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The water, sanitation and hygiene gender equality measure (WASH-GEM): Conceptual foundations and domains of change

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ABSTRACT

Multiple established connections link access to safely managed water, sanitation and hygiene (WASH) and gender equality. As development actors seek to attain the fifth and sixth Sustainable Development Goals, the need to measure WASH programs' contributions to gender equality outcomes is increasingly pressing. Yet the measurement of such outcomes remains challenging. This article describes and justifies the theory, concepts and decisions that underlie a recently developed quantitative measure of gender equality in WASH — the water, sanitation and hygiene gender equality measure (WASH-GEM) — and outlines key tensions navigated in its development. We developed the WASH-GEM through a collaborative, iterative process informed by a feminist perspective, critical review of relevant literature, pilot implementation and partner engagement. We report on five design considerations critical for the robust design of quantitative measures of social change: conceptual framing; measurement focus; measurement context; sectoral scope; and evaluative scope. We also define the WASH-GEM's five domains of measurement: Resources; Agency; Critical consciousness; Wellbeing; and Structures, and discuss how we balanced theoretical integrity with practical application and relevance to WASH. In reflecting on the WASH-GEM design, this article contributes to a critical discourse on methodological challenges and imperatives in the measurement of complex social change.

Introduction

The intentional pursuit of gender equality is needed alongside efforts to improve water, sanitation and hygiene (WASH) in low and middle-income countries. Without gender equality and shifts in patriarchal culture, sustainable WASH outcomes are challenging to secure, women's voices are likely to remain unheard, and initiatives may inadvertently entrench unequal power relations. With women and girls responsible for most household WASH activities, strategic improvements in WASH can also be a pathway towards broader gender equality (Willetts et al., 2010). As development actors seek to address gender equality in WASH policy, strategy and programs, they are faced with the challenge of measuring contributions to changes in gender equality. To date, work in this area has sought to understand gender outcomes associated with WASH programs (Carrard et al., 2013; Caruso et al., 2017; Fisher, 2006; Fisher et al., 2017). These gender outcomes reflect the complexities of WASH as a household concern, a public or private service, and an arena in which gendered power dynamics play out (Carrard et al., 2013). However, the measurement of such outcomes in WASH programming remains challenging.

Measuring gendered change has been the focus of numerous agencies and in academic literature over the last decade. The measurement of changes in gender equality emerged as a challenge for demographers in the mid-1990s but has since expanded into program monitoring and evaluation initiatives. Initial approaches to measure changes in gender equality paralleled the Beijing Platform for Action in the Fourth World Conference on Women in the mid-1990s. They relied on frameworks from Human Development and Capability Approaches (see Nussbaum, 2000) and quantitative measures as seen in UNDP's Gender-related Development Index (GDI) and the Gender Empowerment Measure (GEM). Additionally, aspects of gender roles, empowerment and women's status were added between 1994 and 2000 in the Demographic and Health Surveys (Kishor & Subaiya, 2008), narrowing the focus to the individual functioning of women. These macro-approaches were less useful in program-level evaluations (Hancock, 2010) and approaches have since emerged which employ a spectrum of qualitative to quantitative tools (Bowman & Sweetman, 2018).

Such program-level approaches for measuring changes in gender

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equality reflect the diverse methodological and conceptual viewpoints of researchers. This diversity has led to tensions between the dynamic, contextual and constructed nature of gender equality scholarship, and the quantitative approaches employed by demographers (Kabeer, 2019; White, 2015; Worthen, 2012). This, in turn, has led to a surge in discussions regarding measurements of change in gender equality with a focus on mixed-methods and integrated approaches. Mixed-method proponents recommend different integration modalities including: using qualitative research to explain quantitative data (Richardson, 2018; Kabeer, 2019), synergistically using one type of data to strengthen the other (Batliwala, 2011), or using different types of research to explore different aspects of gender equality (Malhotra et al., 2002).

