepal.

We then fielded the WE-WASH modules as part of household surveys in rural areas of Malawi and Nepal. We selected Malawi and Nepal based on their high priority status for WASH programming by the United States Agency for International Development and our ability to identify strong local research partners in each country. Additionally, we purposefully selected two countries that were distinct from one another to allow us to test WE-WASH in different contexts. In both countries we limited our work to rural areas. The motive for doing so was an expressed need by the donor for a tool and indicators that would be well suited for use in rural areas. In addition, three-fourths or more of the population in both countries is rural (World Bank, 2023), implying wide applicability of these measures.

In each country, where possible, one woman and one man from each household were administered the individual-specific modules, while the household-level survey was administered to any knowledgeable adult member. We sampled approximately 800 households in each country and covered the three key geographic regions within each country. By covering the geographic diversity of each country, we anticipate the WE-WASH survey and indicators will be broadly applicable. The sample size of 800 was based on recommended sample sizes for indicator development and previous experience with similar methodologies developing indicators for the WEAI and pro-WEAI.

We developed theoretical definitions of indicators and proposed initial thresholds. Using the data from these validation surveys, we drew on factor analysis and aspects of the Alkire-Foster methodology to refine indicators for each domain. The Alkire-Foster methodology is a counting-based approach that forms the basis of multidimensional poverty indices and has been used to develop other empowerment metrics. Specifically, we use this approach to inform the selection of indicator cut-offs (i.e., empowerment thresholds). We describe our approach in more detail in the indicator development part of

[2] Logistical and budget constraints prevented us from conducting cognitive interviewing in more than one country.

the methods section. Where needed, we adjusted thresholds based on the distributions of the indicators in the underlying data in both countries. Certain indicators were deemed relevant for only a single country context, but this was the exception; overall, we strove to maintain comparability in indicator construction across both contexts. Proposed indicators and empowerment thresholds for men and women in both countries were discussed at length with our in-country co-authors, who provided useful contextual explanations for existing patterns. Associations with additional individual, household and community-level characteristics were proposed and investigated, strengthening confidence in our indicators. In the following section we describe this approach in greater detail.

Study context

Malawi

Malawi is a landlocked country situated in Southeastern Africa. The country is bordered by Tanzania to the north and northeast, Zambia to the west and northwest and Mozambique to the southeast and southwest. Covering over 118,484 square kilometers, Malawi has highlands, plateaus, and isolated mountains across the country, as well as many freshwater bodies, including Lake Malawi which is the fifth largest freshwater lake (by volume) in the world. As of 2021, Malawi had an estimated population of 19.4 million people, with a majority of young people aged between 10 and 35 years (UNICEF, 2020). The majority of Malawi's population lives in the rural areas with only about 18% living in urban areas (World Bank, 2023).

In 2021, the per capita gross domestic product (GDP) of Malawi was 645 USD (World Bank, 2023). Malawi is among the poorest countries in the world, ranked 169 of 189 on the Human Development Index (HDI), and over half of its population lives in poverty (United Nations Development Programme, 2021). In 2022 and 2023, Malawi encountered several setbacks, including various cyclones, cholera outbreaks, and foreign currency exchange crises, all these setbacks are projected to weaken the nation's economy and may lead to poor health and sanitation services. Malawi's economy depends on agriculture, which generates more than a quarter of its GDP and is the main source of employment in the country, as 68% of women and 52% of men work in agriculture (National Statistical Office (NSO) & ICF, 2017). Primary cash crop production focuses heavily on tobacco as well as soya bean, tea, cotton, and sugar, while maize is commonly cultivated as the primary staple crop.

According to Joint Monitoring Programme on Water Supply, Sanitation, and Hygiene (WHO-UNICEF JMP, 2022), 84% of rural households rely on non-piped improved water sources, while only eight percent have access to piped improved sources. In contrast, in urban areas, around 77% of households use piped improved water sources, with 19% utilizing non-piped improved sources. Consequently, 23% of rural

households travel more than 30 minutes to secure clean water, compared to only ten percent of urban residents. In terms of sanitation, nearly half of all households (50%) have access to improved and non-shared sanitation facilities. However, the prevalence of shared sanitation facilities persists, with 24% of rural households and 39% of urban households relying on improved but shared facilities. Notably, within rural areas, 24% of households are still using unimproved toilet facilities, as compared to only ten percent of the urban population. Among households with sanitation facilities, 81% have a facility for handwashing, but only 20% of those have soap and water available (WHO-UNICEF JMP, 2022).

Nepal

Nepal is a small landlocked South Asian country situated along the Himalayan Mountain range and is divided into three broad regions based on topography – the mountain, hills and terai (plains). As of 2021, Nepal's population was estimated at slightly more than 30 million, of whom 6.3 million - or roughly a fifth - lived in urban areas (World Bank, 2023). With a per capita income of USD 1077.70 (in current US dollars) in 2020, Nepal is the poorest country in the region. However, the country has made substantial progress over the last few years, with the proportion of the population deemed to be poor, according to a multidimensional poverty measure, falling from 30.1 percent in 2014 to 17.2 percent in 2019, a substantial improvement (Government of Nepal, National Planning Commission, 2021). Close to 80% of the population is employed in the informal sector (International Labor Organization, 2023) and agriculture and allied activities still contribute slightly more than a fifth of the country's GDP (World Bank, 2023).

Nepal shares an open border with its neighbor, India, (towards the east, west and south) and many Nepalis migrate to India for work. In recent years, longer-distance migration to the Gulf and to Malaysia has also picked up pace. According to the recent 2021 Census, approximately 23.4% of the population lives abroad, with 82% of this population being men (National Statistics Office, Nepal, 2023).

Information on the status of WASH indicators in Nepal is collected regularly as part of the nationally representative DHS. According to the 2022 DHS, 98% of all households had access to an improved source of drinking water, an improvement from 95% in 2016 and 89% in 2011 (Ministry of Health, 2017). Tube wells or boreholes, which are primarily found in the Terai, were the most common source of this water in rural areas of Terai regions, where 96% of households reported receiving water from an improved source. Only 1% of all households spent more than 30 minutes to obtain water, but only 19% of rural households report treating their water appropriately before drinking. Ninety-one percent of rural households reported using an improved toilet facility. Sixty-three percent of rural households had soap and water available for washing hands. Nine percent of children under the age of five years in rural

areas had diarrhea in the two weeks preceding the survey. Seventy percent of all rural households possessed mosquito nets, and 10% of rural households possessed an insecticide-treated mosquito net.

Questionnaire development

Our review of gender sensitive and empowerment related indicators (Myers et al., 2022) highlighted the need to collect indicators of empowerment for men and women under four major WASH-related themes: water access, sanitation access, hygiene behaviors, and menstrual hygiene. For each theme, we identified agency related domains that addressed intrinsic, instrumental, and collective agency, and conducted a scoping exercise to identify existing frameworks. Based on this scoping review we drafted modules that covered the four priority themes and each of the three forms of agency. Before fielding the questionnaire, it was field tested in Nepal using cognitive interviewing (described in detail below) that assessed respondents' comprehension of the questions and analyzed the types of errors respondents might make while responding. In-country partners also reviewed the questionnaire and provided extensive feedback. Based on the results of the cognitive interviewing and our colleagues' input, we refined the questionnaire for comprehensibility and accuracy. Table 1 details the current version of WE-WASH modules along with their content, motivation and the indicators derived from the module.

Table 1. Description of WE WASH modules

Module Name	Content	Motivation	Indicators derived from this module
Intrinsic and instrumental agency in WASH	The first part of the module consists of 18 questions, each of which asks how frequently the respondent experiences a negative reaction to specific WASH experiences (e.g., feeling frustrated or angry about your WASH situation or afraid or unsafe while bathing). Responses are on a 4-point Likert scale ranging from never to always. The second part of the module asks who in the household makes decisions about specific activities related to improving the household's WASH facilities and how often the respondent's input is considered (4-point Likert scale from never to always).	To assess intrinsic and instrumental agency related to water, sanitation, and hygiene situations	1) WASH experiences do not generate negative affect (intrinsic agency) 2) Feels safe while gathering water and conducting personal hygiene (empowerment environment) 3) Feels lack of water does not limit normal sanitation and hygiene activities (intrinsic agency) 4) Input into household-level WASH infrastructure decisions (instrumental agency)
Collective agency in WASH	The module consists of 7 statements. The first 3 statements relate to water, sanitation, or hygiene issues that the community faces as a whole and how the community comes together to deal with it. The last 4 statements relate to the support received by the individual from the community and participation in the community decision-making processes around WASH. Responses are on a 4-point Likert scale ranging from completely disagree to completely agree.	To assess the individual's perception of collective agency in their community, as well as the extent to which they participate in and benefit from the community's actions.	1) Community comes together on WASH issues (collective agency) 2) Individual participates in and benefits from community WASH activities (collective agency)

Module Name	Content	Motivation	Indicators derived from this module
WASH time-use agency	The module includes four questions about who in the household does specific WASH labor activities, whether they would like help with these activities, how often they asked for help, and whether they received it. These questions are asked about: water collection, food preparation and related clean up, bathing of children or others who rely on help to bathe, and cleaning of the house and surrounding area, such as washing floors, wiping down surfaces, cleaning surfaces of the latrine, and washing clothes.	To assess who engages in WASH-related labor and whether individuals are able to get help doing these activities.	1) Receives help on WASH activities (when wanted) (instrumental agency)
Freedom of movement in sanitation (asked only to women)	The question asks the frequency in which the respondent avoids traveling to a place due to a lack of adequate facilities to urinate or defecate. The 6 places asked in this module are: the closest market to either buy or sell goods, a place to do work for several hours, such as a field, fishery/fishpond, a market, or your place of business, a place to conduct business in an office, such as a bank or a government office, a hospital, clinic, or doctor's office, a religious site, such as a temple, church, or sacred site, and another village or community	To assess a woman's ability to move freely, without barriers caused by the lack of adequate sanitation facilities.	1) Does not avoid places out concern for a safe place to urinate or defecate (empowerment environment)
Intrinsic agency in menstrual health (asked only to women)	This module consists of 16 questions that ask about perception of menstruation, the limitations it poses to a woman and the support that should be offered to menstruating women. Responses are on a 4-point Likert scale ranging from completely disagree to completely agree.	To assess women's intrinsic agency related to the experiences and management of her menstrual cycle	1) Women do not need to be separated while menstruating (intrinsic agency in menstrual hygiene management) 2) Menstruation is a normal part of life for women (intrinsic agency in menstrual hygiene management)

Module Name	Content	Motivation	Indicators derived from this module
Freedom of movement in menstrual health (asked only to women who menstruated in the past year)	This module asks whether the respondent avoided traveling to or spending time at specific places during their last menstrual period. These places included the closest market, workplace, public facilities like hospital/clinic, to a religious site, community water source/private water source or a home garden. In addition, the module asks specifically about avoidance of entering parts of the household (i.e., kitchen), touching a water source, and food preparation.	To assess women's ability to move freely when menstruating, whether outside or inside her home.	1) Freedom of movement and doing as desired while menstruating (empowerment environment)
Instrumental agency in menstrual health (asked only to women who menstruated in the past year)	The first set of questions in this module ask about the types of menstrual health products used by the menstruating respondent, the frequency of access to these products and the reasons the respondent was unable to use their preferred products. The module also has 6 questions that ask about frequency of access to private, safe, and clean facilities, at home, or at a place of work to safely manage menstruation and dispose of a menstrual product.	To assess whether the respondent has access to preferred menstrual products and safe spaces for menstrual hygiene management.	1) Access to facilities for menstrual hygiene needs (Empowerment environment for menstrual hygiene management) 2) Access to menstrual products (Empowerment environment for menstrual hygiene management)
Responsibility for and time spent on WASH activities	There are two questions in this module. The first asks who in the household is usually responsible for doing that activity. The second asks about the amount of time spent (in minutes) by the respondent on that activity daily. The activities include water collection, ensuring sufficient clean water, food preparation and clean up, bathing or washing children or others who rely on care, cleaning and maintaining the toilet or latrine, cleaning the house and surrounding areas, purchasing hygiene products, purchasing menstrual hygiene products, participation in community or school WASH activities, managing the urine/chamber pot, and washing clothes.	To assess who in the household is responsible for different WASH activities, as well as how much time the respondent spends time doing each of the activities.	1) Does not spend undue time on WASH activities (instrumental agency in WASH

Notes: Authors' construction.

Cognitive interviewing

According to Willis & Miller (2011), discrepancies between how researchers ask questions and how respondents interpret them may occur at any point as a respondent interprets a question, recalls the information requested, or responds. The purpose of cognitive interviewing is to identify such sources of error (Willis, 2004). There are four specific cognitive processes where such discrepancies may occur: comprehension, retrieval, judgment, and response. According to Willis (2004), these concepts are defined as:

- Comprehension: A respondent's understanding of a question's content, including key terms.
- Retrieval: Recall of the information in question, e.g., a time period stated in the question.
- Judgment: Discomfort a respondent may feel while answering a specific question, e.g., social desirability bias.
- Response: The ease of replying to a question in its suggested format, specifically being able to choose from pre-specified response options.

Cognitive interviewing methods

We conducted cognitive interviews among 36 women and 18 men (54 respondents total) in Nepal in July and August 2022. Twelve women and six men each were sampled from the Central Terai, Western Terai, and Hill regions to ensure the cultural diversity of Nepal was reflected in the sample, and trained facilitators tested the seven proposed WE-WASH modules. Four of the seven modules (intrinsic and instrumental agency in WASH; collective agency in WASH; WASH time-use agency; freedom of movement in sanitation) were cognitively tested with 18 women and 18 men; the other three (intrinsic agency in menstruation; freedom of movement in menstrual health; instrumental agency in menstrual health) were only tested with 18 women, given the subject matter was only relevant for women. The question guide included open-ended cognitive questions immediately following the survey items to which they were referring, and we also asked additional questions to contextualize respondents' answers (i.e., contextualizing questions) in each module. Some examples of the cognitive interviewing questions we used were:

- "Can you explain to me in your own words what '[key phrase]' means?" (comprehension)
- "What period of time were you thinking of when I asked you [about key activity]?" (retrieval)
- "Do you think these questions would make other women like you in your community feel uneasy or uncomfortable? Why?" (judgement)
- "Can you explain the difference between 'rarely' and 'sometimes?'" (response)

The corresponding types of cognitive error tested in each module are summarized in Table 2. The cognitive interviewing data were analyzed in Microsoft Excel using inductive codes for a thematic analysis, with specific emphasis on potential comprehension, retrieval, judgement, and response errors. Contextualizing questions were analyzed to determine if the proposed survey items were salient to respondents' lived experiences.

Table 2. Modules tested and corresponding types of cognitive questions

Module name	Type of cognitive error targeted
Intrinsic and instrumental agency in WASH	Comprehension, retrieval, contextualizing
Collective agency in WASH	Comprehension, response, contextualizing
WASH time-use agency	Comprehension, response, contextualizing
Freedom of movement in sanitation	Comprehension, retrieval, contextualizing
Intrinsic agency in menstruation	Comprehension, judgement, contextualizing
Freedom of movement in menstrual health	Comprehension, retrieval, judgement, contextualizing
Instrumental agency in menstrual health	Comprehension, retrieval, judgement, contextualizing

Notes: Authors' construction.

Cognitive interviewing results and suggested revisions

Overall, the modules and survey items therein were clearly understood and easy to respond to, indicating that the proposed survey items captured the information intended and may be used to accurately measure empowerment. However, we did find nominal cognitive errors, which were used to inform revisions to the instrument. These included comprehension errors in three of seven modules where it was tested (collective agency in WASH; intrinsic agency in menstruation; instrumental agency in menstrual health), retrieval errors in two of four (intrinsic and instrumental agency in WASH; freedom of movement in sanitation), and response error in one of two (collective agency in WASH). We did not find any evidence of judgement error in the two modules where it was tested. An example of a cognitive error from the instrumental agency in menstrual health module was that when respondents were asked to explain what washing and drying reusable pads or a scrap cloth during menstruation to their satisfaction meant, respondents described not feeling shame about having to clean their menstrual products, when we had intended to ask about their perception of cleanliness. Another example is that in the intrinsic and instrumental agency in WASH module we used a recall period of four weeks; when probed about it, respondents largely did not mention any time period, an example of a retrieval error. Finally, an example of a response error from the collective agency in WASH module is that respondents found it difficult to distinguish between "partially agree" and "partially disagree," indicating the respondents were not

interpreting the subtleties among the Likert scale responses in the way that we had anticipated. that we had hoped they would.

The research team discussed the findings and revised the WE-WASH instrument, including rephrasing, eliminating and adding questions, splitting questions into two, and revising response options (e.g., Likert scales) to enhance the clarity of the instrument and ensure response options reflect respondents' lived experiences. An example of a revision based on a comprehension error is when we revised a question from asking "How frequently did you change what you or your household members would eat because there were problems with your water, sanitation, or hygiene situation, such as lack of water to prepare or clean food?" to "How frequently do you change your or your household members' eating habits because there are problems with your water, sanitation, or hygiene situation, such as lack or water to prepare or clean food?". An example of a revision to reduce retrieval error was changing the recall period from "in the last four weeks" to "these days." In the collective agency in WASH module, we changed a five-point Likert scale to four points to reduce response error. Table 3 shows the type of errors identified in each module, if any, and the complementary revision(s) made to each of the seven modules tested. In the freedom of movement in menstrual health module, we did not find any errors but did add additional questions given the responses to contextualizing questions asked during the cognitive interviews.

Table 3. Cognitive errors identified and module-by-module revisions

Module	Cognitive error(s) identified	Revision(s) to instrument
Intrinsic and instrumental agency in WASH	Retrieval	Rephrased 18 questions
Collective agency in WASH	Response Comprehension	Reduced Likert scale Eliminated 2 questions Rephrased 1 question
WASH time-use agency	None	None
Freedom of movement in sanitation	Retrieval	Rephrased 1 question
Intrinsic agency in menstruation	Comprehension	Rephrased 3 questions Eliminated 4 questions
Freedom of movement in menstrual health	Contextualizing questions[1]	Added 2 questions
Instrumental agency in menstrual health	Comprehension	Rephrased 2 questions Eliminated 1 question

	Split 1 question into 2

Notes: Authors' construction.
[1] Given the responses to contextualizing questions, we added two additional questions to the freedom of movement in menstrual health module to account for additional locations women may be constrained from visiting while menstruating despite not identifying any cognitive errors in this module.

Survey data collection

For the household surveys in both Malawi and Nepal we identified respondent households through a multistage sampling approach. In Malawi, we purposefully selected two districts from each of the country's three regions. In each of the six districts, we randomly selected nine rural primary sampling units[3] (PSUs) (54 total) and 15 households from within each PSU, for a total of 810 households. In Nepal, we first selected districts from within Provinces using probability proportional to size (PPS) methods, while ensuring representation across the Mountain, Hill, and Terai regions. We then selected 5 rural PSUs (wards under the old pre-2015 administrative structure) from each district using PPS methods, and 15 households at random from the list of eligible households within each PSU, for a total of 825 households.