The most recent wave of gender equality measurement tools emerged in the 2010s as quantitative cross-country comparable empowerment measures. The most influential of these measures is the Women's Empowerment in Agriculture Index (WEAI) designed for USAID's Feed the Future Initiative by the Oxford Poverty and Human Development Initiative and the International Food Policy Research Institute (IFPRI). Initially piloted in Guatemala, Uganda and Bangladesh, the WEAI relies on conceptualizations of empowerment as agency (Ibrahim & Alkire, 2007; Kabeer, 1999) to create a cross-country comparable measure. In 2019, a project-level WEAI (pro-WEAI) was introduced which adapts the WEAI for use in program monitoring and evaluation (Malapit et al., 2019). The pro-WEAI explicitly explores aspects of agency as defined by Rowlands (1995), namely collective agency (power with), instrumental agency (power to) and intrinsic agency (power within), which have been used to shape multiple measurement approaches (Ibrahim & Alkire, 2007; Malapit et al., 2019; O'Hara & Clement, 2018).

With the recent focus on measures of empowerment, gender equality is sometimes treated as synonymous with women's empowerment. This risks obscuring the complementary, yet distinct, conceptual characteristics of the two constructs. Women's empowerment, as defined by Rowlands (1995), focuses on internal and external changes in women's power, and can be considered foundational for gender equality (MacArthur et al., 2020). Women's empowerment places women at the center. It is an expansion of women's consciousness and capacity to act to transform their worlds (Rowlands, 1997; Kabeer, 1999; Batliwala, 2007) and is an ongoing, relational and context-specific process (Cornwall, 2016). Gender equality similarly grapples with the structures and relations that perpetuate inequalities in roles, responsibilities and access to resources (Molyneux, 1981; Moser, 1989; Nussbaum, 2000; United Nations, 1995). But it adopts a broader focus that can redress a tendency for women's empowerment to place the burden of change on women, compounded by aid program donors seeking tangible, measurable (often individually countable) outcomes, with an associated risk of conceptual dilution (Batliwala, 2007; Cornwall & Rivas, 2015; Hillenbrand et al., 2015). Recently, scholarship and practice have adopted the language of gender 'transformation' to reclaim the more radical aspects of gender equality in addressing social norms and power structures (Hillenbrand et al., 2015; MacArthur et al., 2020, 2021). Our conceptualization of gender equality aligns with this latter 'transformational' approach. We view changes in women's empowerment as a pathway towards gender equality, and we also focus on the roles and responsibilities of people of all genders, particularly men, in working towards greater equality. This said, our conceptual basis, described later in this article, draws on theorists from both the gender equality and empowerment spheres.

The WASH sector has historically adopted a technical approach, leading to solutions and systems which may disregard the roles and needs of women and girls and the opportunity to address gender dynamics (Elmendorf & Isely, 1981; Willetts et al., 2010). However, increasingly gender-focused WASH interventions and research are emerging (Fisher, 2006; Fisher et al., 2017; Dery et al., 2020; MacArthur et al., 2020; Dickin et al., 2021). Notably, the Sustainable Development Goals (United Nations General Assembly, 2015) have highlighted the importance of connecting WASH and equality in targets 6.1 'universal and equitable access to safe and affordable drinking water *for all*' [emphasis added] and 6.2 'access to adequate and equitable sanitation and hygiene for all and end open defecation, paying *special attention to the needs of women and girls* and those in vulnerable situations' [emphasis added].

The interlinkages between gender and WASH arise from both the roles women and girls have traditionally played in household-level WASH such as cooking, cleaning, care work and the collection of water (Elmendorf & Isely, 1981; MacArthur et al., 2020; White et al., 1972) and the differentiated needs of women and girls related to menstruation, bathing, urination and defecation (Hulland et al., 2015; Sahoo et al., 2015). There is a well-recognized disproportionate burden placed on women and girls regarding responsibility for water collection, which has significant impacts on time, health and education (Graham et al., 2016). These interconnections lead to opportunities for changes in gender equality through WASH interventions (for example see: Sam and Todd, 2020; Leahy et al., 2017; Willetts et al., 2013; Gero et al., 2014) including both practical and strategic changes to shift gender dynamics for individuals, in relationships and within institutions (Carrard et al., 2013).

The purpose of this article is to describe and justify the theory, concepts and decisions that underlie the recent development of a quantitative measure of gender equality in WASH – the water, sanitation and hygiene gender equality measure (WASH-GEM), and to outline key tensions that were navigated in its development. We present the overall conceptual basis for the WASH-GEM, then critically reflect on its design with reference to four 'decision points' central to development of a measure. The second part of the article describes and justifies the nature and scope of the WASH-GEM's five 'domains of change'.

Approach

The conceptual model for the WASH-GEM was developed through a collaborative, iterative process informed by a critical review of relevant literature and deepened through engagement with practitioners and specialists in the fields of gender, WASH and international development. We also tested and refined the tool with in-country partners in Nepal and Cambodia. The process took place over a period of eighteen months (January 2019–July 2020). The authors are five white female researchers with feminist values and many years' experience working across cultures in low- and middle-income countries. We recognize that this positionality influenced our approach and we have been intentionally self-reflective. As such, this article also documents insights gained through our shared process, our engagement with civil society partners and quantitative research specialists, and our continuing critical reflections.

The first stage of conceptual development involved collation and analysis of academic and grey literature from the field of gender and development and from an increasing body of work focused on the gender–WASH nexus. The review focused on the various ways 'gender equality' and 'women's empowerment' were defined and conceptualized. Key concepts articulated in the literature were explored using mind-mapping techniques, to identify the breadth, prevalence and connectivity of the 'domains of change' associated with empowerment or gender equality, as well as their relevance to WASH. The literature review was limited to English language publications, predominantly from South Asia and Africa (see MacArthur et al., 2020). Although the different domains of change identified through the literature are explored and written about in a wide range of fields, we focused our review to the fields of gender and international development.

In parallel to conceptual development, we reviewed literature pertaining to the development of other quantitative measures and clarified key design considerations. Such literature included the work of Richardson (2018), Malhotra et al. (2002) and Alkire et al. (2013) in designing and comparing measures. These existing measures include scales, indices, models, and collections of indicators for the purpose of

measuring change in equality and empowerment in a variety of contexts and sectors. The review identified four critical design considerations: measurement focus, measurement context, sectoral scope and evaluative scope.

The second stage involved seeking input from practitioners and academics who shared resources, reviewed and deepened our early thinking and helped to connect our concepts to practice. The collaboration process involved non-government organizations (NGOs) and technical advisors, most of whom are partners within the Australian Government's Water for Women Fund. For example, an early version of the emerging conceptual framework was presented to gender and WASH practitioners from the Asia-Pacific region at a Water for Women Learning Event in Bangkok in March 2019. These practitioners provided their critiques and ideas, and shared program examples. The process also engaged the expertise of the Individual Deprivation Measure (IDM) team at the International Women's Development Agency through discussions, reviews and sharing of resources and experiences (for example, Fisk et al., 2020; Fisk & Crawford, 2017; Hunt et al., 2017). The first draft of the WASH-GEM was circulated for review to a group of more than 20 NGO partners and academic collaborators, based in Australia and other countries (including Bhutan, Cambodia, Indonesia and Nepal).

The third phase involved collaborative piloting of the measure. Piloting was done in partnership with WASH NGO partners in Cambodia and Nepal (iDE and SNV respectively) and to date has involved three stages: rapid, exploratory and validation piloting. Rapid piloting included cognitive testing of items and reality-checking survey feasibility. Exploratory and validation piloting tested the measurement properties of the tool. In this article, we draw on how these pilots informed the conceptual foundations of the WASH-GEM, with separately published (Gonzalez et al., forthcoming; MacArthur et al., forthcoming). The piloting process helped to identify items that needed to be adapted to different contexts, and it led to an untangling of the complexity of the domains and their conceptual interrelationships in collaboration with partners.

Conceptual basis and key design considerations

This section provides rationale and explanation for the conceptual basis of the WASH-GEM, then outlines the literature and critical reflection that informed measure design with reference to key design considerations of measurement focus, measurement context, sectoral scope and evaluative scope.