In both countries, all interviews were conducted using computer assisted person interviewing (CAPI) on Android tablets programmed with CSPro. In each household, a knowledgeable adult household member (often the head) responded to a household questionnaire, which included a household roster and other information that could be assessed at the household level. Then one woman (aged 18-49) and one man (aged 18-64) were randomly selected from the household roster using the CAPI program. For the individual interviews, the interviewers and respondents were paired on gender, meaning that women were only interviewed by women and men were only interviewed by men. In both countries, we were concerned about the number of households in which there would be no adult men available for the interview. In Nepal this is due to high male out migration. While in Malawi, a variety of factors, including migration, polygyny, marital instability, and prime-age adult mortality, contribute to a high share of woman-only headed households. Interviewing a sufficient number of men was important as comparisons between women and men are valuable for assessing potential cutoffs during indicator development. We addressed this concern differently in each country. In Malawi, according to the most recent Demographic and Health Survey, approximately 30% of households are woman-headed (National Statistical Office (NSO) & ICF, 2017). Thus, we assumed that a random sample of households where at least one woman aged 18-49 resided would lead to a sample of approximately 567 men, sufficient for indicator development and that the household could still be eligible to be interviewed if there was no adult man in

[3] PSUs often correspond to villages. Larger villages may contain multiple PSUs.

the household. In Nepal, absent men are much more common due to seasonal labor migration. Thus, we only selected households for inclusion in our survey if at least one woman and one man in the target age range resided.

Further details on the sample design for each country and content of the questionnaires are provided below.

Malawi sample

First, we purposefully selected two districts from each of Malawi's three regions (Northern, Central, and Southern). We reviewed summary characteristics on women's empowerment and WASH to ensure we selected districts with variability in these characteristics. Tsogolo la Thanzi (TLT), a local research group, was selected as the data collection partner and provided additional input on ethno-linguistic diversity to ensure that the sample would include all major ethnic groups. (Likoma, Chikwawa, and Nsanje districts were not considered because of potential travel concerns and flooding during the rainy season when data were being collected.) From the Northern region, we selected Mzimba and Nkhata Bay. From the Central region we selected Salima and Dowa. In the Southern region, we selected Balaka and Phalombe.

To select nine PSUs[4] from within each of the six districts, we used the sampling frame from the 2018 Census and limited the eligible PSUs to those that were considered rural. We also limited the potential PSUs to those with between 100 households (to ensure an adequate sample could be drawn) and 1,000 households (to avoid outliers). We then randomly selected the PSUs according to PPS using Stata. We also randomly selected three "reserve" PSUs to have as back-up options if the teams could not gain access to the selected areas. During fieldwork, six PSUs were replaced with reserve PSUs for the respective districts: two in Nkhata Bay, two in Mzimba, one in Balaka and one in Phalombe; in each case, the replacements were necessary due to impassable roads damaged by heavy rains.

In each PSU, households were selected using a random walk method. A bottle was spun to select a starting point. Enumerators then set off in the selected direction identifying every 5th household in the South and Central regions and every 3rd household in the North region where communities are more dispersed. To be eligible for an interview, the household needed to have at least one female member between 18 and 49 years old. Upon completion of the interview, the house was marked in chalk on the door post (or elsewhere as agreed upon with the owner). In the case of non-response, the team turned 90 degrees to the right and followed the same steps, or as close to this as was feasible given the layout of the community, but interviewed the fourth household (second in the north) as a replacement household. Upon completion of an interview, the process then continued by turning left. This process continued until 15

[4] In Malawi a PSU is often a village, but larger villages include multiple PSUs.

eligible households were identified. Each pair of enumerators aimed to collect interviews from five households in each PSU, but sometimes some pairs collected more than five while others collected less than five, but each enumeration team always collected interviews from 15 households per PSU.

After completing the household roster, the individual respondents were selected. Among the women aged 18-49 in the household who were available for an individual interview within the next two days, one was randomly selected using the CAPI program. The same was done among men aged 18-64 in the household.

Nepal sample

Following a reclassification of urban and rural areas in 2015, Nepal is now divided into seven provinces: Koshi Province, Madhesh Province, Bagmati Province, Gandaki Province, Lumbini Province, Karnali Province, and Sudurpaschim Province. Each province is divided into districts, districts into municipalities, and municipalities into wards. We used an updated version of the sampling frame from the Nepal Population and Housing Census (NPHC) from 2011, and so considered old wards within the new federal structure as the clusters for this survey. In total, Nepal has 77 districts, which include a total of 753 (local level) municipalities. Of the municipalities, 293 are urban and 460 are rural. Our survey was restricted to rural municipalities only.

We used a multi-stage, stratified cluster sampling design. First, we selected districts within provinces. We determined the number of districts from each province based on the population size of the province, then selected the study districts to maintain representation across strata (geographical regions – mountain, hill, terai). All provinces in our sample, except one (Madhesh) Koshi, straddle multiple strata. To select the required strata in each province districts were separated into Mountain, Hill and Terai and a sampling frame was prepared separately for each stratum in each province. From the frame, the required number of districts from within each stratum and province were then selected by PPS. The resulting sample distribution across provinces is summarized in Table 4.

The second stage of sampling involved the selection of clusters or PSUs. For this, all old wards within the rural municipalities in the selected districts were listed and five clusters were selected from each district following PPS methods using the list of the number of households per rural municipality. Finally, within each PSU, the survey firm conducted a household listing and selected 20 households at random from among those that met the study criteria, i.e., that one adult man (18-64 years) and one adult woman (18-49 years) were available for interview. Larger PSUs were split into smaller segments of no fewer than 150 households using easily identifiable physical features (roads, forests etc.) before eligible households were listed by the field team. From each PSU, we selected fifteen households for the primary sample and five households to be retained as replacement in case one or more households (or individuals

within households) from among the primary sample refused to participate. From each selected household we recruited one adult man and one adult woman as the primary respondents to the survey.

Table 4. Study area and sample distribution, Nepal

Province	Total # of districts	Selected Districts (Strata)	Selected PSU (5 PSUs from each district)	HH (15 from each PSU)	Individuals (1 man and 1 woman each from selected HH)
Koshi	14	2 (1H, 1T)	10	150	300 (150 women and 150 men)
Madhesh	8	2 (2T)	10	150	300 (150 women and 150 men)
Bagmati	13	2 (1M, 1H)	10	150	300 (150 women and 150 men)
Gandaki	11	1 (1H)	5	75	150 (75 women and 75 men)
Lumbini	12	2 (1H, 1T)	10	150	300 (150 women and 150 men)
Karnali	10	1 (1M)	5	75	150 (75 women and 75 men)
Sudurpaschim	9	1(T)	5	75	150 (75 women and 75 men)
Total	**77**	**11 (5T, 4H, 2M)**	**55**	**825**	**1650 (825 women and 825 men)**

Notes: Authors' construction. T-Terai, H-Hill, and M-Mountain

Questionnaire

The questionnaire fielded as part of this study consisted of two components, a household questionnaire administered to a knowledgeable adult member of the household, and an individual questionnaire, which included the WE-WASH modules and was administered to one woman and one man in each household. Table 5 summarizes the key modules in each survey, while Appendix 1 provides the complete questionnaire.

The household questionnaire collected information on household demographic and socioeconomic characteristics, including asset ownership and other indicators used to construct wealth quintiles. It also included detailed questions about WASH characteristics, such as the type of toilet used, handwashing facilities and the main source of water, and about recent illnesses among members of the household. In Malawi, the module on household illness also included questions asking if household members had been sick with cholera, due to an outbreak that occurred in the months preceding data collection in that country.

In addition to the WE-WASH modules, the individual questionnaire included a validation module asking respondents to rate their satisfaction with their health and financial situation, as well as asking respondents how often they had gone without enough food, or felt unsafe in their home, over the past 12 months. These questions were used to triangulate information obtained from other modules.

Table 5. Description of additional modules included in the validation survey

Name of module	Content	Questionnaire
Respondent information	Basic household information: location, demographic information, eligibility criteria, and outcome of visit.	Household
Household roster and characteristics	Age, education, occupation, relationships with other household members, and other basic information about each household member.	Household
Housing characteristics	Construction details of house, methods used for cooking, lighting, and waste disposal.	Household
WASH characteristics	Household toilet, handwashing facilities, and water sources.	Household
Asset ownership	Items owned by household.	Household
Household illness	Illnesses experienced by household members, and treatment measures taken.	Household
Validation[1]	Happiness, satisfaction with health and financial situation, confidence in self and community, feelings of hunger and safety, input into decisions.	Individual

Source: Authors.
[1] Although not within the scope of the current report, the questions included in this module will allow for the assessment of convergent and divergent validity in future analysis.

Training and fieldwork

Malawi

For data collection in Malawi, we selected TLT, a data collection firm based in Balaka, through a competitive bid process. The enumerator training was held in Zomba in February 2023, and 21 male and female enumerators were instructed on how to conduct the household and individual interviews. The training was a collaborative effort among IFPRI, TLT, and experts from Lilongwe University of Agriculture and Natural Resources (LUANAR). The five-day training consisted of three days of classroom instruction, focusing on the questionnaire and the enumerator manual, which included details on background information of the study, household and respondent eligibility, informed consent, and suggested interview techniques, as well as instructions on conducting the interviews using the CAPI program on Android tablets. On the fourth day enumerators piloted the survey in a nearby community (not part of the study sample), and the fifth day was used to debrief from piloting and to make final adjustments to the questionnaire and CAPI. Three supervisors and three assistant supervisors were selected from the 21 enumerators, and they received an additional day of training to better understand the

sampling methods and how to troubleshoot potential CAPI issues. Enumerators were assigned to one of three teams based on a variety of factors, including familiarity with the selected PSUs as well as language skills, for example, the team going to the North region needed to be fluent in Tumbuka. Each enumeration team consisted of one supervisor and six enumerators (three men and three women). The enumerators worked in pairs, with one male and one female enumerator moving together to visit households and complete interviews with women and men in each household.

Data collection took place in February and March 2023. Notably these months are during the height of the rainy season, which created transportation challenges and is important for the interpretation of these findings. Data collection began in Phalombe district in the Southern region. After completing all EAs in Phalombe district, one half-day of training was conducted to reiterate questionnaire details and interview techniques based on feedback received on initial data checks performed by IFPRI. After this, one team traveled to Nkhata Bay district in the North region, one team traveled to Dowa district in the Central region, and one team traveled to Balaka district in the Southern region. When the Southern team finished in Balaka district, they joined the Central team to complete the interviews in Salima district. Both the Central and Southern teams joined the Northern team to assist completing data collection in Mzimba district, where enumeration areas were vast and communities sparsely populated.

There were several challenges encountered during data collection. First, the data collection team had to navigate damaged roads due to intense rains. They also sometimes experienced difficulty locating the correct PSUs and staying within the bounds prescribed by maps from the National Statistical Office. When the Southern and Central enumeration teams went to Mzimba district, several enumerators faced difficulty conducting the interviews in Tumbuka, as they were not conversant in this language and several interview respondents had difficulty responding to the questions if asked in Chichewa. Several enumerators also reported that the interview was too long and expressed concern that some of the questions may have been too sensitive for respondents. Occasionally, when younger members of the household (although still at least 18 years old) were randomly selected by the CAPI algorithm, they were not very knowledgeable about the management of the household and various WASH activities carried about by the other family members; thus, they had difficulty responding to specific questions. Finally, for many respondents, it was difficult to estimate the time they spent on specific WASH activities, as many people did not regularly carry a watch or phone.

Nepal

Through a competitive bid process, we selected New Era, a research organization located in Kathmandu, to conduct the data collection in Nepal. Enumerator training and data collection in Nepal were deliberately scheduled to be held after data collection in Malawi had begun, so that lessons learnt from the

field there could be incorporated into the Nepal training and survey organization. In March 2023 New Era and IFPRI staff trained 47 enumerators for the household and individual surveys. The enumerator training included four days of classroom-based work and one day of piloting in nearby Chandeshwori area of Banepa municipality in Kavrepalanchowk district. The training included information on the background of the study, ethics, informed consent, interview techniques, and detailed discussions of the questionnaires and the field manual, as well as practical exercises like role-playing in mock interviews.

Data collection began immediately after training and continued through March and April 2023. Most enumerators conducted the household and individual surveys in Nepali, though other languages, such as Maithili and Bhojpuri, were also used. On arriving in a study area, the research team sought approval for the survey from local representatives, especially ward chairs. An official letter from New ERA and ethical approval (see below) were presented to secure community approval. A household listing was conducted in consultation with the ward chair and knowledgeable people in the area, such as the Female Community Health Workers. Once the listing exercise was complete, supervisors compiled the lists, selected households, and distributed these households to the enumerators for the interviews.

If selected respondents were not available in the household and were not reachable throughout the study period in that particular cluster, another household was selected as replacement. Before conducting the interview, respondents were asked to identify a preferred location where they felt comfortable responding. To prevent interruptions from outsiders, interviews were conducted separately in spaces such as the lobby, hall, and private rooms.

One of the key challenges faced during data collection was obtaining permission for the study and locating representatives who had complete and up-to-date information about cluster boundaries. It was sometimes difficult to find respondents during the day, and some did not have mobile phones or used Indian phone numbers, especially in border clusters. Enumerators adjusted their hours to meet with respondents in the early morning and late evening. In mountain districts, travel between clusters took longer than expected.

Ethics approval

This study was approved by the Internal Review Board (IRB) of the International Food Policy Research Institute (IFPRI). The country studies also received approval at the national level from the National Health Science Research Committee in Malawi and the Nepal Health Research Council accordingly. Additionally, the cognitive interviewing sub-study was approved separately by the IFPRI IRB and the Nepal Health Research Council. All enumerators received training in research ethics for the study. In Nepal all study participants provided signed informed consent prior to the start of each interview, while in Malawi they provided oral consent. In Nepal, 1643 of 1651 survey respondents were provided a small

mobile phone top up of 200 Nepali rupees (approximately $1.5) that was delivered either the day of the interview or 1-2 days after. The remaining 8 respondents did not have a mobile phone and were provided the same incentive in cash. In Malawi, no incentives were provided for participants. The choice of consent practices and whether respondents received incentives was in accordance with local research practices and the preference of the national ethics committees.

Data processing

Completed surveys were synced with a secured server on a daily basis, and periodic data cleaning checks were performed for data quality assurance. Raw data was shared with the IFPRI team at regular intervals to process data in real-time. All data with personally identifiable information was stored in confidential folders set up by IFPRI IT; de-identified data was made available through Dropbox to researchers working on this project.

The survey firms conducted basic cleaning of the raw data to remove duplicate entries or incomplete forms, correct erroneous entries after consultation with the enumerators, reclassify text responses that matched with responses categories and so on. All other data cleaning – checking data completeness, adding variable labels and value labels, merging the roster on to the main modules, checking skip patterns and checking for outliers – was done by IFPRI staff using Stata 17 and 18. Variables capturing both contextual factors and key outcome indicators were developed and checked for accuracy. More detail on indicator development is provided below.

Indicator development

As with any empowerment measure, the design of WE-WASH required a series of normative choices that were informed by empirical evidence. In the case of WE-WASH, these choices related specifically to the indicators and empowerment cutoffs. Our process for addressing these choices is described below. The goal of this process was to design indicators that measure distinct aspects of empowerment using a standardized approach and are of practical use for WASH projects.

First, we grouped together similar survey items to form indicators and define sets of potential empowerment cutoffs for each indicator. To make these item groupings we drew on all available information. This includes theory, i.e., the degree to which we expect items to relate to each other *a priori*, as well as insights from cognitive interviewing, expert consultation, and, if appropriate, factor analytic methods (see next section for details). The empowerment cutoff refers to the threshold at which a person is considered to have achieved empowerment in an indicator. While not strictly necessary for a dashboard of indicators, the use of empowerment cutoffs can be helpful for communicating findings to

non-technical audiences. For each indicator, we defined multiple potential empowerment cutoffs based on the response structure(s) for the included items. We purposefully defined the set of potential cutoffs to capture different "difficulty" levels, ranging from cutoffs that most respondents would be expected to surpass to those few would be expected to achieve.

Next, we conducted a sensitivity analysis on the potential cutoffs and select the most defensible cutoff for each indicator. The sensitivity analysis involved comparison of various statistics for each potential cutoff of an indicator, including the empowerment headcount ratio, i.e., the proportion of respondents who reached the threshold for a given empowerment cutoff and indicator, and missingness, i.e., the proportion of respondents who are missing responses to one or more of the items used to construct an indicator. The choice of empowerment cutoff for each indicator was based on these findings, as well as other factors such as ease of interpretability and communicability. Among these considerations is how much variation the cutoff produces in the data. Ideally, the empowerment headcount ratios should reflect meaningful gender differences and not be so high as to preclude improvement over time.

For indicators comprised of more than three items, we conducted sensitivity analyses to determine if a version of the indicator with fewer items would yield similar levels of empowerment when compared to the longer version. To do this, we first examined the degree of relatedness among the items included in the indicator. We then followed the steps outlined above, but also, importantly, considered the degree of similarity between the two versions. Although the shorter versions implicitly involved a loss of information, they are defined to preserve as much fidelity to the longer version as possible while utilizing fewer survey items. The focus on calculating the indicator with as few items as possible will benefit projects facing tight resource constraints.

In the final step of indicator development described in this report, we compared levels of empowerment across a range of individual characteristics. We considered a range of individual characteristics, which are expected to be positively correlated with agency and empowerment. For both Malawi and Nepal, we compare outcomes by region (Central, North, and South in Malawi; Mountain, Hill and Terai in Nepal), education level (no school or some primary, primary complete, completed secondary or more), age group (18-29, 30-39, 40-49, and 50-65 [men only]), and wealth quintile, (poorest, poor, middle, high, and highest). A wealth index was constructed separately for each country by conducting a principal components analysis of housing characteristics and assets owned by the household (Filmer & Pritchett, 2001); using the continuous index, households were divided into five groups. In Malawi, we also compared empowerment by household type (dual headed [a man and a woman head of household] and woman-only headed), and in Nepal we compared outcomes by caste of the household head (Dalit, Janajati, Madhesi, and Brahman/Chhetri). We do not report separate empowerment levels for Muslim households, as there are too few to ensure reliable estimates.

Factor analysis

For a subset of modules that we determined were measuring latent factors and for which the response structures were conducive to factor analysis (i.e., multipoint, ordinal, Likert scales), we aimed to develop measures of these latent constructs that could be used in both settings. The modules we determined were appropriate for factor analysis included Module A on intrinsic and instrumental agency in WASH (limited to the intrinsic agency items A1-A18, Module B on collective agency in WASH, and Module E on intrinsic agency in menstrual health. We conducted exploratory factor analysis (EFA) using a randomly selected half of respondents from each of the four subsamples (by gender and country). Both orthogonal (e.g., varimax) and oblique (e.g., promax) rotations were considered to identify an optimal fit. We dropped items that did not load well (<.35 factor loading) or loaded on multiple factors (cross-loaded). Then, using the factor structure identified by EFA we conducted confirmatory factor analysis (CFA) to determine if the proposed factor structure also fit the second random half of the data set. Model fit was assessed by considering whether individual fact loadings were significant and using three test statistics for overall model fit: the root mean square error of approximation (RMSEA) (range 0−1, <0.05 considered good fit and <0.08 adequate); the comparative fit index (CFI) (range 0−1, >0.95 good and 0.90 adequate); and the Tucker-Lewis index (TLI) (range and cut-off values the same as for the CFI).

RESULTS

Sample descriptions

Malawi

In the Malawi sample 84% of the 812 households had a male head of household (Table 6). The average household had about five members, and an average of two to three children under 18 years old. Although it was not a requirement for eligibility, 91% of households in the Malawi sample included a man between the ages of 18 and 64. The average house had about 3 rooms and 64% of households used some method to treat their drinking water. 82% of households sourced their drinking water mainly from a tube well or borehole; only 12% reported piped water as their main source. 52% of the household heads were primary school educated, with only 12% having completed a secondary degree or higher. 88% of the household heads were Christian, and 10% were Muslim.

Table 6. Household characteristics, Malawi

	Mean (SD)/ Proportion
Sex of household head	
Man	83.6
Woman	16.4
Household size	5.11 (1.91)
Number of children under 18 in household	2.48 (1.59)
There is a man aged 18-64 in the household	90.6
Number of rooms in house	3.20 (1.12)
Household treats drinking water	64.2
Religion of household head	
Christian	88.4
Muslim	9.5
African Animist/Traditional	1.5
Other	0.5
Atheism	0.1
Region of household	
Central	33.3
North	33.3
South	33.3
Household's main source of drinking water	
Tube well/borehole	81.5
Piped water	12.1
Unprotected dug well	2.6

	Mean (SD)/ Proportion
Protected dug well	1.6
Unprotected spring	1.6
Protected spring	0.5
Other	0.1
N	812

Source: Authors' calculations.

In Malawi, 551 men and 808 women completed individual interviews. The average man was close to 35 years old; about 80% were the head of their household, while another 14% were an adult child of the household head (Table 7). The average woman was about 30 years old; about 10% identified as being the head of their household, 73% were the spouse of the household head, and another 12.5% were an adult child of their household's head. Men were slightly more likely to be married (84.9%) than women (80.0%), while women were more likely to be separated or divorced (9.5%) than men (1.5%). More than 90% of both men and women had attended school for at least some period, with about half of both men and women having started but not completed primary school. Men were somewhat more likely to have attended or completed secondary school than women. About two-thirds (67.2%) of women reported farming as their main occupation, as did 55.5% of men. 14% of men said they were engaged in some form of off-farm self-employment.

Table 7. Individual characteristics of women and men respondents, Malawi

	Mean (SD)/Proportion	Mean (SD)/ Proportion
	Men	**Women**
Average age (years)	34.9 (11.5)	30.4 (8.9)
Relationship to the head of household		
Head	80.4	10.6
Spouse	1.1	73.0
Child/adopted child	14.3	12.5
Grandchild	0.5	1.0
Niece/nephew	1.1	0.1
Parent (father or mother)	0.0	0.1
Sibling (sister or brother)	1.6	0.5
Son-in-law or daughter-in-law	0.0	1.5
Brother-in-law or sister-in-law	0.0	0.3
Father-in-law or mother-in-law	0.0	0.3
Other relative	0.2	0.0
Household employee or their family member	0.5	0.1
Other non-relative	0.2	0.0

	Mean (SD)/Proportion	Mean (SD)/ Proportion
	Men	**Women**
Marital status		
Married	84.9	80.0
Never married	13.4	7.4
Separated/divorced	1.5	9.5
Widowed	0.2	3.1
Highest educational level completed		
No school	6.2	9.3
Some primary	50.3	58.9
Completed primary	9.3	10.0
Some secondary	20.7	16.3
Completed secondary	10.5	4.1
More than secondary	3.1	1.4
Primary occupation		
Farming (including livestock rearing)	55.5	67.2
Self-employed off-farm	14.0	5.3
Casual labor off-farm	7.3	6.4
Casual labor on-farm	7.3	3.3
Student	3.6	2.5
None/unemployed	2.5	7.7
Salaried employment off-farm	6.5	1.7
Salaried employment on-farm	2.5	1.4
Housework	0.0	3.2
Other	0.7	1.2
N	551	808

Source: Authors' calculations.

Nepal

In the 826 households in the Nepal sample, 93% were headed by a man, which is much higher than the national average and attributable to how the sample was selected (Table 8). An average household had slightly more than 5 members, and an average of 1.86 children under the age of 18. The average house had 2.67 rooms, and 25% of the households in the sample treated their drinking water. About a quarter of household heads had never attended school, and only 2% had completed a tertiary degree. In terms of ethnicity and caste, 36% of household heads are Janajati (indigenous group), and 25% are Brahman or Chhetri (so-called upper castes) and 14% are Dalit (so-called lower castes). 82% of household heads are Hindu. Due to the sampling structure, each of Nepal's seven provinces contain either one or two sampled districts, depending on the population of the province. This translates to each province containing either 9% or 18% of the households in the sample. Almost all households mainly source their water from either piped water, a tube well or a borehole.

Table 8. Household characteristics, Nepal

	Mean (SD)/Proportion
Sex of household head	
Man	93.1
Woman	6.9
Household size	5.15 (2.15)
Number of children under 18 in household	1.86 (1.42)
Number of rooms in house	2.67 (1.34)
Household treats drinking water	24.7
Caste/ethnicity of household head	
Janajati	36.0
Brahman/Chhetri	25.4
Madhesi	19.5
Dalit	13.8
Muslim	4.5
Other	0.8
Religion of household head	
Hindu	82.2
Buddhist	11.4
Muslim	4.2
Christian	1.8
Kirat	0.4
Region of household	
Terai	45.5
Hills	36.3
Mountain	18.2
Household's main source of drinking water	
Piped water	54.6
Tube well/borehole	43.9
Surface water	0.7
Unprotected spring	0.2
Bottled water	0.2
Unprotected dug well	0.1
Protected spring	0.1
N	826

Source: Authors' calculations.

The men were, on average, close to 40 years old; 71% reported themselves as the household head, while another 25% or so were an adult child of the household head. The average woman was 32.5 years old; 57.9% were the wife of the household head and another 28.5% were a daughter-in-law of the

household head. About 87% of men and about 92% of women were married. Almost one-third of women (29.2%) and about one-sixth of men (15.4%) had never attended school, but about 13% of both women and men had at least completed grade 12, with a few going on to work on a college degree. About half of women and men respondents reported being farmers. About 16% of men reported being employed casually on other people's farms and 11% of men were self-employed off-farm, while about a third of women (32.7%) said their primary job was taking care of household work and chores.

Table 9. Individual characteristics of women and men, Nepal

	Mean (SD)/Proportion	**Mean (SD)/Proportion**
	Men	**Women**
Average age (years)	39.5 (12.1)	32.5 (8.8)
Relationship to the head of household		
Head	70.9	3.0
Spouse	1.3	57.9
Child/adopted child	24.5	8.2
Grandchild	1.5	0.2
Niece/nephew	0.1	0.0
Parent (father or mother)	0.2	0.0
Sibling (sister or brother)	0.6	0.5
Son-in-law or daughter-in-law	0.2	28.5
Brother-in-law or sister-in-law	0.0	1.2
Father-in-law or mother-in-law	0.4	0.1
Other relative	0.2	0.4
Marital status		
Married	87.2	92.3
Never married	10.4	6.7
Separated/divorced	0.2	0.1
Widowed	2.2	1.0
Highest educational level completed		
No school or some primary school	53.6	60.9
Completed primary and some secondary	33.2	26.0
Completed secondary or higher	13.2	13.1
Primary occupation		
Farming (including livestock rearing)	52.9	50.7
Housework	1.2	32.7
Self-employed off-farm	11.0	5.2
Casual labor on-farm	15.7	0.7
Salaried employment off-farm	9.3	4.5
Student	4.2	4.0

	Mean (SD)/Proportion	Mean (SD)/Proportion
	Men	**Women**
Casual labor off-farm	2.9	1.8
None/unemployed	2.1	0.4
Salaried employment on-farm	0.2	0.0
Other	0.4	0.0
N	826	826

Source: Authors' calculations.

Dimensionality

The EFA results for the intrinsic agency in WASH items (Table 10) revealed three latent factors total, two for each country. The two factors for Malawi addressed experiencing negative affect as a result of WASH experiences and the frequency with which lack of water limited normal sanitation and hygiene activities. For the Nepal results the latent factor on the frequency with which WASH experiences limited normal activities also emerged, as well as a factor on feeling unsafe while conducting WASH activities.

Table 10. Intrinsic agency in WASH, factor analysis results

	Malawi		Nepal	
	EFA factor loadings	**CFA factor loadings**	**EFA factor loadings**	**CFA factor loadings**
Factor 1 (Malawi only)				
A1. Frequency of feeling frustrated, upset, or angry due to WASH	.663	.838***	--	--
A2. Frequency of quarrelling with others due to WASH situation	.605	.620***	--	--
A4. Frequency of worry over lack of water	.627	.743***	--	--
Fit statistics (CFA only)			--	--
CFI	--	1.000	--	--
TLI	--	1.000	--	--
RMSEA	--	.000	--	--
Factor 2 (Nepal only)				
A5. Frequency of feeling unsafe while collecting water	--	--	.517	.411***
A6. Frequency of feeling unsafe while bathing	--	--	.663	.726***
A7. Frequency of feeling unsafe when using the bathroom at home	--	--	.595	.630***
A8. Frequency of feeling unsafe when using the bathroom at place of work	--	--	.524	.632***
Fit statistics (CFA only)	--	--	--	
CFI	--	--	--	.974
TLI	--	--	--	.921

	Malawi		Nepal	
	EFA factor loadings	**CFA factor loadings**	**EFA factor loadings**	**CFA factor loadings**
RMSEA	--	--	--	.040
Factor 3				
A12. Frequency of going without bathing because of water problems.	.607	.789***	.671	.690***
A13. Frequency of going without cleaning sanitation facilities because of water problems.	.683	.856***	.783	.797***
A16. Frequency of not cleaning as much as you should because of water problems.	.756	.823***	.719	.927***
A17. Frequency of not having enough water to conduct income generating activities	.626	.752***	.711	.645***
A18. Frequency WASH problems disrupt your daily plans.	.647	.806***	.751	.743***
Rotation (EFA only)	Varimax	--	Varimax	--
Fit statistics (CFA only)				
CFI	--	.986	--	.994
TLI	--	.954	--	.980
RMSEA	--	.026	--	.019

*p<.10, **p<.05, ***p<.01. -- Not applicable

The EFA results of the collective agency module for both Malawi and Nepal revealed two latent factors (Table 11), the first of which focused on how the individual perceived the community comes together to address WASH issues. The second latent factor indicates how the individual participates in and benefits from community WASH activities. Both factor structures were confirmed by the results of the CFA.

Table 11. Collective agency in WASH, factor analysis results

	Malawi		Nepal	
	EFA factor loadings	**CFA factor loadings**	**EFA factor loadings**	**CFA factor loadings**
Factor 1				
B01. Community comes together to solve water, sanitation, and hygiene problems	.744	.770***	.733	.807***
B02. Community comes together to solve problems with human waste	.707	.808***	.788	.835***
B03. People share new information about WASH uses in the community	.393	.503***	.444	.559***
Fit statistics (CFA only)				
CFI	--	1.000	--	1.000
TLI	--	1.000	--	1.000
RMSEA	--	.000	--	.000
Factor 2				

	Malawi		Nepal	
	EFA factor loadings	**CFA factor loadings**	**EFA factor loadings**	**CFA factor loadings**
B05. Able to participate when your community comes together on WASH issues	.799	.729***	.787	.853***
B06. Able to express concerns when the community addresses WASH issues	.750	.701***	.799	.791***
B07. Benefits when community addresses WASH issues	.614	.672***	.503	.590***
Rotation (EFA only)	Promax	--	Promax	--
Fit statistics (CFA only)				
CFI	--	1.000	--	1.000
TLI	--	1.000	--	1.000
RMSEA	--	.000	--	.000

*p<.10, **p<.05, ***p<.01. -- Not applicable

The EFA results for intrinsic agency in menstrual hygiene (Table 12) revealed two factors that were common to Malawi and Nepal: one related to separation from others and food preparation while menstruating and another on receiving support from family and friends when menstruation. There was also a third factor in Nepal that included items describing the normative nature of menstruation. The CFA results for the factor on separation from other revealed good fit in both countries. We did not conduct CFA for the second factor, because CFA requires a minimum of three items. The CFA results from the third factor in Nepal on the normative nature of menstruation reveal a model that fits well, but the factor loading for the item on the acceptability of treating menstrual pain was low and insignificant. (We do, however, consider an indicator based on these items in subsequent steps.) Overall, the sub-optimal results for the last two factors suggest the need for further development of the related indicators. Specifically, additional items should be tested in later surveys, and the factor structure of these items should be analyzed.

Table 12. Intrinsic agency in menstrual hygiene, factor analysis results

	Malawi		Nepal	
	EFA factor loadings	CFA factor loadings	EFA factor loadings	CFA factor loadings
Factor 1				
E12a. Separated from other when menstruating	.755	.314***	.639	.529***
E12b. Separated from places when menstruating	.762	.323***	.578	.501***
E13a. Should not prepare food when menstruating	.756	.942***	.869	.980***
E13b. Should not enter the kitchen when menstruating	.786	.900**	.839	.890***

	Malawi		Nepal	
	EFA factor loadings	CFA factor loadings	EFA factor loadings	CFA factor loadings
Fit statistics (CFA only)				
CFI		1.000		1.000
TLI		1.000		1.000
RMSEA		.000		.000
Factor 2				
E15. Others will help you obtain pain medication when menstruating	.951		.633	
E16. Others will help you with your daily activities when in pain from menstruation	.952		.688	
Factor 3				
E02. Menstruation is normal		DNC	.484	.634***
E03. Girls should learn about menstruation		DNC	.396	.442***
E04. Acceptable to treat menstrual pain		DNC	.362	.049
E10. Should not feel ashamed when acquiring menstrual products		DNC	.440	.302***
Rotation (EFA only)	Varimax	--	Promax	--
Fit statistics (CFA only)				
CFI	--	DNC	--	1.000
TLI	--	DNC	--	1.000
RMSEA	--	DNC	--	.000

*p<.10, **p<.05, ***p<.01. -- Not applicable DNC=Did not converge.

Summary of indicators and definitions

In Table 13 we describe the 14 proposed WE-WASH indicators. For each indicator, we provide its conceptual definition, explain how the empowerment cutoff for the indicator is calculated, and suggest the types of projects that may want to consider including this indicator as part of data collection for evaluation. The table is divided by types of agency and by whether they are general WASH indicators or menstrual hygiene-related indicators.

To measure instrumental agency in WASH, we have three indicators related to decision-making, sharing of WASH labor, and WASH-related time use. The first, *Input into household-level WASH infrastructure decisions,* addresses household-level decision-making about WASH infrastructure and we expect it to be meaningful to projects that aim to strengthen WASH infrastructure, improve water resource management, strengthen water service providers, and strengthen water systems financing. The second, *Receives help on WASH activities (when wanted)*, would be particularly important for projects that are concerned about an increase in women's labor burden, such as those that promote hygiene activities. The third, *Does not spend undue time on WASH activities*, would also likely be important for hygiene promoting projects that may increase women's labor burden, as well as those that aim to

strengthen WASH infrastructure and strengthen water service providers, which could affect women's time use either positively or negatively.

The two indicators that measure intrinsic agency in WASH are *WASH experiences do not generate negative affect* and *Feels lack of water does not limit normal sanitation and hygiene activities*. Both indicators would be strategic for projects that aim to promote hygiene, strengthen WASH infrastructure, improve water resource management, and strengthen water service providers.

Community comes together on WASH issues and *Individual participates in and benefits from community WASH activities* are designed to measure aspects of collective agency in WASH. These indicators should be collected for programs that aim to strengthen WASH systems at the community level and promote community-driven sanitation initiatives, as well as those that aim to improve governance and attract innovative financing.

Two indicators measure the WASH empowerment environment (resources for empowerment): *Does not avoid place out of concern for a safe place to urinate or defecate* and *Feels safe while gathering water and conducting personal hygiene.* These indicators may be especially important for interventions that aim to strengthen WASH infrastructure but may also be appealing to a wider range of projects that are aiming to address WASH needs in contexts with escalated safety concerns.

Additionally, we have three indicators on instrumental and intrinsic agency as it related to menstrual hygiene. These indicators are only applicable to women and include *Women do not need to be separated while menstruating, Menstruation is a normal part of life,* and *Experiences freedom of movement and to do as desired while menstruating*. The third of these indicators is only applicable to women who menstruated in the last year. These indicators could be used by menstrual hygiene focused interventions.

Finally, two indicators focused on the menstrual hygiene empowerment environment: *Access to facilities for menstrual hygiene needs* and *Access to menstrual products*. These indicators are only applicable to women who have menstruated in the past year, and we expect them to be a good fit for menstrual hygiene focused interventions. Additionally, depending on specific approaches, *Access to menstrual products* may be useful for projects that aim to attract innovative financial approaches for increasing the availability and uptake of menstrual products.

Table 13. Summary of WE-WASH indicators

Indicator name	Definition of empowerment	For projects that aim to
Instrumental agency in WASH		
Input into household-level WASH infrastructure decisions	A19A, B, C, D A20A, B, C, D Respondent is a joint decision maker, and their input is taken into consideration (A20 =2 or 3); respondent is sole decision maker; or respondent is not decision maker but their input is considered sometimes (=2) or always (=3) for the following four activities: Build, install, or improve your households' latrine or toilet facility; Build, install, or improve a cistern or large water storage drum; Build, install, or improve a water source, for example a well, pipe, tap, or pump; and Purchase equipment or materials for treating household drinking water	Strengthen WASH infrastructure, Improve water resource management, Strengthen water service providers, Strengthen water systems financing
Receives help on WASH activities (when wanted)	C01 A-E C02 A-E C04 A-E If respondent receives help sometimes or always for all activities they want help with (if C02x =1, and C04x=2 or 3); If respondent does not want help with any activities; if participant does not participate in any activities. The activities include water collection, food preparation and cleanup, bathing children and adults who need help, cleaning the house and surrounding areas, and washing clothes.	Promote hygiene
Does not spend undue time on WASH activities	H02 A – I, K (10 activities) Total time spent on the activities is less than the median value for the sample of women and men combined. The activities asked about include water collection, ensuring sufficient water for consumption, food preparation and clean-up, bathing and washing hands of others, cleaning the toilet or latrine, cleaning the house and surrounding areas, acquiring hygiene and menstrual hygiene products, contributions to community or school-related WASH activities, and washing clothes.	Promote hygiene, Strengthen WASH infrastructure, Strengthen water service providers
Intrinsic agency in WASH		

Indicator name	Definition of empowerment	For projects that aim to
WASH experiences do not generate negative affect[1]	A01, A02, A04 Reports never (=0) or rarely (=1) for every applicable situation: feel frustrated, upset, or angry about your water, sanitation, or hygiene situation; quarrel with others outside your household about your water, sanitation, or hygiene situation; worry you will not have enough water for all your household needs	Promote hygiene, Strengthen WASH infrastructure, Improve water resource management, Strengthen water service providers
Feels lack of water does not limit normal sanitation and hygiene activities	A11 – A13, A16 – A18 Reports never (=0) or rarely (=1) for every activity they go without doing because of water problems (exception if item does not apply): washing hands after doing something that made them dirty; go without washing your body; you go without cleaning your household's sanitation facilities; not clean as much as you want to or think you should; conduct income generating activities in the way you normally do; change your schedule or plans due to problems	Promote hygiene, Strengthen WASH infrastructure, Improve water resource management, Strengthen water service providers
Collective agency in WASH		
Community comes together on WASH issues	B01, B02, B03 Partially agrees (=2) or fully agrees (=3) with three statements indicating that people come together to solve WASH problems; people come together to solve problems related to human waste disposal; and people share new information related to WASH	Strengthening WASH systems at the community level, Community-driven sanitation, Improve governance, Attract innovative financing
Individual participates in and benefits from community WASH activities	B05, B06, B07 Partially agrees (=2) or fully agrees (=3) with three statements indicating that are able to participate when the community resolves WASH issues, that they are able to express their viewpoint when the community addresses WASH issues, and that they benefit from how the community addresses WASH issues	Strengthening WASH systems at the community level, Community-driven sanitation, Improve governance, Attract innovative financing
WASH empowerment environment (resources for empowerment)		
Feels safe while gathering water and conducting personal hygiene[2]	A05, A06, A07, A08 Reports that they never feel unsafe or afraid (=0) when gathering water, bathing, going to the bathroom when they are at home, and going to the bathroom at their place of work	Strengthen WASH infrastructure, Contexts with safety concerns

Indicator name	Definition of empowerment	For projects that aim to
Does not avoid places out concern for a safe place to urinate or defecate	D01 A, B, E, F Respondent does not avoid any locations (=2) for all applicable locations from among the closest market, their place of work, a religious site, or another village or community.	Strengthen WASH infrastructure, Contexts with safety concerns
Instrumental and intrinsic agency related menstrual hygiene		
Women do not need to be separated while menstruating	E12a, E12b, E13a Completely disagrees (=0) or partially disagrees (=1) with all three statements indicating that while menstruating women need to be separated from others, separated from certain places, and that they should not prepare food.	Menstrual hygiene focused interventions
Menstruation is a normal part of life for women	E03, E04, E10 Partially agrees (=2) or fully agrees (=3) with all three statements: good for girls to know about menstruation, acceptable to treat menstrual pain with medication, and should not feel ashamed to purchase menstrual products.	Menstrual hygiene focused interventions
Freedom of movement and to do as desired while menstruating	F02A, F02B, F02E, F02G, F02H, F02J, F04, F05. Answers no (=2) (did not avoid) for every applicable location including the closest market, they place where they work, a religious site, another village or community, a community water source, and a home/kitchen garden, and every applicable activity including spending time in the kitchen, specific food preparation activities, and touching the household water source.	Menstrual hygiene focused interventions
Menstrual hygiene empowerment environment (resources for empowerment)		
Access to facilities for menstrual hygiene needs	G06, G09, G10 Reports sometimes (=2) or always (=3) for all three items: having access to a clean, private, and safe place to change your menstrual product when at home and at work and having a place to dispose of menstrual products at home.	Menstrual hygiene focused interventions, Strengthening WASH infrastructure
Access to menstrual products	G01, G03, G04 Is normally able to use improved menstrual products (reusable pads, disposable pads, toilet paper, tampons, or menstrual cup), can wash/dry if product is reusable pads, and never has trouble getting menstrual products.	Menstrual hygiene focused interventions, Attract innovative financing

Source: Authors' conceptualization

[1] Data for this indicator only available for Malawi

[2] This indicator is only calculated for Nepal

Empowerment in WASH by characteristics

In the following sections we report on each of the indicators described in Table 13 in detail. We begin by reporting the overall percent of women and men in Malawi and Nepal who are empowered in each indicator. We then further break down each indicator to describe empowerment by individual characteristics, including region, level of education, age group, wealth quintile, whether they live in a woman-only headed household or dual headed household (Malawi only), and caste (Nepal only). We begin with the instrumental agency in WASH indicators, then address intrinsic agency in WASH, collective agency in WASH, and the WASH environment (or resources for empowerment). Then we address the menstrual hygiene indicators by focusing on both instrumental and intrinsic agency in WASH, followed by the menstrual hygiene empowerment environment.