Conceptual foundations

Defining a clear and transparent conceptual basis is critical if a measure to be robustly designed, appropriately applied and correctly interpreted. Batliwala and Pittman (2010) assert that one of the biggest flaws found across measurement tools in the fields of women's rights, gender equality and women's empowerment is that they measure one part of the 'elephant' and yet claim to measure the whole. Rowlands (1995) calls on us to be precise and deliberate in the way we define terms to ensure our measure is of value in illuminating development practice. Being explicit about which part of the 'elephant' we are measuring also prevents misinterpretations or harmful over-claims.

The WASH-GEM is underpinned by a feminist understanding of gender equality as critical for human development and requiring societal transformation (MacArthur et al., 2021). Our approach invokes the development philosophies of Nussbaum (2000) and Sen (1999) and the feminist development theories of Kabeer (1994, 1999) and Batliwala (1997). Our feminist thinking has influenced the conceptualization of gender equality and consequent approaches to designing the WASH-GEM.

The human development approach to gender equality includes a strong focus on the empowerment of women within communities, relationships and the individual (Kabeer, 1994, 1999; Rowlands, 1997). Such empowerment explores aspects of power over, to, with, and within, picking up on the importance of collective empowerment and critical consciousness (Rowlands, 1997). Similarly, Kabeer's (1999) influential writing on women's empowerment acknowledges the importance of mobilizing available resources through agency, leading to desired outcomes. Kabeer draws on Moser (1989) and Molyneux (1981) who distinguish between strategic and practical types of outcomes from a gender equality perspective, namely those that address existing gendered power relations, and those that do not, but may meet existing practical needs. A focus on agency has been further explored and quantified in recent connections made between psychology and feminist theory (Ibrahim and Alkire, 2007; Alkire et al., 2007) with a more explicit definition of agency as involving autonomy, decision-making and leadership, and recognition of different types of agency as practical, subjective and cognitive.

Following these human and feminist development perspectives, the WASH-GEM is constructed around five domains of change related to gender equality conceived as essential for human flourishing. The five domains of the WASH-GEM are: Resources, Agency, Critical consciousness, Wellbeing and Structures (Fig. 1). Identification of domains of focus is necessarily limiting, given that the disaggregation of human experiences is, by definition, reductionist. We have sought to maintain conceptual integrity within a reductionist approach by defining domains with reference to the established conceptual foundations described above. We have also articulated the boundaries between each domain, as well as how the included gender equality concepts relate to WASH.

Four of the five domains drew on frameworks for exploring empowerment proposed by Kabeer (1999; 2018), namely Agency, Structures, Resources and Critical consciousness. While Kabeer (1999) conceptualizes intangible, cognitive processes of reflection and analysis as a component of agency (later describing this as 'cognitive agency', (Kabeer, 2018), we intentionally separate critical consciousness to form its own domain, in line with findings of O'Hara and Clement (2018). This choice was based on a perceived need to highlight and 'make visible' this foundational aspect of gender equality, as thinking drives action (Freire, 1970). We also included a 'wellbeing' domain, reflecting the human flourishing approach to development and drawing on recent evidence about the links between WASH, gender, and psychosocial health. The domains are presented and justified in the section detailing domains of change.

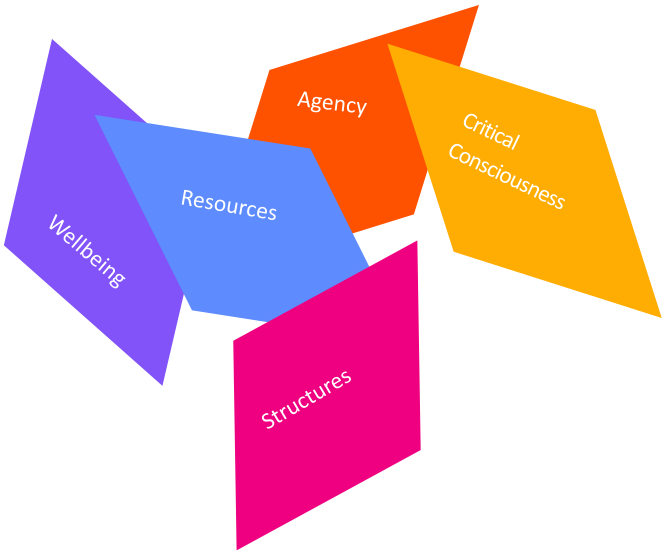

Fig. 1. The five WASH-GEM domains.

Measurement focus

A gender equality measure must be clear about who or what is the central sphere of measurement, as well as the connections to other social spheres. We considered the WASH-GEM measurement focus both in terms of whose views would be sought and what 'spheres' would be explored, following Rowlands (1997) identification of the individual, relational and collective spheres of empowerment. While some gender equality and women's empowerment measures solely investigate individual women (e.g. Grabe, 2012), others include relational elements such as decision-making (e.g. those that rely on demographic and health survey data). Some measures, such as the WEAI, examine both men and women as individuals, in relationships and in communities (Alkire et al., 2013).

The WASH-GEM explores both men's and women's perspectives as individuals, in relationships, in their households and in the wider community. This focus builds on previous work on gender equality outcomes in WASH programs across individual and relational spheres at different levels (Carrard et al., 2013). Participating men and women are generally expected to be beneficiaries of a WASH program, however there could also be potential to measure change in relation to boundary actors or change agents in non-direct delivery programmatic models (i.e. market based, governance based or behaviour change communication).

By investigating responses from both women and men, we align with Cornwall's (2003) perspective that gender equality must reflect a collective and relational approach. As such, while maintaining many items that have a household focus, we aim to address interconnected gender dynamics. This multi-sphere perspective aggregates the analysis of individual, household, and community aspects as recommended by Malhotra et al. (2002), Richardson (2018), and Gram et al. (2018).

While the WASH-GEM focuses on household adult decision-maker dyads, it has the flexibility needed to apply an alternative sampling strategy depending on the context. Dyads are the combination of the female decision-maker (among females) of a household, and the male decision-maker (among males) in the same household. In many cases this will constitute a wife and her husband, but not always. The advantage of dyads is that they can support meaningful comparison between female and male results. Complexities and disadvantages include: logistical challenges of administering the survey and having both dyad members at home to be interviewed; exclusion of households in which men are absent due to migration for work or other reasons; possible exclusion of unmarried women; and narrowing of the ages sampled to predominantly middle-aged women and men. The exploratory piloting of the WASH-GEM in Cambodia and Nepal showed that inclusion of some female and male respondents who were from the same household, but did not constitute decision-maker dyads, did not significantly affect the analysis and results.

Measurement context

It is important to be explicit about whether a gender equality or empowerment measure is designed to be internationally comparable or context-specific, and to consider the advantages and drawbacks of the chosen approach. Ibrahim and Alkire (2007) outline the benefits of internationally comparable indicators which allow researchers to explore policy issues such as the interconnections between empowerment and economic or human development. Yount et al. (2016) identify the standardization of rigorous approaches to such measurement as a priority for global research and policy. In the WASH sector, there are also significant efficiency gains in making available well-researched tools for cross-cutting areas such as gender equality, to avoid each international agency investing its own resources in tool development. In the agriculture sector, demand for a standardized and validated measure of women's empowerment is a factor that drove the development of the WEAI (Malapit et al., 2019).

Equally, the application of internationally comparable indicators across widely differing contexts can result in misinterpretation. Kabeer (1999) highlights the importance of selecting indicators carefully. She uses an example about 'status' and 'autonomy' to demonstrate her point. We may assume that a woman's status grants her greater autonomy, but if that status is derived from bearing many sons, it may actually reduce her autonomy (Kabeer, 1999).