Instrumental agency in WASH

Input into household-level WASH infrastructure decisions

An individual is considered empowered in *Input into household-level WASH infrastructure decisions* if they report that their input is taken into consideration in joint decisions, if they are a sole decision maker, or if they are not one of the three main decision makers but their input is still taken into consideration. In Malawi, 59% of men are empowered in this indicator while only 41% of women are empowered (Figure **1**). In Nepal, 88% of men reached empowerment, compared to only 45% of women.

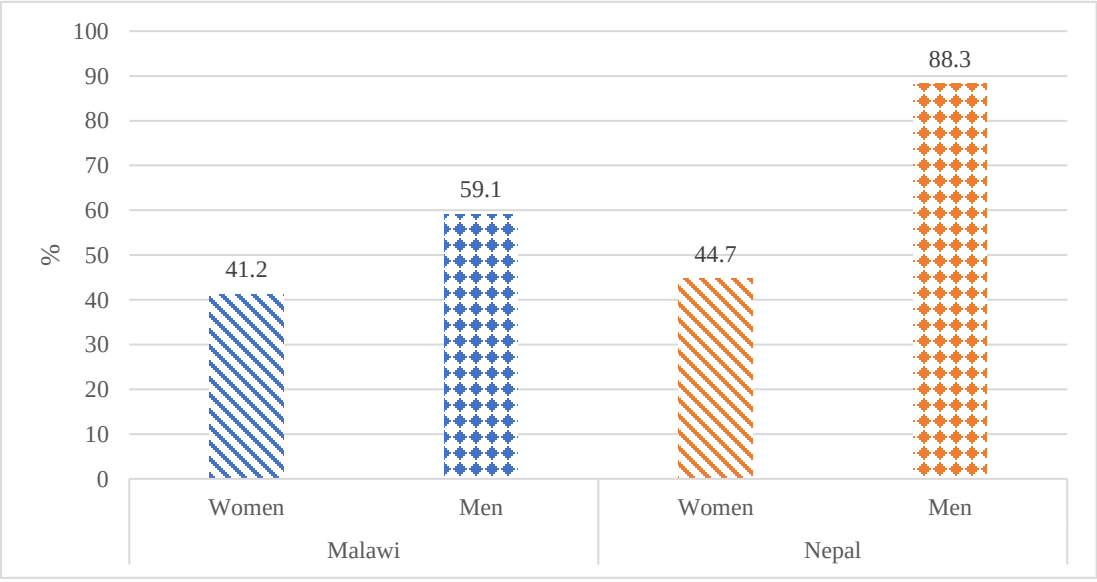

Figure 1. Input into household-level WASH infrastructure decisions

We present empowerment on the *Input into household-level WASH infrastructure decisions* indicator based on individual characteristics for both countries (columns (1) and (2) of Table 14 and Table 15). Stars indicate the significance of chi-squared tests, which determine if there are significant differences in empowerment among the categories within each characteristic.

We observe substantial regional differences in empowerment in the *Input into household-level WASH infrastructure decisions* in Malawi (Table 14). In the Central region, 55% and 66% of women and men are considered empowered, a considerably greater proportion than in the Northern and the Southern regions. We see higher levels of empowerment among more educated women, though differences in empowerment across education categories are only weakly significant, and among older women and women from woman-only headed households, with strong statistical significance for both categories.

For Nepal, we notice substantial regional disparities (Table 15). Women and men from the Hill regions have the highest levels of empowerment (58% for women, 91% for men), followed by Mountain and Terai regions. Empowerment falls monotonically with education of the male household member, but there are no statistically significant differences across the education categories for women. Empowerment among men and women increases with age, with strongly significant differences between age groups. Empowerment on this indicator shows an inverse-U shaped relationship with wealth for both men and women, rising initially and then declining as households become wealthier. In Nepal, there are caste-based differences in empowerment for women, with Brahmin/Chhetri women demonstrating the highest level of empowerment among the various caste groups (60%) with the second highest level of empowerment among Janajati women (52%). This finding is a noteworthy contrast to the common finding that Janajati women typically have more say in household decision making. It may be that households from lower-status castes have fewer infrastructure investments to which women can provide input.

Receives help with WASH activities (when help is wanted)

A respondent is considered empowered on *Receives help with WASH activities* if he or she received help sometimes or always for each WASH activity they wanted help with, or if they did not request help with any WASH activities they participated in, or if they did not participate in any WASH activities and therefore did not need help. Although we expect this indicator is also relevant for Malawi, the results are only calculated for men and women in Nepal, as there was a data collection error in Malawi that prevents us from calculating the indicator. Overall, 13% of women in Nepal and 44% of men in Nepal were empowered in *Receiving help with WASH activities* (Figure 2). Men in the Terai region were much more likely to receive help (61.4%) compared to men from the Hills (29.0%) or Mountain (30.7%) regions, and the differences between regions were statistically significant (columns (3) and (4) of Table 15). While

very few women in Nepal were empowered in *Receiving help with WASH activities*, more educated women were more likely to achieve empowerment, but differences by education levels were only weakly significant. Conversely, men with higher levels of completed education were significantly less likely to be empowered in receiving help. Empowerment increases with age for women, but not so for men, where men in the youngest and oldest age groups were more likely to be empowered in receiving help than men in the middle two age groups. Associations of empowerment with wealth suggest a U-shaped relationship, with lowest empowerment in the middle wealth quintiles for both men and women. Women of the Janajati caste are least likely to be empowered in receiving help with WASH activities (7.7%), while women in the Brahman/Chhetri caste are most likely to be empowered in receiving help (16.7%); differences in women's empowerment across caste groups is strongly significant. Similar to women, men of the Janajati caste are least likely to be empowered (32.0%), while men of the Madhesi caste are most likely to be empowered in receiving help (65.2%); again, these caste differences are strongly significant.[5]

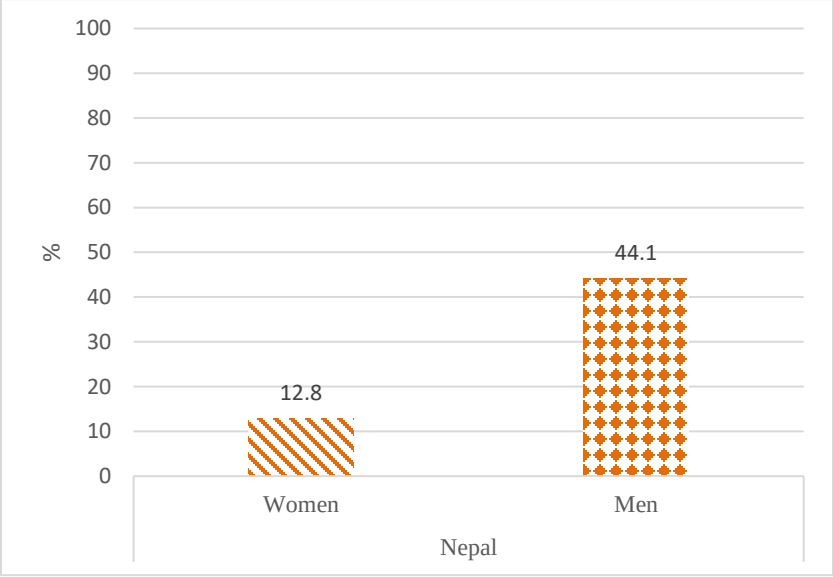

Figure 2. Receives help with WASH activities (when wanted)

Does not spend undue time on WASH activities

Empowerment in *Does not spend undue time on WASH activities* is defined as the individual's total time spent on WASH labor activities being less than the median time spent by the entire sample (women and men combined for country-specific cut-offs). Figure 3 illustrates the levels of empowerment in this indicator, revealing high rates of empowerment for men (92% in Malawi and 87% in Nepal) and

[5] Brahmin/Chhetri families often maintain more patriarchal norms compared to Janajati families. However, this finding may be driven by the possibility that the Madhesi men may come from so-called "higher" castes with higher education, wealth and social standing in the communities.

significantly lower rates for women in both countries. Women in Nepal face the greatest time burden on WASH activities, with only 12% being empowered, compared to 22% for women in Malawi.

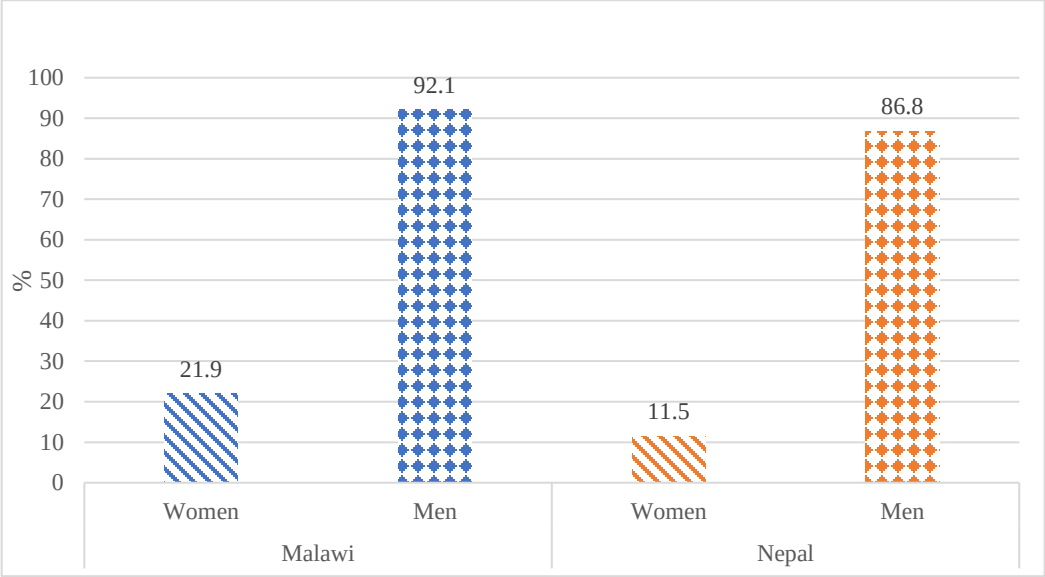

Figure 3. Does not spend undue time on WASH activities

Columns (3) and (4) of Table 14 provide a detailed breakdown of empowerment by individual characteristics in Malawi. Large and statistically significant differences in empowerment among women are observed across the Central, Northern, and Southern regions, with women in the Southern regions exhibiting the highest level of empowerment (45%). Men display uniformly high levels of empowerment, with only weakly significant differences by region. Empowerment is higher among individuals with lower levels of education for both women and men, with statistically significant differences in empowerment between education categories. Furthermore, older women and those from woman-only headed households demonstrate higher levels of empowerment, with strong statistical significance for both categories.

In Table 15, we find significant regional disparities in empowerment for both men and women in Nepal (columns (5) and (6)). Women aged 30-39 years have the lowest levels of empowerment in this indicator (7%), while 11% of women aged 18-29 and 18% of women aged 50-64 are empowered. Among Nepalese men, empowerment exceeds 80% across all wealth quintiles, with highest levels of empowerment observed among wealthiest men (93%). Lastly, we observe large and statistically significant caste-based differences in empowerment for both men and women. Dalit groups in particular have largely been discriminated against, and water is a key component of purity/impurity.

Table 14. Empowerment on instrumental agency indicators, by individual characteristics in Malawi

	Input into household-level WASH infrastructure decisions		Does not spend undue time on WASH activities	
Characteristics	Women (1)	Men (2)	Women (3)	Men (4)
Regions				
Central	54.8***	66.3***	13.0***	88.4*
North	31.9	48.0	12.2	94.9
South	36.9	62.2	44.8	93.5
Education				
No school or some primary	38.7*	59.9	25.7***	95.8***
Primary complete	46.5	57.6	14.1	87.2
Completed secondary or more	47.7	59.5	14.3	87.7
Age				
18-29	34.8***	53.0	19.9	90.1
30-39	45.1	61.0	21.7	92.9
40-49	51.8	65.8	27.6	95.0
50-64	--	62.5	--	91.7
Wealth quintile				
Poorest	41.7***	60.6	20.5	95.7
Poor	31.7	63.3	26.0	88.7
Middle	42.6	56.1	21.1	92.9
High	51.6	65.6	21.3	91.8
Highest	38.5	50.8	20.9	91.5
Type of household				
Dual headed	39.3***	--	22.4	--
Woman-only headed	53.1	--	19.0	--
Total	41.2	59.1	21.9	92.1
N	808	548	761	544

Notes: Authors' calculations. *p<.10, **p<.05, ***p<.01. -- Not applicable

Table 15. Empowerment on instrumental agency indicators, by individual characteristics in Nepal

	Input into household-level WASH infrastructure decisions		Receives help with WASH activities (when wanted)		Does not spend undue time on WASH activities	
Characteristics	Women (1)	Men (2)	Women (3)	Men (4)	Women (5)	Men (6)
Regions						
Mountain	54.7***	82.0**	15.3	30.7***	18.7**	65.3***
Hills	58.0	90.7	12.3	29.0	10.0	82.7
Terai	30.1	88.8	12.2	61.4	9.9	98.7
Education						
No school or some primary	45.3	90.1**	11.3*	48.3**	11.3	87.6
Primary complete	43.0	88.3	13.0	39.8	10.3	86.1
Completed secondary or more	45.4	80.7	19.4	37.6	14.8	85.3
Age						
18-29	35.3***	72.6***	17.2***	52.8***	11.0***	90.4
30-39	49.1	94.3	10.1	36.1	7.1	82.8
40-49	53.8	94.2	9.5	40.8	17.6	87.4
50-64	--	90.8	--	48.0	--	87.2
Wealth quintile						
Poorest	46.4**	86.7	18.7*	48.8	9.0	81.9**
Poor	50.6	88.5	10.9	43.6	12.2	84.2
Middle	47.9	87.3	9.1	40.6	10.9	86.1
High	44.2	86.7	12.1	38.8	12.7	89.1
Highest	34.5	92.1	13.3	48.5	12.7	92.7
Caste[1]						
Dalit	37.7***	88.6	14.9***	45.6***	8.8**	86.0***
Janajati	51.9	89.9	7.7	32.0	16.2	86.2
Madhesi	21.1	88.8	13.0	65.2	8.1	100.0
Brahman/Chhetri	59.5	85.2	16.7	36.2	10.5	76.2
Total	44.7	88.3	12.8	44.1	11.5	86.8
N	825	826	826	826	825	826

Notes: Authors' calculations. [1]Muslim and other not included due to small sample size. *p<.10, **p<.05, ***p<.01.
-- Not applicable

Intrinsic agency in WASH

WASH experiences do not generate negative affect

An individual is empowered in *WASH experiences do not generate negative affect* if they rarely or never face negative consequences or challenges related to WASH situations. We present results for this

indicator only for Malawi, as our factor analysis results did not suggest an underlying latent variable of this nature for Nepal. Figure 4 presents the levels of empowerment among women and men, showing that a higher proportion of women (80%) claim to be unaffected by negative WASH experiences compared to men (68%)

In Table 16, which breaks the data down by individual characteristics, we find that there are no statistically significant differences in women's empowerment on this indicator by region, education, age, wealth, or type of household (columns (1) and (2)). However, we observe that empowerment is highest among men aged 18-29 years (74%) and 50-64 years (72%) compared to other age groups, and that this difference in empowerment between age groups is statistically significant.

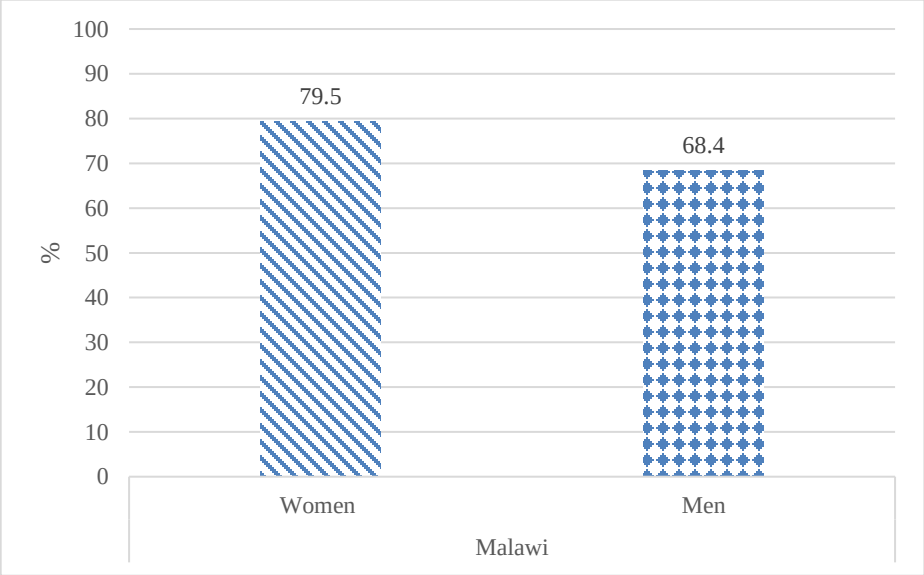

Figure 4. WASH experiences do not generate negative affect

Feels lack of water does not limit normal sanitation and hygiene activities

An individual is considered empowered in *Feels lack of water does not limit normal sanitation and hygiene activities* if the availability of water or water-related issues rarely or never restricts their regular daily activities. These activities include personal hygiene, household tasks, income generation, social interactions, and relaxation, among others. In Malawi, 88% of women report that their normal activities are not limited by water-related challenges, compared to 81% of men. In Nepal, 81% of women and 70% of men achieve empowerment in this indicator (**Figure 5**).