Taking these two perspectives into account, a number of scholars argue for combining internationally comparable indicators with tailored, contextually defined indicators when exploring gender dynamics and women's empowerment in different contexts (see for example Richardson, 2018; Alkire et al., 2013; Yount et al., 2019; Glennerster et al., 2018). Indicators may be defined through the use of participatory approaches such as those used in Oxfam's Women's Empowerment Index (WEI) (Lombardini et al., 2017) which stipulates levels and dimensions of change applicable across contexts, but then defines the 'characteristics' of 'an empowered woman' through a collaborative process which become contextualized indicators (Lombardini et al., 2017).

A less intensive option is to undertake local adaptation of a measure, or complementary qualitative research. Local adaptation may occur through the process of translating surveys into different languages, which often requires concepts to be altered slightly. Or, it may involve tailoring content to reflect context, which the WEAI does by customizing general lists of assets, agricultural activities or expenditure categories for different country applications (Alkire et al., 2012). Complementary qualitative research also supports contextualization and enriches analysis. The original WEAI took this approach through qualitative case studies which sought to elicit definitions of empowerment from men and women themselves (Alkire et al., 2012, 2013).

The WASH-GEM is designed to be utilized across a variety of country and cultural contexts by WASH practitioners implementing a range of WASH-related initiatives, primarily in low and middle-income countries. Its design required distilling the 'essence' of each domain into a generalized form that could be applied to multiple cultural contexts. This means that the WASH-GEM measure may not resonate in every context, and analysis may miss important contextual nuances. We have taken steps to address this, including promoting the use of the tool as part of a broader suite of approaches, including qualitative approaches (currently under development in parallel to the measure) and discouraging its stand-alone use. The tool is accompanied by guidance documents that will provide options for its contextualization and adjustment, as well as methods to support ground-truthing and reflection about the findings. Lastly, we have tailored certain items and questions to different cultural contexts. For example, we ask a question about which groups in the community a person belongs to, and we tailor the list of groups to suit the context. When piloting the WASH-GEM in Cambodia, we learned membership of a religious group was not indicative of agency in the way that membership of other groups was, so we removed this option.

As predominantly qualitative researchers, we were uncomfortable with the inevitable need to prescribe a normative view of gender equality when defining the domains and constituent items and methods for the WASH-GEM. This is at odds with the constructionist epistemological stance we each hold, where gender equality is viewed as socially constructed, contextually mediated and constantly evolving. However, we ultimately agreed that avoiding the development of a generalized approach to measuring gender equality would simply mean that gender equality is less often measured. Nevertheless, it is important to acknowledge that the WASH-GEM's normative stance is shaped primarily by our own values, rather than by the values of the respondents.

Sectoral scope

Existing gender equality or women's empowerment measures have different levels of focus on specific sectors. Some measures do not include a sectoral focus and are designed to be used across different types of programs (Lombardini et al., 2017). This is in line with

demographic measures such as the Empowerment Measures or Functional Scales of Empowerment which use demographic and health survey data (Asaolu et al., 2018; Ewerling et al., 2017; Miedema et al., 2018; Pratley & Sandberg, 2018). Other measures are designed for programs, asking about aspects of empowerment (such as decision-making) with reference to specific program activities. These are common in health and microfinance (see CARE USA, 2008; Hashemi et al., 1996; Mahmud et al., 2012; Schuler et al., 2010). A final group of measures embed sectoral content within the measure design. For example, various measures that draw on the WEAI framework ask empowerment-related questions framed with reference to a particular sector (but not specific program activity) such as agriculture (Alkire et al., 2013), livestock (Galiè et al., 2019), nutrition (Narayanan et al., 2019), fisheries (Cole et al., 2018) and solar power (Burney et al., 2017).

Building from the third group of sector-focused measures, the WASH-GEM aims to leverage feminist principles of gender equality and place them in the context of WASH programs as an entry point for change. In this framing, empowerment spills over from one aspect of life (in this case WASH) to another (Sen, 1999), so that changes in WASH impact areas of life beyond WASH. Additionally, the WASH-GEM seeks to reveal intended and unintended changes in relation to gender equality associated with WASH programs, which means that parts of the measure require a clear sectoral focus. Because of this, we intentionally emphasized those changes most likely to be influenced by WASH programs. As such, the tool does not constitute a generalized approach to measuring gender equality in all its dimensions. Rather, its intent is to support examination of the extent to which WASH programs can influence, not only core WASH-related gender equality outcomes, but also wider gender transformation in individuals, relationships and societies.

To that end, we drew on a previous framework developed by our team to explore the gender equality outcomes of WASH programs in qualitative research and evaluation (Carrard et al., 2013). The previous framework synthesized outcomes across a wide range of areas at the intersection of WASH, gender equality, households, communities and the wider public sphere, based on previous evaluations and research. We also drew on recent psychosocial health-related WASH literature, given their findings on gender-differentiated outcomes. Further details of the WASH-specific and wider gender equality outcomes identified for each domain are shared below in the section detailing domains of change.

Evaluative scope and application

The final design consideration concerned the proposed use of the WASH-GEM within WASH programs as a monitoring, evaluation and learning tool. Timely information on gender equality changes is considered crucial to ensuring 'do no harm' principles are upheld, and to test the effectiveness of programming strategies to integrate gender equality into WASH programming.

Existing measures differ in how they compare or evaluate change, their levels of connection to specific interventions, and their intended frequency of application. In non-programmatic and nationally aggregated demographic models, populations are compared against one another, and thresholds are often designed to identify levels of empowerment or equality. Examples of this include the Gender-related Development Index or the Gender Empowerment Measure, both designed by UNDP. In programmatic evaluative models, populations are primarily compared against themselves, and thresholds are avoided in recognition of the complexity and diversity of equality outcomes. Finding middle ground, some measures such as the original WEAI, are designed for large initiatives, but take a population-based monitoring approach (Malapit et al., 2019).

The WASH-GEM is an evaluative assessment tool which can measure changes over time through multiple applications of the tool in a population group engaged in a program. The WASH-GEM has been designed as a component of research linked to NGO or government WASH programs. This is similar to the objective of the project-WEAI which was explicitly designed as an assessment tool (Malapit et al., 2019). The WASH-GEM is designed to be used in both formative and summative assessments, and as a monitoring tool throughout programs. Populations can be compared to themselves and with similar programs across countries and time.

Domains of change

In this section we expand on our explanation of the WASH-GEM conceptual framework, presenting the normative directions, definitions and scope of the WASH-GEM's five domains of change: Resources; Agency; Critical consciousness; Wellbeing; and Structures. The domains of change and included themes are illustrated in Fig. 2. For each domain, we articulate its definition with reference to foundational literature. We present the themes addressed within each domain and discuss their relevance to WASH. Building on the established potential for WASH interventions to act as entry points for wider change (Carrard et al., 2013; Willetts et al., 2010), we also provide scope to measure contributions to gender equality outcomes that transcend specific WASH-gender outcomes.

Resources

In the WASH-GEM, gender equality would be evidenced by women and men enjoying similar levels of access to adequate material, human and social resources. Access to these resources has the potential to enhance the ability to exercise choice. Resources are defined with reference to Kabeer's (1999) work whereby resources are tangible and intangible. They can be material (in an economic sense), human and social. Importantly, a person can have, own or use resources individually or collectively in exercising agency. Access to resources is gained through social relationships in different domains of society (family, market, community) (Kabeer, 1999). In Kabeer's model, access to resources is a precondition to the exercise of choice (Kabeer, 1999). Resources play a role in a wide variety of conceptual frameworks for exploring or measuring empowerment and gender equality but with slightly different definitions. For example, the resource domain in the WEAI includes ownership of, access to, and decision-making power about, productive resources such as land, livestock, agricultural equipment, consumer durables, and credit (Alkire et al., 2013).

We include Resources as a domain consistent with Kabeer's conceptualization and because access to WASH services is linked to broader – often gendered – resource gains and losses. Resource-related items in the WASH-GEM therefore investigate access to water and sanitation facilities, skills or income linked to WASH, and a number of 'beyond WASH' dimensions (described below). Items on water and sanitation access diverge from the standardized Joint Monitoring Programme (JMP) indicators (WHO/UNICEF, 2018) that address sufficiency at the household level. In the WASH-GEM, they take a subjective, individual orientation that is meaningful at the intra-household level (informed by the IDM) (see for example, McInerney & Fisk, 2019a; McInerney & Fisk, 2019b).