We observe small but statistically significant regional differences in empowerment for men and women in Malawi, but no clear patterns emerge across regions (columns (3) and (4) of Table 16). No other significant differences are observed across education, age, wealth, and type of household. In the Mountain region of Nepal, 49% of women and 39% of men state that availability of water or water-

related issues does not disrupt their normal activities, while the empowerment rates are significantly higher for the Hill and Terai regions (Table 17). We also find that empowerment in this indicator increases from the poorest to the wealthiest quintiles in Nepal, with statistically significant differences across wealth groups. Lastly, there are substantial variations in empowerment based on caste. Madhesi households show the highest empowerment rates for both men and women, followed by Janajati and Dalit households, with Brahmin/Chhetri men and women demonstrating the lowest rates of empowerment. It is possible that this is the case because members of these groups are more concentrated in the Mountain region where geographical characteristics limit access to water.

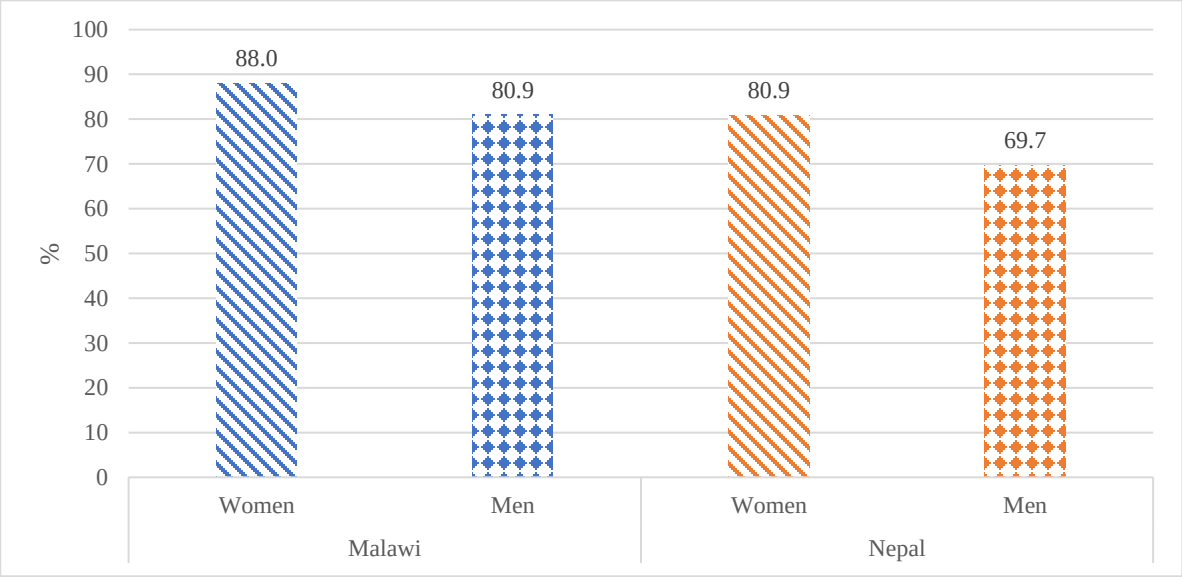

Figure 5. Feels lack of water does not limit normal sanitation and hygiene activities

Table 16. Empowerment on intrinsic agency indicators, by individual characteristics in Malawi

	WASH experiences do not generate negative affect		Feels lack of water does not limit normal sanitation and hygiene activities	
Characteristics	Women (1)	Men (2)	Women (3)	Men (4)
Regions				
Central	78.5	72.5	91.1*	85.5*
North	77.0	66.1	84.4	80.2
South	82.8	66.1	88.4	76.4
Education				
No school or some primary	78.4	67.8	86.9	80.4
Primary complete	81.2	69.1	90.1	83.0
Completed secondary or more	84.1	69.3	90.9	78.7
Age				
18-29	81.5	74.4**	89.3	83.3
30-39	77.7	64.1	87.6	77.5
40-49	76.8	60.7	85.4	78.7
50-64	--	72.2	--	84.7
Wealth quintile				
Poorest	81.6	67.0	85.9	83.0
Poor	82.6	75.0	88.8	81.0
Middle	79.0	71.1	87.0	82.5
High	80.1	64.8	90.7	79.5
Highest	73.9	65.3	87.6	79.3
Type of household				
Dual headed	80.1	--	88.2	--
Woman-only headed	75.2	--	86.7	--
Total	79.5	68.4	88.0	80.9
N	808	551	808	551

Notes: Authors' calculations. *p<.10, **p<.05, ***p<.01. -- Not applicable.

Table 17. Empowerment on intrinsic agency indicators, by individual characteristics in Nepal

Characteristics	Feels lack of water does not limit normal sanitation and hygiene activities	
	Women (1)	Men (2)
Regions		
Mountain	48.7***	38.7***
Hill	85.3	67.3
Terai	90.2	84.0
Education		
No school or some primary	79.5	68.6
Primary complete	83.3	70.1
Completed secondary or more	82.4	73.4
Age		
18-29	83.1	72.1
30-39	81.3	71.8
40-49	76.9	68.4
50-64	--	66.3
Wealth quintile		
Poorest	71.1***	53.0***
Poor	75.8	68.5
Middle	77.6	69.1
High	88.5	75.2
Highest	91.5	83.0
Caste[1]		
Dalit	75.4***	61.4***
Janajati	81.1	73.4
Madhesi	93.8	83.9
Brahman/Chhetri	71.4	54.8
Total	80.9	69.7
N	826	826

Notes: Authors' calculations. *p<.10, **p<.05, ***p<.01. -- Not applicable.

Collective agency in WASH

Community comes together on WASH issues

An individual is considered empowered in *Community comes together on WASH issues* if they perceive that their community collaborates to address WASH problems, manage waste, and share new information about WASH issues. Figure **6** illustrates the proportion of empowered individuals in this indicator, disaggregated by gender, for each country. In Malawi, approximately 80% of women and 83% of men believe that their community comes together to address WASH issues. In Nepal, however, the levels are lower, with only 50% of women and 65% of men considered empowered. These lower levels in Nepal are possibly attributable to the current "one house, one tap" policy, whereas previously, access to

drinking water was typically a community effort. Table 18 provides a detailed breakdown of empowerment by individual characteristics in Malawi. Among women, there are significant differences across the three regions, with the Southern region exhibiting the highest levels of empowerment at 83%. Among men, we find that those with lower levels of education tend to experience empowerment in this indicator more often, although the difference between education categories is only weakly significant. We find significant differences across a variety of characteristics in Nepal (Table 19). Across the regions, we observe significant variation in empowerment; among women, those in the Hill region have the highest levels of empowerment (75%), while among men, those in the Mountain region have the highest levels (81%). In addition, we find significantly higher achievement at higher levels of education for both genders, among older men, and among the Brahmin/Chhetri for men and women.

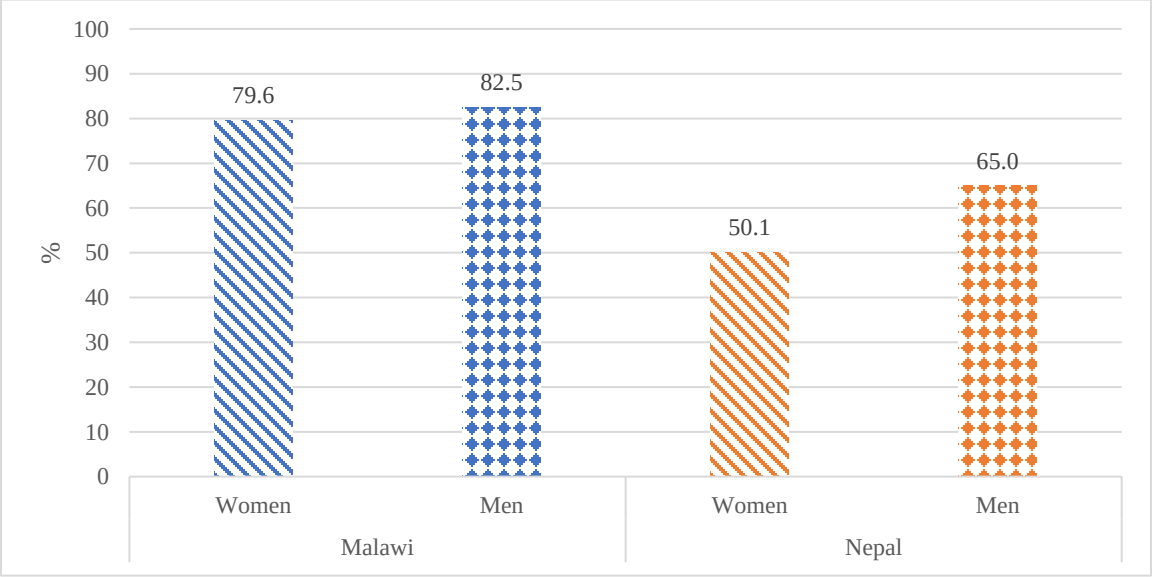

Figure 6. Community comes together on WASH issues

Individual participates in and benefits from community WASH activities

Empowerment in *Individual participated in and benefits from community WASH activities* measures the individual's participation in community WASH activities in terms of expressing opinions and perspectives to other community members and benefitting from WASH solutions developed at the community level. Figure 7 illustrates the proportion of empowerment in this indicator for each country, disaggregated by gender. In Malawi, 93% of women and 90% of men are empowered. However, the numbers are notably lower in Nepal, with 62% of women and 77% of men expressing a sense of participation and benefit from community-level WASH activities.

When we look at empowerment across individual characteristics in Malawi (columns (3) and (4) of Table 18), we find little evidence of differing empowerment across the three regions and age groups for either men or women, with the only significant differences being by age for women. In Nepal, significant

regional differences emerge, with the highest levels of empowerment (86% of women and 91% of men) in the Hill region (columns (3) and (4) of Table 19). Empowerment is significantly higher among women and men with more education and who are older. Empowerment, we find statistically significant differences based on caste, with the highest levels of empowerment being among Brahmin/Chhetri women (84%) and men (90%).

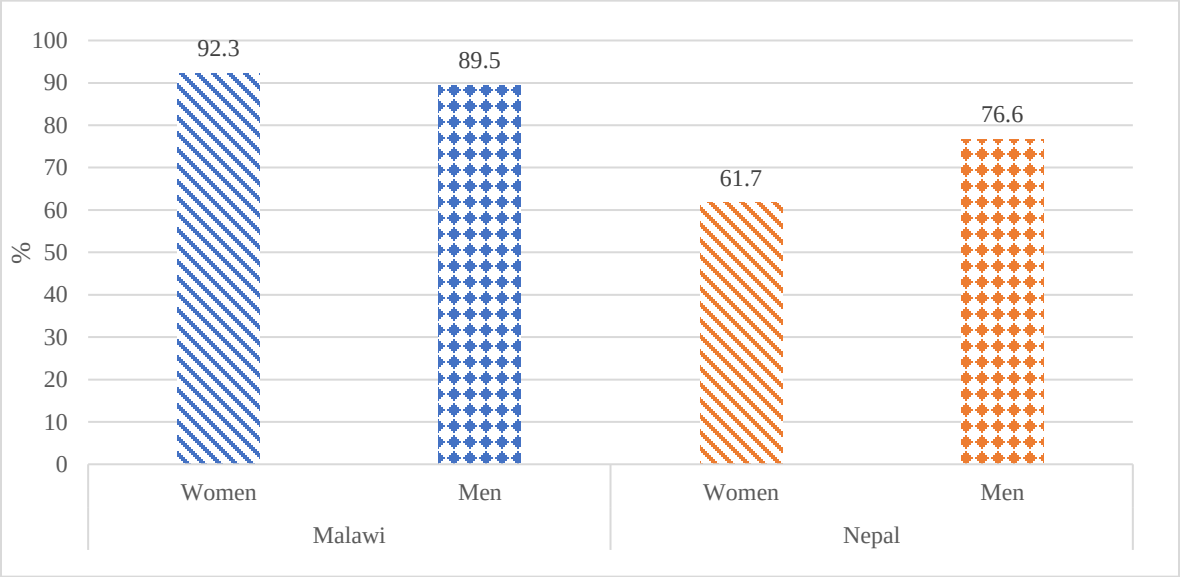

Figure 7. Individual participates in and benefits from community WASH activities

Table 18. Empowerment on collective agency indicators, by individual characteristics in Malawi

	Community comes together on WASH issues		Individual participates in and benefits from community WASH activities	
Characteristics	Women (1)	Men (2)	Women (3)	Men (4)
Regions				
Central	81.1**	84.0	95.6*	85.5*
North	74.4	85.3	90.7	91.5
South	83.2	77.6	90.7	92.0
Education				
No school or some primary	78.4	85.2*	91.5	91.3
Primary complete	83.6	80.6	94.8	88.5
Completed secondary or more	75.0	74.7	90.9	84.0
Age				
18-29	77.9	80.9	90.5*	87.0
30-39	82.0	78.9	95.3	88.7
40-49	80.5	84.4	92.7	91.0
50-64	--	90.3	--	95.8
Wealth quintile				
Poorest	77.9	86.2	92.6	90.4
Poor	80.7	81.0	93.8	88.0
Middle	80.9	80.7	91.4	90.4
High	79.5	82.8	92.5	93.4
Highest	78.9	81.8	91.3	85.1
Type of household				
Dual headed	79.3	--	92.1	--
Woman-only headed	81.4	--	93.8	--
Total	79.6	82.5	92.3	89.5
N	808	551	808	551

Notes: Authors' calculations. *p<.10, **p<.05, ***p<.01. -- Not applicable.

Table 19. Empowerment on collective agency indicators, by individual characteristics in Nepal

Characteristics	Community comes together on WASH issues		Individual participates in and benefits from community WASH activities	
	Women (1)	Men (2)	Women (3)	Men (4)
Regions				
Mountain	55.3***	81.3***	74.0***	89.3***
Hill	75.3	78.7	85.7	91.0
Terai	27.9	47.6	37.8	60.1
Education				
No school or some primary	45.9***	59.8***	57.1***	73.1**
Primary complete	53.0	71.9	66.0	79.2
Completed secondary or more	63.9	68.8	75.0	84.4
Age				
18-29	47.3	59.9*	58.0**	70.6*
30-39	47.9	66.5	61.0	76.2
40-49	57.0	64.6	68.3	81.6
50-64	--	68.9	--	78.1
Wealth quintile				
Poorest	56.0	68.7	61.4	72.9
Poor	47.3	61.2	62.4	79.4
Middle	52.7	69.1	66.7	80.0
High	47.3	61.8	63.0	73.9
Highest	47.3	64.2	55.2	77.0
Caste[1]				
Dalit	49.1***	64.0***	62.3***	70.2***
Janajati	50.5	70.0	67.7	82.5
Madhesi	18.6	48.4	29.8	54.7
Brahman/Chhetri	75.7	79.0	83.8	89.5
Total	50.1	65.0	61.7	76.7
N	826	826	826	826

Notes: Authors' calculations. *p<.10, **p<.05, ***p<.01. -- Not applicable. [1] Muslim and other not included due to small sample size.

WASH empowerment environment

Does not avoid places out of a concern for a safe place to urinate or defecate

To be considered empowered on *Does not avoid place out of concern for a safe place to urinate or defecate* the respondent must not avoid any of the following: the closest market to either buy or sell goods; a place to do work for several hours, such as a field, fishery, market, or their place of business; a religious site, such as temple, church or sacred site; or another village or community. This indicator is

only calculated for women. Figure 8 shows that 67.7% of women in Malawi and 75.1% of women in Nepal were found to be empowered as they did not avoid any of the listed locations.

In Malawi, 61.1% of women in the Southern region did not avoid any of the named locations, given them significantly lower levels of empowerment compared to women in the Central (70.0%) or Northern (71.5%) regions (Table 20). There were no significant differences in empowerment between Malawian women based on age groups, educational levels, household wealth, or the type of household they lived in.

In Nepal, regional empowerment differences were statistically significant; 50.7% of women in the Mountain region were empowered, while empowerment in the Hill region was highest (93.3%) (column (1) of Table 21). There were also significant differences between women's empowerment by wealth quintile and caste, although no clear trend emerged. Women of the Janajati caste were most likely to not avoid any locations (80.5%), and women of the Brahman/Chhetri caste had the lowest empowerment levels (69.0%).

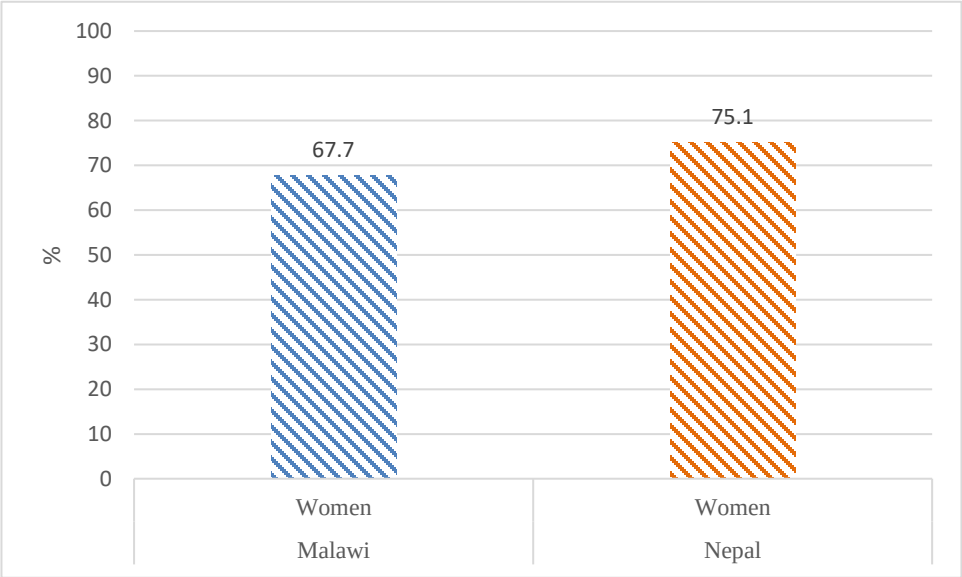

Figure 8. Does not avoid places out of a concern for a safe place to urinate or defecate

Feels safe while gathering water and conducting personal hygiene

An individual is considered empowered on *Feels safe while gathering water and conducting personal hygiene* if they consistently feel safe while gathering water and engaging in personal hygiene activities such as bathing, urinating, or defecating, whether at home or their workplace. We present results for this indicator only for Nepal, as factor analysis only identified this latent domain for Nepal. Figure 9 illustrates the levels of empowerment for men and women with 55% of men and 52% of women being considered empowered for this indicator.

Table 21 provides further insights specifically for Nepal. A significantly larger share of women (62%) and men (68%) living in the Hill region report that they feel safe while collecting water and conducting personal hygiene, compared to those living in the Mountain region. Additionally, men and women who are better educated and wealthier experiences significantly higher levels of empowerment in this indicator. Lastly, there are statistically significant caste-based differences for men, with men from the Dalit class having the lowest levels of empowerment (43%).

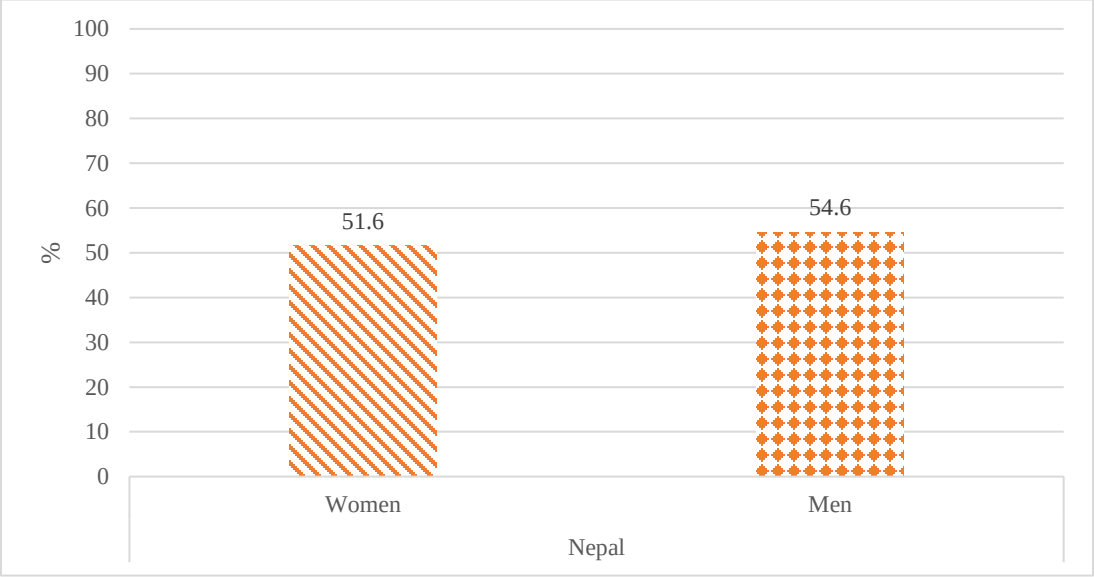

Figure 9. Feels safe while gathering water and conducting personal hygiene

Table 20. Empowerment on WASH empowerment environment indicators, by individual characteristics in Malawi, women only

	Does not avoid places out of a concern for a safe place to urinate or defecate
Characteristics	Women
Regions	
Central	71.5**
North	70.0
South	61.6
Education	
No school or some primary	67.9
Primary complete	66.2
Completed secondary or more	72.7
Age	
18-29	66.9
30-39	67.0
40-49	70.7
50-64	
Wealth quintile	
Poorest	66.3
Poor	72.0
Middle	59.9
High	69.6
Highest	70.8
Type of household	
Dual headed	67.5
Woman-only headed	69.0
Total	67.7
N	808

Notes: Authors' calculations. *p<.10, **p<.05, ***p<.01. -- Not applicable.

Table 21. Empowerment on WASH empowerment environment indicators, by individual characteristics in Nepal

Characteristics	Does not avoid places out of a concern for a safe place to urinate or defecate	Feels safe while gathering water and conducting personal hygiene	
	Women	Women	Men
	(1)	(2)	(2)
Regions			
Mountain	50.7***	40.0***	31.3***
Hills	95.0	62.3	68.0
Terai	70.4	47.6	53.2
Education			
No school or some primary	74.0	47.3***	47.9***
Primary complete	78.0	52.1	59.9
Completed secondary or more	79.6	70.4	68.8
Age			
18-29	73.6	51.8	49.2
30-39	76.8	53.2	56.8
40-49	77.8	49.3	56.8
50-64			55.1
Wealth quintile			
Poorest	69.3*	35.5***	36.1***
Poor	77.4	40.6	46.7
Middle	82.4	50.9	56.4
High	75.2	58.2	60.6
Highest	74.5	72.7	73.3
Caste[1]			
Dalit	77.2*	46.5	43.0***
Janajati	80.8	50.2	52.2
Madhesi	75.2	51.6	57.1
Brahman/Chhetri	69.5	56.7	57.6
Total	75.6	51.6	54.6
N	825	826	826

Notes: Authors' calculations. *p<.10, **p<.05, ***p<.01. -- Not applicable. [1] Muslim and other not included due to small sample size.

Instrumental and intrinsic agency related menstrual hygiene

Questions related to menstrual hygiene were only collected from women, and those on experiences with menstruation were only collected from women who menstruated in the past year.

No need for women to be separated while menstruating

A woman achieves empowerment in *No need for women to be separated while menstruating* if she disagrees with three statements saying that women should be separated from others and certain places, and that they should not prepare food, when they are menstruating. Among women in Malawi, 58.7% have achieved empowerment, while 26.3% of women in Nepal have done so (Figure 10).

When disaggregated across individual characteristics, we see that in Malawi empowerment differs significantly across regions, with women in the North (63.3%) and Central (60.0%) regions exhibiting higher empowerment than those in the South (52.6%) (column (1) of Table 22). Empowerment is also significantly higher among women who have completed more schooling.

Empowerment also differs significantly across the three regions of Nepal, with empowerment in the Terai (21.3%) lower than that in the Mountain (30.7%) and Hill (30.3%) regions (column (1) of Table 23). As in Malawi, empowerment for this indicator differs significantly across education levels and wealth quintiles, with a strong positive gradient for education. In Nepal, however, women in the middle wealth quintile have a higher level of empowerment than those in the two higher wealth quintiles. Finally, empowerment differences based on caste are large and significant, with Janajati women exhibiting the highest level of empowerment (38.7%), and Brahman/Chhetri women exhibiting the lowest (11.0%).

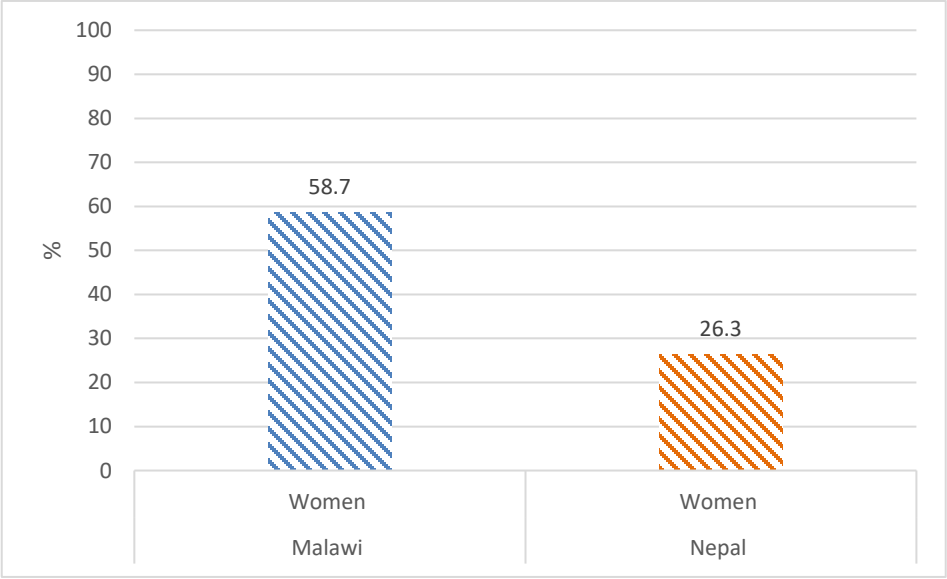

Figure 10. No need for women to be separated while menstruating

Menstruation is a normal part of life for women

Women are considered empowered in *Menstruation is a normal part of life* if they agree with statements affirming that it is good for women to know what menstruation is and what to do before they experience it, that it is acceptable for women to use medication to treat menstrual pain, and that the respondent does

not feel shy or ashamed when acquiring menstrual products. In Malawi 22.3% of women are empowered in this indicator, compared with 54.8% of women in Nepal (Figure 11).

In Malawi, empowerment in this indicator only shows significant variation across household wealth categories, with women in the highest wealth quintile achieving the highest empowerment, though empowerment does not increase linearly with wealth (column (2) of Table 22).

In Nepal, empowerment varies significantly by region, with 69.1% of women in the Terai achieving empowerment, compared with 44.7% and 42.0% of women in the Mountain and Hill regions, respectively (column (2) of Table 23). Differences in empowerment based on caste are also strongly significant, with 68.3% of Madhesi women achieving empowerment compared to only 47.1% of Janajati women.

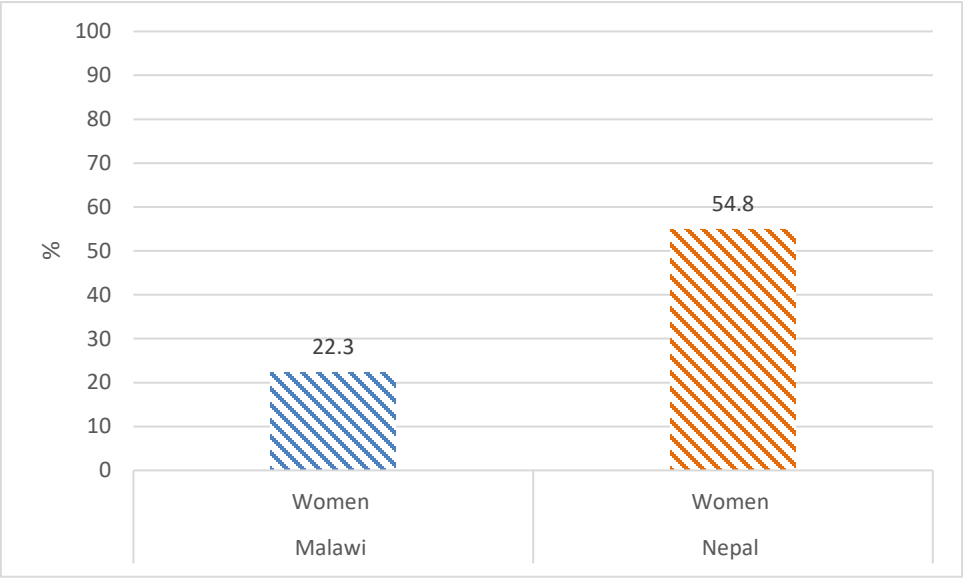

Figure 11. Menstruation is a normal part of life for women

Experiences freedom of movement while menstruating

Empowerment in *Experiences freedom of movement while menstruating* is achieved if a woman reported not avoiding a list of places and activities, including a market, religious site, or food preparation, because she was menstruating. As these questions were only asked of women who menstruated in the past year, the sample size for the indicator is smaller than for other indicators. 71.0% of women in Malawi are empowered in this indicator, compared to only 18.3% of women in Nepal (Figure 12).

In Malawi, differences in empowerment by region are strongly significant, with women in the Central region exhibiting higher empowerment (86.3%) than women in the North (70.1%) and South (59.4%) regions (column (3) of Table 22). Empowerment does not vary significantly by other characteristics.

In Nepal, too, we see significant differences in empowerment across regions (column (3) of Table 23). Among women in the mountain region 24.4% achieve empowerment, compared to 21.2% and 13.8% of women in the Hill and Terai regions, respectively. Empowerment also differs significantly and strongly across caste groups, with 25.8% of Janajati women achieving empowerment, compared with only 8.3% of Brahman/Chhetri women.

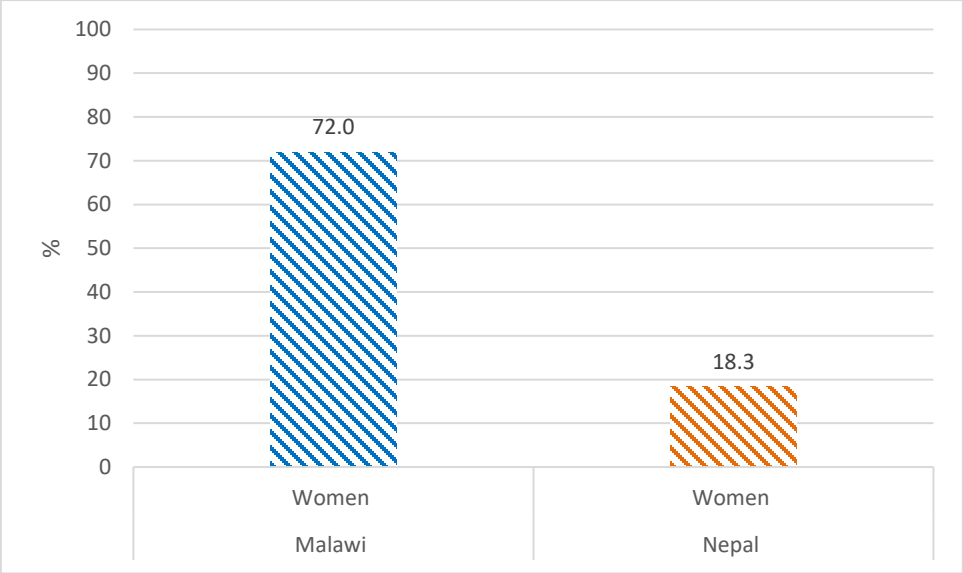

Figure 12. Experiences freedom of movement while menstruating

Table 22. Empowerment on instrumental/intrinsic menstrual hygiene indicators in Malawi, women only

Characteristics	No need for women to be separated while menstruating Women (1)	Menstruation is a normal part of life for women Women (2)	Experiences freedom of movement while menstruating Women (3)
Regions			
Central	60.0**	19.3	86.3***
North	63.3	25.6	70.1
South	52.6	22.0	59.4
Education			
No school or some primary	54.6***	21.8	69.9
Primary complete	64.8	21.1	74.5
Completed secondary or more	79.5	34.1	82.8
Age			
18-29	56.7	23.8	69.1
30-39	60.1	22.3	73.5
40-49	61.6	18.3	77.3
Wealth quintile			
Poorest	48.5***	22.1*	64.0
Poor	52.8	18.6	71.6
Middle	60.5	26.5	69.5
High	64.6	16.8	76.5
Highest	67.1	27.3	78.4
Type of household			
Dual headed	58.6	23.0	72.8
Woman-only headed	59.3	17.7	67.1
Total	58.7	22.3	72.0
N	808	808	517

Notes: Authors' calculations. *p<.10, **p<.05, ***p<.01. -- Not applicable. The indicator in column (3) is only calculated for women who have menstruated in the past year. Women ages 50-64 years are not included as a result.

Table 23. Empowerment on instrumental/intrinsic menstrual hygiene indicators, in Nepal, women only

Characteristics	No need for women to be separated while menstruating Women	Menstruation is a normal part of life for women Women	Experiences freedom of movement while menstruating Women
	(1)	(2)	(3)
Regions			
Mountain	30.7**	44.7***	24.4**
Hills	30.3	42.0	21.2
Terai	21.3	69.1	13.8
Education			
No school or some primary	22.9***	53.3	17.5
Primary complete	26.2	57.5	16.6
Completed secondary or more	42.6	56.5	24.8
Age			
18-29	29.7	57.9	19.6
30-39	22.1	55.8	16.0
40-49	26.2	48.9	19.1
Wealth quintile			
Poorest	18.1**	50.6	13.3
Poor	24.4	50.6	19.7
Middle	31.5	61.2	20.8
High	26.7	56.4	15.3
Highest	30.9	55.2	22.4
Caste[1]			
Dalit	21.9***	62.3***	17.5***
Janajati	38.7	47.1	25.8
Madhesi	27.3	68.3	20.1
Brahman/Chhetri	11.0	50.0	8.3
Total	26.3	54.8	18.3
N	825	825	716

Notes: Authors' calculations. *p<.10, **p<.05, ***p<.01. -- Not applicable. [1] Muslim and other not included due to small sample size. The indicator in column (3) is only calculated for women who have menstruated in the past year.

Menstrual hygiene empowerment environment

These two indicators are only calculated for women who menstruated in the past year.

Access to facilities for menstrual hygiene needs

Empowerment in *Access to facilities for menstrual hygiene needs* is achieved if the respondent reports having access to a private, clean, and safe place to change her menstrual product at home and at work, and a place to dispose or store her menstrual product at work. Among women in Malawi, 80.0% are empowered in this indicator, compared with 62.9% of women in Nepal (Figure 13).

We do not see any statistically significant differences by characteristics in Malawi (column (1) of Table 24). In Nepal, empowerment varies significantly across regions, with 76.3% of women in the Hill region achieving empowerment, compared to only 52.9% and 55.9% of women in the Mountain and Terai regions, respectively (column (1) of Table 25). This pattern is likely due to the higher level of development in the Hill regions, compared to the Mountain and Terai regions. Empowerment is also higher among those with more education and wealth, though differences by education level are only marginally significant.

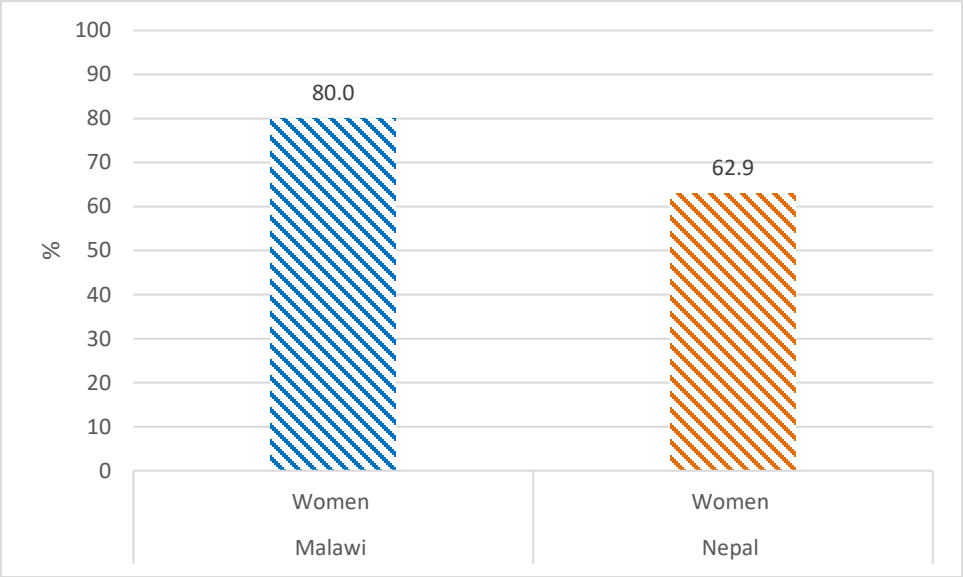

Figure 13. Access to facilities for menstrual hygiene needs

Access to menstrual products

Empowerment in *Access to menstrual products* is achieved if the respondent uses an *improved* menstrual product, can wash/dry that product if it is reusable, and never has trouble getting menstrual products when she is menstruating. Only 21.9% of women in Malawi are empowered in this indicator, compared with 42.0% of women in Nepal (Figure 14).

In Malawi, differences in empowerment by region are only marginally significant, with women in the Central region more often exhibiting empowerment (27.4%) than women in the North (20.7%) and South (17.6%) (column (2) of Table 24). Differences across education levels and wealth quintiles are strongly significant, and empowerment is higher among both the more educated and the wealthier. Empowerment differs significantly across age groups, with women in the youngest group exhibiting the highest proportion of empowerment (26.0%).

In Nepal, we see strongly significant differences in empowerment by all individual characteristics except caste (column (2) of Table 25). In terms of regional differences, 47.0% of women in the hill regions are empowered, compared with 27.7% in the mountain regions and 43.2% in the Terai. Empowerment rises dramatically with education levels, with 30.6% of women with no school or some primary school achieving empowerment, compared with 71.3% of women with at least a secondary degree. Among women aged 18-29, 50% achieve empowerment, a proportion which decreases with each subsequent age group. Finally, empowerment is significantly higher among higher wealth categories.

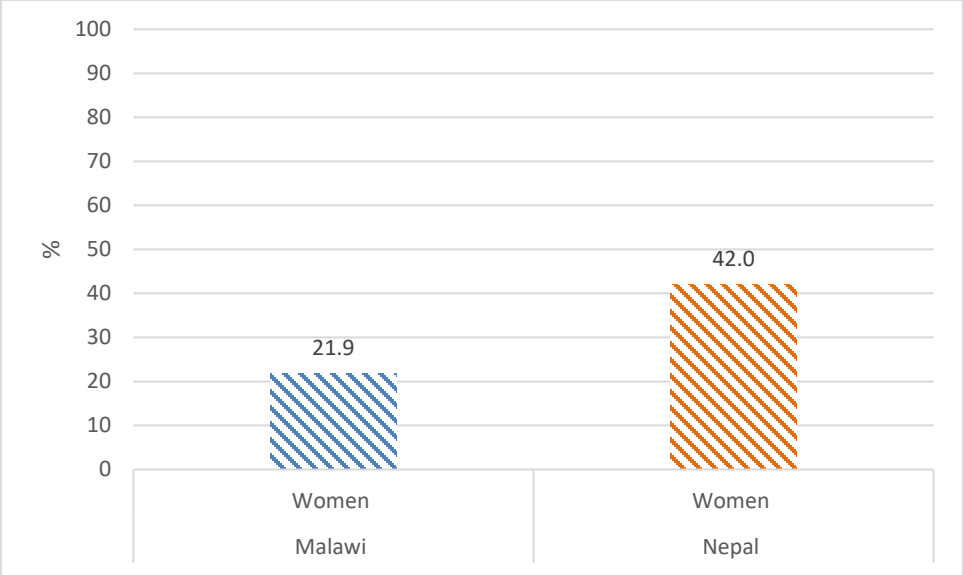

Figure 14. Access to menstrual products

Table 24. Empowerment on menstrual hygiene-empowerment environment indicators, by individual characteristics in Malawi, women only

	Access to facilities for menstrual hygiene needs	Access to menstrual products
Characteristics	Women (1)	Women (2)
Regions		
Central	81.0	27.4*
North	77.0	20.7
South	82.3	17.6
Education		
No school or some primary	78.0	16.8***
Primary complete	83.9	30.2
Completed secondary or more	82.8	37.9
Age		
18-29	80.6	26.0**
30-39	80.7	18.5
40-49	77.3	15.5
Wealth quintile		
Poorest	82.0	9.9***
Poor	77.2	13.7
Middle	80.0	23.2
High	82.5	27.6
Highest	78.4	35.1
Type of household		
Dual headed	80.5	22.6
Woman-only headed	76.9	17.7
Total	80.0	21.9
N	516	517

Notes: Authors' calculations. *p<.10, **p<.05, ***p<.01. -- Not applicable. These indicators are only calculated for women who have menstruated in the past year. Women ages 50-64 years are not included as a result.

Table 25. Empowerment on menstrual hygiene-empowerment environment indicators, by individual characteristics in Nepal, women only

Characteristics	Access to facilities for menstrual hygiene needs Women (1)	Access to menstrual products Women (2)
Regions		
Mountain	52.9***	27.7***
Hills	76.3	47.0
Terai	55.9	43.2
Education		
No school or some primary	60.0*	30.6***
Primary complete	64.8	51.8
Completed secondary or more	71.3	71.3
Age		
18-29	59.2	50.0***
30-39	67.5	45.1
40-49	63.2	23.7
Wealth quintile		
Poorest	52.8***	28.7***
Poor	55.3	27.5
Middle	66.7	41.0
High	66.7	46.5
Highest	72.7	66.4
Caste[1]		
Dalit	62.9	34.0
Janajati	63.2	39.6
Madhesi	64.7	49.6
Brahman/Chhetri	59.4	43.3
Total	62.9	42.0
N	716	716

Notes: Authors' calculations. *p<.10, **p<.05, ***p<.01. -- Not applicable. [1] Muslim and other not included due to small sample size.

DISCUSSION

Motivated by the limited metrics for measuring women's empowerment in the WASH sector, we developed a suite of 14 WE-WASH indicators to assess key areas of women's and men's WASH-related empowerment. The development of the survey modules on which these indicators are based was informed by a review of gender sensitive and empowerment related indicators in the WASH sector (Myers et al., 2022) as well as the need to address different types of agency and the range of activities for addressing different WASH needs. Importantly, these indicators are designed to focus on instrumental, intrinsic, and collective agency, as well as the empowerment environment, which we hypothesize serves as a resource for the development of women's agency (Kabeer, 1999). Using data from surveys collected for the purpose of developing WE-WASH in Malawi and Nepal, we draw on psychometric methods and approaches for development of multi-dimensional poverty indices, both of which have previously been applied to the development of women's empowerment indicators. We settle on 14 indicators that cover instrumental, intrinsic, and collective agency in WASH; the empowerment environment in WASH; instrumental and intrinsic agency in menstrual hygiene management, and the empowerment environment in menstrual hygiene management. By focusing on two countries with very different WASH contexts, we demonstrate the utility of these indicators and the established empowerment cutoffs in multiple contexts. Moreover, the dataset is valuable for continued exploration of the dynamics of empowerment in WASH. In the remainder of this discussion, we focus on summarizing some keys trends across the descriptive data we report, describing the limitations of our current work along with suggestions for future research, and providing suggestions for the use of WE-WASH.

In most cases, we observe that men have higher levels of empowerment compared to women. This finding is to be expected, as women often have less power than men across many domains. The modules were also designed to focus on areas where women have limited power. Additionally, as described in the methods sections, cut-offs are often selected to ensure there is differentiation between groups where there are known power differentials. There are, however, a few exceptions, and women in both Malawi and Nepal are more empowered on both intrinsic agency in WASH indicators: *WASH experiences do not generate negative affect* and *Feels lack of water does not limit normal sanitation and hygiene activities*. This pattern of findings may suggest that the women in our sample are more adept than men at managing the frustrations of WASH challenges. It may also suggest that they are biased against reporting negative feelings and responses in these circumstances.[6] Additionally, in Malawi, women are

[6] Concerns about bias in reporting are a perpetual concern in survey research. It may be worth pairing these questions with a social desirability index, for example, to further explore this issue.

also slightly more empowered than men in *Individual participates in and benefits from community WASH activities*. This finding may point to the importance of how women engage in and benefit from groups in Malawian society, especially because many WASH interventions in Malawi have been delivered at the level of the community or the community group.

The descriptive findings we report also provide insight into areas of substantial disempowerment in both Malawi and Nepal. Some of the highest levels of disempowerment in both country samples are the instrumental agency indicators. Only around 40% to 45% of women in each country have input into WASH infrastructure decisions in their households. Additionally, only 13% of women in Nepal (data not available for Malawi) are receiving help on WASH activities (compared to 44% of men). Of considerable prominence, the vast majority of women in both Malawi and Nepal are spending undue time on WASH activities (meaning more than the median amount of time for the sample of women and men combined in each country), compared to around 90% of men in each country. All three of these intrinsic agency areas are key areas of intervention for strengthening women's empowerment in the WASH sector.

Consistent with other work in Nepal, thus lending face validity to these indicators, experiences related to menstruation are an important area of disempowerment for women. For women in both countries, basic access to products specifically designed for menstruation management (e.g., (reusable pads, disposable pads with the ability to clean and dry them, toilet paper, tampons, or menstrual cup) in our samples is low: 21.9% in Malawi and 42% in Nepal. Although these are not direct measures of women's agency, the inability to have these basic needs addressed may limit their potential to achieve empowerment. Moreover, only 18.3% of women in Nepal can go and do as they normally would when menstruating, and only 26.3% believe that they do not need to be separated while menstruating. Meanwhile, only 22.3% of women in Malawi agree with statements indicative of them believing that menstruation is a normal part of life. Overall, these findings suggest that helping women meet their basic menstrual hygiene needs as well as supporting their belief in their own abilities and rights in the context of menstruation are important areas to continue addressing in WASH-sector programming.

In both countries, we also identify notable patterns of disempowerment for differences among women and among men by individual and household characteristics. In both countries there are substantial regional differences. In Malawi, speaking generally across the indicators, individuals in both the North and South regions had lower levels of empowerment than those in the Central region. In Nepal, the regional differences were significant across a number of indicators. Depending on the indicator, women in the Terai and Mountain regions were often notably less empowered than those in the Hill region. These findings suggest that regionally targeted strategies might be important for improving empowerment in the WASH sector. In Nepal, the differences in empowerment by caste also stand out and reveal interesting patterns. Notably, the so-called higher caste Brahman and Chhetri groups are not always

more empowered, as often these women are more secluded and experience more restrictions when menstruating. For example, they are among the least empowered in the instrumental and intrinsic agency in menstrual hygiene indicators. At the same time, women and men who are members of these so-called "upper" caste groups experience high levels of collective agency, both in terms of their belief that their community comes together, as well as their own participation and ability to benefit from community WASH activities. In other cases, members of the Dalit group are least empowered. For example, Dalit women and men are least likely to feel safe while collecting water (significant for men, non-significant trend for women), which may be due in part to the higher rates of victimization of Dalits, but is also indicative of their limited access to WASH infrastructure and their exclusion from certain water sources due to taboos related to purity and water. In Nepal, further examining the intersection of region with caste and ethnicity will also be important for planning and targeting.

Limitations and future research

We see two primary areas of future work with WE-WASH. First, further work on validation with continued refinement of the indicators and cut-offs based on those findings. Second, take-up and use of the indicators both for assessing program impact on these areas of empowerment, as well as identifying other correlates or drivers of WASH-related empowerment.

Our work developing the WE-WASH indicators was limited to cross-sectional data collection in two countries. Although the two country contexts were distinct from one another, they still represent a limited number of use cases. The availability of data from other contexts would lead to improved support for the choices related to indicator construction and selection of cut-offs. Additionally, the cut-off for one indicator (*Does not spent undue time on WASH activities*) is sample specific. The amount of time spent on WASH activities, which includes a wide range of activities in addition to water collection, varies seasonally and by context. For example, in Malawi, the survey was conducted during the rainy season when water availability is easier and less time consuming, because of rainwater harvesting. It is possible that with additional data it may be possible to recommend a universal cut-off, as opposed to a sample specific cut-off.

It would also be beneficial to conduct additional analysis to establish evidence of convergent and divergent validity, i.e., how well each indicator measures the construct of interest based on the indicator's correlation (or lack of correlation) with other measures expected to be related (or not related) to the same construct. The availability of data collected in both countries in the validation module makes this a strong recommendation for future work that can be completed in the near future.

Lastly, it is important to put these indicators to use. Given the dearth of metrics for measuring women's empowerment in the WASH sector (Caruso et al., 2022; Myers et al., 2022), it is perhaps

unsurprising that there is also a dearth of evidence on the types of WASH interventions that contribute to the conditions in which women can empower themselves. The use of these metrics in impact evaluations and monitoring and evaluation activities will help provide evidence for not only what is working to empower women, but also on the type of activities that do *not* empower women or that may potentially generate backlash and disempower women. This evidence is extremely valuable in the quest to achieve both SDG 5 (gender equality and women's empowerment), as well as equitable access to drinking water and sanitation and hygiene (Targets 6.1 and 6.2, respectively) and related national-level priorities.

Recommendations for use

The WE-WASH indicators were designed with the objective of use in impact assessments and monitoring and evaluation surveys linked to WASH program activities. We do not get into the specifics of study design in this paper, but the usefulness of these indicators for impact evaluation does depend on strong study design and the identification of an appropriate counterfactual. Recognizing that primary surveys often have limited amounts of space to include additional indicators, we recommend that projects select from among the 14 indicators according to their anticipated project outcomes and hypothesized theory of change for achieving these outcomes. Again, recognizing the limits of survey space, we have aimed to limit the number of questions required to construct each indicator. We do not recommend that potential users go further by constructing these indicators with fewer than the recommended questions.

In Table 13 we provide suggestions on which indicators would likely be most useful according to project objectives, such as those that aim to strengthen WASH infrastructure, promote hygiene, strengthen community WASH systems, improve governance, strengthen water service providers, attract innovative financing, improve water resource management and menstrual hygiene-focused interventions. These suggestions should be considered a starting point, as many of the hypothesized pathways in the theories of change proposed by WASH programs are more complex than can be captured in this table.

Although the WE-WASH indicators we develop provide important information on the empowerment of women and men as they pertain to the WASH sector, they do not provide a full picture of women's and men's empowerment. For example, although *Does not spend undue time on WASH activities* assesses WASH-specific workloads, this indicator does not account for overall shifts in workloads outside of WASH-specific activities. WE-WASH also does not include measures of general household decision making. Surveys that include WE-WASH may want to collect additional women's empowerment indicators that are not specific to the WASH sector and have been validated elsewhere to develop a fuller picture of women's empowerment.

CONCLUSION

In this paper, we describe the development of 14 WE-WASH indicators using data collected from household surveys in Malawi and Nepal. The 14 indicators are designed to measure intrinsic, instrumental, and collective agency in WASH; intrinsic and instrumental agency in menstrual hygiene; and characteristics of the WASH empowerment environment. Descriptive analysis of these 14 indicators suggests that women in both Malawi and Nepal experience high levels of disempowerment when it comes to contributions to household decisions related to WASH infrastructure as well as the fact that they spend large amounts of their time contributing to WASH-related labor. In Nepal, agency as it is related to menstruation experiences is also a notable area of disempowerment. These 14 new WE-WASH indicators have potential applications in determining how WASH programs can target their efforts to increase women's empowerment, as well as in determining whether these programs contribute to improvements in women's empowerment.

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APPENDIX 1

MODULE A: INTRINSIC AND INSTRUMENTAL AGENCY IN WASH

READ: Now I will ask you some questions about your water, sanitation, and hygiene situation. By water, sanitation, and hygiene situation, we mean how you get water and whether you have enough water, how you manage the disposal of human waste, such as urine and feces, and unclean water, and any practices used to keep you, your household members, and your possessions clean.

#	QUESTION	RESPONSE		GO TO
A01	These days, how frequently do you feel frustrated, upset, or angry about your water, sanitation, or hygiene situation?	Never Rarely Sometimes Always Refused Doesn't know Not applicable	0 1 2 3 95 97 98	
A02	These days, how frequently do you quarrel with others outside your household about your water, sanitation, or hygiene situation?	Never Rarely Sometimes Always Refused Doesn't know Not applicable	0 1 2 3 95 97 98	
A03	These days, how frequently do you change your or your household members' eating habits because there are problems with your water, sanitation, or hygiene situation, such as lack or water to prepare or clean food?	Never Rarely Sometimes Always Refused Doesn't know Not applicable	0 1 2 3 95 97 98	
A04	These days, how frequently do you worry you will not have enough water for all your household needs?	Never Rarely Sometimes Always Refused Doesn't know Not applicable	0 1 2 3 95 97 98	
A05	These days, how frequently do you feel afraid or unsafe while collecting water?	Never Rarely Sometimes Always Refused Doesn't know Not applicable	0 1 2 3 95 97 98	
A06	These days, how frequently do you feel afraid or unsafe while bathing?	Never Rarely Sometimes Always Refused Doesn't know Not applicable	0 1 2 3 95 97 98	
A07	These days, how frequently do you feel afraid or unsafe when you are at home and needed a place to urinate and/or defecate?	Never Rarely Sometimes	0 1 2	

		Always	3	
		Refused	95	
		Doesn't know	97	
		Not applicable	98	

#	QUESTION	RESPONSE		GO TO
A08	I am going to ask you about the place where you work. This might be an agricultural field, a market, or a building where you work. These days, how frequently do you feel afraid or unsafe when you are at the place where you work and need a place to urinate and/or defecate?	Never Rarely Sometimes Always Refused Doesn't know Not applicable	0 1 2 3 95 97 98	
A0**9**	I want to ask you some questions related to having problems with water. By problems with water, we mean not having enough water, not having enough of the kinds of water you prefer, or any other problem you have collecting water. These days, how frequently do problems with water mean that clothes for members of your household are not washed?	Never Rarely Sometimes Always Refused Doesn't know Not applicable	0 1 2 3 95 97 98	
A10	These days, how frequently do problems with water mean that there is not as much water as you would like available to drink?	Never Rarely Sometimes Always Refused Doesn't know Not applicable	0 1 2 3 95 97 98	
A11	These days, how frequently do you have to go without washing hands after doing something that made them dirty because of problems with water?	Never Rarely Sometimes Always Refused Doesn't know Not applicable	0 1 2 3 95 97 98	
A12	These days, how frequently do you have to go without washing your body because of problems with water?	Never Rarely Sometimes Always Refused Doesn't know Not applicable	0 1 2 3 95 97 98	
A13	These days, how frequently do problems with water mean that you go without cleaning your household's sanitation facilities?	Never Rarely Sometimes Always Refused Doesn't know Not applicable	0 1 2 3 95 97 98	
A14	These days, how frequently do you have to go without watering the home garden because of problems with water?	Never Rarely Sometimes	0 1 2	

		Always Refused Doesn't know Not applicable	3 95 97 98	
A15	These days, how frequently do problems with water cause you to feel ashamed, excluded, or stigmatized?	Never Rarely Sometimes Always Refused Doesn't know Not applicable	0 1 2 3 95 97 98	

#	QUESTION	RESPONSE		GO TO
A16	I want to ask you about your experienced when cleaning. When I say cleaning, I mean tasks like washing or mopping the floors, wiping down a table with a damp cloth, clearing the household latrine, or any other cleaning activity that uses water. These days, how frequently do problems with water cause you to not clean as much as you want to or think you should?	Never Rarely Sometimes Always Refused Doesn't know Not applicable	0 1 2 3 95 97 98	
A17	I want to ask you about your experience with water and income generating activities. By income generating activities, I mean any activities you and/or your household members do to support yourselves or earn money. This could be growing or processing crops, raising livestock, or off farm work, such as selling goods. These days, how frequently do you not have enough water to conduct income generating activities in the way you normally do?	Never Rarely Sometimes Always Refused Doesn't know Not applicable	0 1 2 3 95 97 98	
A18	Sometimes problems with water, sanitation, or hygiene might force people to change their schedule or plans to provide care for others, do household chores, work, rest, relax, or socialize. These days, how frequently do you change your schedule or plans due to problems with your water, sanitation, or hygiene situation?	Never Rarely Sometimes Always Refused Doesn't know Not applicable	0 1 2 3 95 97 98	

Read: Now, I would like to ask some questions regarding the decisions in various activities in your households and what is your role in those decisions.	If your household needed to make a decision whether or not to [ACTIVITY] and how to do it, who would most likely make that decision? **ENTER UP TO THREE (3) MEMBER IDs** **IF RESPONSE IS <u>MEMBER ID (SELF) ONLY</u> <u>NEXT ACTIVITY</u>**	How often do you think that your input would be part of the decisions whether to [ACTIVITY] and how to do to? **SELECT ONE**
ACTIVITY	**A19**	**A20**

A	Build, install, or improve your households' latrine or toilet facility	[_ _] [_ _] [_ _] 1. 2. 3. **Others Code:** NON-HH MEMBER 96 NOT APPLICABLE 98	Never 0 Rarely 1 Sometimes 2 Always 3 Refused 95 Doesn't know 97 Not applicable 98
B	Build, install, or improve a cistern or large water storage drum	[_ _] [_ _] [_ _] 1. 2. 3. **Others Code:** NON-HH MEMBER 96 NOT APPLICABLE 98	Never 0 Rarely 1 Sometimes 2 Always 3 Refused 95 Doesn't know 97 Not applicable 98
C	Build, install, or improve a water source, for example a well, pipe, tap, or pump	[_ _] [_ _] [_ _] 1. 2. 3. **Others Code:** NON-HH MEMBER 96 NOT APPLICABLE 98	Never 0 Rarely 1 Sometimes 2 Always 3 Refused 95 Doesn't know 97 Not applicable 98
D	Purchase equipment or materials for treating household drinking water	[_ _] [_ _] [_ _] 1. 2. 3. **Others Code:** NON-HH MEMBER 96 NOT APPLICABLE 98	Never 0 Rarely 1 Sometimes 2 Always 3 Refused 95 Doesn't know 97 Not applicable 98

MODULE B: COLLECTIVE AGENCY IN WASH

READ: Next, I will ask you some questions about how your community manages water and sanitation. Please tell me to what extent you agree or disagree with each statement. You can respond that you completely disagree, partially disagree, partially agree, or completely agree.

#	STATEMENT	RESPONSE		GO TO
B01	When there is a problem with water, sanitation, or hygiene in your community, people in your community come together to find a solution.	Completely disagree Partially disagree Partially agree Completely agree Refused Don't know Not applicable	1 2 3 4 95 97 98	
B02	When there is a problem with human waste, such as urine or feces, management in your community, people in your community come together to discuss how it should be solved.	Completely disagree Partially disagree Partially agree Completely agree Refused Don't know Not applicable	1 2 3 4 95 97 98	
B03	People in your community share new information about water, sanitation, and hygiene issues with other community members if they learn something new	Completely disagree Partially disagree Partially agree Completely agree Refused Don't know Not applicable	1 2 3 4 95 97 98	
B04	If you need help with water, sanitation, or hygiene issues, you can count on people in your community to help you.	Completely disagree Partially disagree	1 2	

		Partially agree 3 Completely agree 4 Refused 95 Don't know 97 Not applicable 98	
B05	When your community addresses water, sanitation, or hygiene issues, you typically feel like you are able to participate in the process if you want.	Completely disagree 1 Partially disagree 2 Partially agree 3 Completely agree 4 Refused 95 Don't know 97 Not applicable 98	
B06	When your community addresses water, sanitation, or hygiene issues, you typically feel like you are able to express your personal concerns and viewpoints to other community members.	Completely disagree 1 Partially disagree 2 Partially agree 3 Completely agree 4 Refused 95 Don't know 97 Not applicable 98	
B07	When your community addresses a water, sanitation, or hygiene issue, you typically feel like you benefit from the solution.	Completely disagree 1 Partially disagree 2 Partially agree 3 Completely agree 4 Refused 95 Don't know 97 Not applicable 98	

MODULE C: WASH TIME-USE AGENCY

READ: I am going to ask you several questions about how you and the adult members of your household divide responsibilities in your household.

		Who in your household usually does [ACTIVITY]? **Enter up to 3 Member IDs**	Would you like other adult household members to help you with [ACTIVITY]?	In the last month, how often have you asked another adult household member to help you with [ACTIVITY]?	When you wanted or needed help with [ACTIVITY], how often did someone help you?
	ACTIVITY	**C01**	**C02**	**C03**	**C04**
A	Water collection	**[_ _] [_ _] [_ _]** Person outside the household does this ..... 96 Activity is not done in the household ……...98 If respondent does not do [Activity] → **Next activity**	YES 1 NO 2	Never 0 At least once 1 At least once a week 2 At least once a day 3	Never 0 Rarely 1 Sometimes 2 Always 3
B	Food preparation and related cleanup	**[_ _] [_ _] [_ _]** Person outside the household does this ..... 96 Activity is not done in the household ……...98 If respondent does not do [Activity] → **Next activity**	YES 1 NO 2	Never 0 At least once 1 At least once a week 2 At least once a day 3	Never 0 Rarely 1 Sometimes 2 Always 3

C	Bathing of children or other people in your household who rely on help to bathe	**[_ _] [_ _] [_ _]** Person outside the household does this …..…. 96 Activity is not done in the household ……..98 If respondent does not do [Activity] N**ext activity**	YES 1 NO 2	Never 0 At least once 1 At least once a week 2 At least once a day 3	Never 0 Rarely 1 Sometimes 2 Always 3
D	Cleaning of the house and surrounding area, such as washing floors, wiping down surfaces, cleaning surfaces of the latrine	**[_ _] [_ _] [_ _]** Person outside the household does this …..…. 96 Activity is not done in the household ……..98 If respondent does not do [Activity] N**ext activity**	YES 1 NO 2	Never 0 At least once 1 At least once a week 2 At least once a day 3	Never 0 Rarely 1 Sometimes 2 Always 3
E	Washing clothes	**[_ _] [_ _] [_ _]** Person outside the household does this …..…. 96 Activity is not done in the household ……..98 If respondent does not do [Activity] N**ext activity**	YES 1 NO 2	Never 0 At least once 1 At least once a week 2 At least once a day 3	Never 0 Rarely 1 Sometimes 2 Always 3

MODULE D: FREEDOM OF MOVEMENT IN SANITATION

ENUMERATOR: THIS MODULE IS ONLY ADMINISTERED TO WOMEN

#	STATEMENT	RESPONSE	GO TO
D00	**IS THE RESPONDENT A WOMAN?**	Yes 1 No 2 ▼	Module H
	READ: Now, I'd like to ask you some questions about visiting some places in the area.		
D01	These days, do you avoid traveling to or spending time at [PLACE] because you are concerned about the availability of a place to safely or comfortably urinate or defecate?		
	PLACE		
A	The closest market to either buy or sell goods	Yes 1 No 2 Not applicable 98	
B	A place to do work for several hours, such as a field, fishery/fishpond, a market, or your place of business	Yes 1 No 2 Not applicable 98	
C	A place to conduct business in an office, such as a bank or government office	Yes 1 No 2 Not applicable 98	
D	A hospital, clinic, or doctor's office	Yes 1 No 2 Not applicable 98	
E	A religious site, such a temple, church, or sacred site	Yes 1 No 2 Not applicable 98	
F	Another village or community	Yes 1 No 2 Not applicable 98	

MODULE E: INTRINSIC AGENCY IN MENSTRUAL HEALTH

ENUMERATOR: THIS MODULE IS ONLY ADMINISTERED TO WOMEN

#	STATEMENT	RESPONSE		GO TO
E00	**IS THE RESPONDENT A WOMAN?**	Yes No	1 2 ▼	 Module H
	Reads: Next, I will read some statements about menstruation. Please tell me to what extent you agree or disagree with each statement. You can respond that you completely disagree, partially disagree, partially agree, or completely agree.			
	STATEMENT			
E01	You understand what is happening to a woman's body when she menstruates.	Completely disagree Partially disagree Partially agree Completely agree Refused Doesn't know Not applicable	1 2 3 3 95 97 98	
E02	Menstruation is a normal thing that happens to women.	Completely disagree Partially disagree Partially agree Completely agree Refused Doesn't know Not applicable	1 2 3 3 95 97 98	
E03	It is good for girls to know what menstruation is and what to do before they experience it for the first time.	Completely disagree Partially disagree Partially agree Completely agree Refused Doesn't know Not applicable	1 2 3 3 95 97 98	
E04	When women or girls experience pain during menstruation, it is acceptable for them to treat the pain with medication or other remedies.	Completely disagree Partially disagree Partially agree Completely agree Refused Doesn't know Not applicable	1 2 3 3 95 97 98	
E05	You feel ashamed when you are menstruating.	Completely disagree Partially disagree Partially agree Completely agree Refused Doesn't know Not applicable	1 2 3 3 95 97 98	
E06	You feel comfortable speaking to healthcare providers about your experiences with menstruation.	Completely disagree Partially disagree Partially agree	1 2 3	

#	STATEMENT	RESPONSE		GO TO
		Completely agree	3	
		Refused	95	
		Doesn't know	97	
		Not applicable	98	
E07	You feel comfortable speaking to other people in your household about your experiences with menstruation.	Completely disagree	1	
		Partially disagree	2	
		Partially agree	3	
		Completely agree	3	
		Refused	95	
		Doesn't know	97	
		Not applicable	98	
E08	You feel that you are unclean or that you smell bad to others when you are menstruating.	Completely disagree	1	
		Partially disagree	2	
		Partially agree	3	
		Completely agree	3	
		Refused	95	
		Doesn't know	97	
		Not applicable	98	
E09	When you menstruate, you are often concerned that an accident will happen, and blood will show on your clothes.	Completely disagree	1	
		Partially disagree	2	
		Partially agree	3	
		Completely agree	3	
		Refused	95	
		Doesn't know	97	
		Not applicable	98	
E10	You do not feel shy or ashamed when you need to acquire products related to menstruation.	Completely disagree	1	
		Partially disagree	2	
		Partially agree	3	
		Completely agree	3	
		Refused	95	
		Doesn't know	97	
		Not applicable	98	
E11	Any pain that women feel when they menstruate is something that they should learn to tolerate instead of relying on pain medication or other remedies.	Completely disagree	1	
		Partially disagree	2	
		Partially agree	3	
		Completely agree	3	
		Refused	95	
		Doesn't know	97	
		Not applicable	98	
E12a	Women need to be separated from others when they are menstruating.	Completely disagree	1	
		Partially disagree	2	
		Partially agree	3	
		Completely agree	3	
		Refused	95	
		Doesn't know	97	
		Not applicable	98	
E12b	Women need to be separated from certain places when they are menstruating.	Completely disagree	1	
		Partially disagree	2	
		Partially agree	3	
		Completely agree	3	

#	STATEMENT	RESPONSE		GO TO
		Refused	95	
		Doesn't know	97	
		Not applicable	98	
E13a	You feel that you should not prepare food when you are menstruating.	Completely disagree	1	
		Partially disagree	2	
		Partially agree	3	
		Completely agree	3	
		Refused	95	
		Doesn't know	97	
		Not applicable	98	
E13b	You feel that you should not enter the kitchen when you are menstruating	Completely disagree	1	
		Partially disagree	2	
		Partially agree	3	
		Completely agree	3	
		Refused	95	
		Doesn't know	97	
		Not applicable	98	

#	STATEMENT	RESPONSE		GO TO
E14	You feel that you should not participate in certain religious activities when you are menstruating.	Completely disagree	1	
		Partially disagree	2	
		Partially agree	3	
		Completely agree	3	
		Refused	95	
		Doesn't know	97	
		Not applicable	98	
E15	If you can't do it yourself, family or friends will help you obtain the products or pain medication you need when you are menstruating.	Completely disagree	1	
		Partially disagree	2	
		Partially agree	3	
		Completely agree	3	
		Refused	95	
		Doesn't know	97	
		Not applicable	98	
E16	If you are feeling unwell or experience pain due to menstruation, family or friends will help you with your daily responsibilities.	Completely disagree	1	
		Partially disagree	2	
		Partially agree	3	
		Completely agree	3	
		Refused	95	
		Doesn't know	97	
		Not applicable	98	

MODULE F: FREEDOM OF MOVEMENT IN MENSTRUAL HEALTH

ENUMERATOR: THIS MODULE IS ONLY ADMINISTERED TO WOMEN

Q.No.	Question	Response		Go To
	READ: The following questions are about how you manage your menstruation.			
F01.	Did you experience a menstrual period during the past 12 months?	Yes	1	
		No	2▼	Module H

F02.	During your last menstrual period, did you avoid traveling to or spending time at [PLACE] because you were menstruating?		
	PLACE		
A	The closest market to either buy or sell goods	Yes 1 No 2 Not applicable 98	
B	A place to do work for several hours, such as a field, fishery/fishpond, a market, or your place of business	Yes 1 No 2 Not applicable 98	
C	A place to conduct business in an office, such as a bank or government office	Yes 1 No 2 Not applicable 98	
D	A hospital, clinic, or doctor's office	Yes 1 No 2 Not applicable 98	
E	A religious site, such as a temple, church, or sacred site	Yes 1 No 2 Not applicable 98	
F	The home of family or neighbors	Yes 1 No 2 Not applicable 98	
G	Another village or community	Yes 1 No 2 Not applicable 98	

Q.No.	Question	Response	Go To
H	A community water source, such as a public well, pond, spring, or river that people outside your household use	Yes 1 No 2 Not applicable 98	
I	A private water source, such as piped water within your household, a residential well, bore hole, or springs	Yes 1 No 2 Not applicable 98	
J	A home/kitchen garden where food for your household consumption is grown	Yes 1 No 2 Not applicable 98	
F03	During your last menstrual period, did you avoid spending time in parts of your household, such as your kitchen, because you were menstruating?	Yes 1 No 2 Not applicable 98	
F04	During your last menstrual period, were there specific food preparation activities that you were not permitted to participate in, because you were menstruating?	Yes 1 No 2 Not applicable 98	
F05	During your last menstrual period, were you prevented from touching or using the household's main water source, because you were menstruating?	Yes 1 No 2 Not applicable 98	

MODULE G: INSTRUMENTAL AGENCY IN MENSTRUAL HEALTH

ENUMERATOR: THIS MODULE IS ONLY ADMINISTERED TO WOMEN

READ: Now, I'm going to ask you about menstrual products. When we say menstrual product, we mean whatever you may use to absorb or collect blood when you menstruate.

#	QUESTION	RESPONSE		GO TO
G01	These days, what menstrual product do you use most often when you are menstruating? **Do not read response options aloud. Listen to respondent and select appropriate code.** **(Allow one choice only)**	Reusable pads made specifically for menstruation Scrap cloth Disposable pads Grass or leaves Paper or toilet paper Tampons Menstrual cup Nothing Other (specify)_____ Refused Doesn't know Not applicable	1 2 3 4 5 6 7 8 94 95 97 98	
G02	Are there any other products that you these days, commonly use when you are menstruating? **DO NOT READ RESPONSE OPTIONS ALOUD. LISTEN TO RESPONDENT AND SELECT APPROPRIATE CODE.** **(SELECT ALL THAT APPLY)**	Reusable pads made specifically for menstruation Scrap cloth Disposable pads Grass or leaves Paper or toilet paper Tampons Menstrual cup Nothing Other (Specify)_____ Refused Doesn't know Not applicable	1 2 3 4 5 6 7 8 94 95 97 98	
G03	**ASK ONLY IF RESPONSES TO QUESTIONS 1 OR 2 (one of the two previous questions) IS 1 OR 2** When you use reusable pads or a scrap cloth during menstruation, are you typically able to wash and dry them?	Yes No	1 2	
G04	Over the last year, how frequently did you have trouble getting menstrual products when you were menstruating?	Never Rarely Sometimes Always Refused Doesn't know Not applicable	0 1 2 3 95 97 98	**G06** **G06**

#	QUESTION	RESPONSE	GO TO
G05	Why were you not able to use one of your preferred products when you were menstruating? **DO NOT READ RESPONSE OPTIONS ALOUD. LISTEN TO RESPONDENT AND SELECT ALL THAT APPLY.** **(Multiple response is possible)**	I cannot afford them 1 I don't feel confident enough to try them 2 They are not available near where I live 3 They are not considered acceptable by others 4 I don't know where to get them 5 I'm embarrassed to be seen purchasing them 6 I'm afraid of verbal or physical harassment if I am seen purchasing them 7 I didn't plan well 8 Refused 95 Doesn't know 97 Not applicable 98	
G06	In the following questions, when we say menstrual product, we mean something like a pad or a cloth, or whatever you normally use to absorb or collect blood when you menstruate. During the past year, when you were at home, how often did you have access to a private, clean, and safe place to change your menstrual product?	Never 0 Rarely 1 Sometimes 2 Always 3 Refused 95 Doesn't know 97 Not applicable 98	
G07	During the past year, when you were at home, how often did you have access to a safe place to dispose of disposable menstrual products?	Never 0 Rarely 1 Sometimes 2 Always 3 Refused 95 Doesn't know 97 Not applicable 98	
G08	During the past year, when you were at home, how often did you have access to a safe place to store reusable menstrual products?	Never 0 Rarely 1 Sometimes 2 Always 3 Refused 95 Doesn't know 97 Not applicable 98	
G09	I am going to ask you about the place where you work. This might be an agricultural field, a market, or a building where you work. During the past year, when you were at your place of work, how often did you have access to a private, clean, and safe place to change your menstrual product?	Never 0 Rarely 1 Sometimes 2 Always 3 Refused 95 Doesn't know 97 Not applicable 98	
G10	During the past year, when you were at work, how often did you have access to a safe place to dispose of disposable menstrual products or store reusable ones?	Never 0 Rarely 1 Sometimes 2 Always 3 Refused 95 Doesn't know 97 Not applicable 98	

#	QUESTION	RESPONSE	GO TO
G11	During the past year, how often did you have access to sufficient clean water to clean your body and your reusable menstrual product when menstruating?	Never 0 Rarely 1 Sometimes 2 Always 3 Refused 95 Doesn't know 97 Not applicable 98	

MODULE H: RESPONSIBILITY AND TIME SPENT ON WASH ACTIVITIES

ENUMERATOR: This module is asked to both MEN and WOMEN

	READ: Now, I'm going to ask you about some activities related to water, food, and hygiene.		
		For your household, who is normally responsible for ensuring that [activity] happens? **Enter up to 3 Member IDs** **IF RESPONDENT IS NOT LISTED >> NEXT ACTIVITY**	On average how much time do you personally spend doing [activity] each day? **Converted to minutes**
	ACTIVITY	**H01**	**H02**
A	Water collection (for drinking, handwashing, cooking, and general household use)	[_ _] [_ _] [_ _] Person outside the household is responsible…. 96 Activity is not done in the household 98 **If respondent is not listed → Next activity**	Minutes [_ _] [_ _] [_ _]
B	Ensuring that all members of the household have sufficient clean water for consumption	[_ _] [_ _] [_ _] Person outside the household is responsible…. 96 Activity is not done in the household 98 **If respondent is not listed → Next activity**	Minutes [_ _] [_ _] [_ _]
C	Food preparation and related clean up	[_ _] [_ _] [_ _] Person outside the household is responsible…. 96 Activity is not done in the household 98 **If respondent is not listed → Next activity**	Minutes [_ _] [_ _] [_ _]
D	Bathing and washing hands of children or other people in your household who rely on help to do so	[_ _] [_ _] [_ _] Person outside the household is responsible…. 96 Activity is not done in the household 98 **If respondent is not listed → Next activity**	Minutes [_ _] [_ _] [_ _]
E	Cleaning and maintaining the toilet, latrine, or other place where people defecate or urinate	[_ _] [_ _] [_ _] Person outside the household is responsible…. 96 Activity is not done in the household 98 **If respondent is not listed → Next activity**	Minutes [_ _] [_ _] [_ _]
F	Cleaning of the house and surrounding area, such as sweeping and mopping floors, wiping down surfaces, (other than the toilet or latrine)	[_ _] [_ _] [_ _] Person outside the household is responsible…. 96 Activity is not done in the household 98 **If respondent is not listed → Next activity**	Minutes [_ _] [_ _] [_ _]

G	Purchasing or bringing hygiene home products, such as soap, for the household	[_ _] [_ _] [_ _] Person outside the household is responsible…. 96 Activity is not done in the household 98 **If respondent is not listed Next activity**	Minutes [_ _] [_ _] [_ _]
H	Purchasing or bringing home menstrual hygiene products, such as pads, for household members	[_ _] [_ _] [_ _] Person outside the household is responsible…. 96 Activity is not done in the household 98 **If respondent is not listed Next activity**	Minutes [_ _] [_ _] [_ _]
I	Household contributions to or participation in any community or school related water or sanitation activities	[_ _] [_ _] [_ _] Person outside the household is responsible…. 96 Activity is not done in the household 98 **If respondent is not listed Next activity**	Minutes [_ _] [_ _] [_ _]
J	Manages urine chamber pot, such as fetching it during the evenings and throwing it out and cleaning it during the mornings	[_ _] [_ _] [_ _] Person outside the household is responsible…. 96 Activity is not done in the household 98 **If respondent is not listed Next activity**	Minutes [_ _] [_ _] [_ _]
K	Washing clothes for household members, such as children, the sick, the elderly, or the disabled	[_ _] [_ _] [_ _] Person outside the household is responsible…. 96 Activity is not done in the household 98 **If respondent is not listed Next activity**	Minutes [_ _] [_ _] [_ _]

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1201 Eye Street, NW
Washington, DC 20005 USA
Tel.: +1-202-862-5600
Fax: +1-202-862-5606
Email: ifpri@cgiar.org