Beyond WASH services, the WASH-GEM captures three key resource dimensions that WASH programs have been found to influence. These dimensions are: discretionary time (Gross et al., 2018), access to financial resources (Indarti et al., 2019; James et al., 2002), and social capital (Bisung et al., 2014). Programs can reduce WASH workloads through service improvements, particularly for women. Depending on women's level of control over how they spend their time, a reduced WASH workload can increase the amount of discretionary time available to them. WASH can increase people's access to money for discretionary spending in multiple pathways. For example, participation in WASH-related businesses (Indarti et al., 2019) can increase the time available time for work, reduce health-related costs associated with water-borne illnesses, or reduce the spending associated with WASH services. A complementary item on household income sufficiency was included in the first pilot. However, this revealed more about gendered perceptions

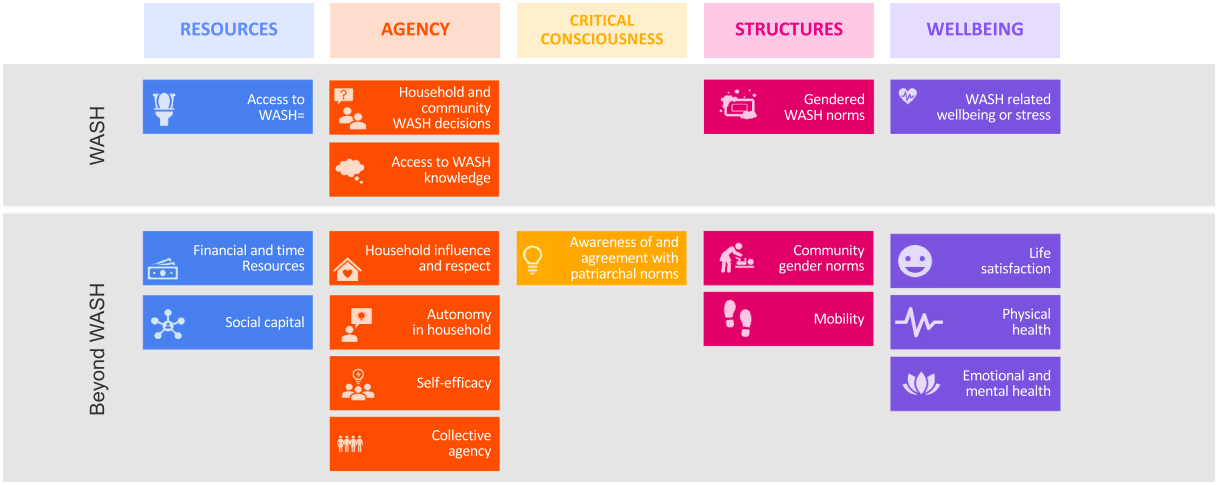

Fig. 2. WASH-GEM themes.

than about actual financial resources (with women and men from the same household responding differently), so it was excluded as unreliable. Social capital is included in the resources domain given the potential for WASH programs to influence social support networks (Barrington et al., 2017; Bisung et al., 2014; Carrard et al., 2013). The items focus on a respondent's ability to access, and offer, non-financial support within their social networks.

Agency

The WASH-GEM aligns with Kabeer's conceptualization of agency as "the ability to define goals and act upon them … including processes of decision making, bargaining and negotiation, deception and manipulation, subversion and resistance as well as more intangible, cognitive processes of reflection and analysis" (Kabeer, 1999, p. 438). In the WASH-GEM, increased gender equality in relation to agency would be evidenced by indications that women and men are exercising increasingly similar levels of ability to define goals and act upon them, including in relation to roles that may be beyond current norms. Transcending norms indicates that agency is not only about efficacy within prescribed gender roles, and encompasses 'transformative agency', defined as the ability to break out of prescribed gender roles to pursue a valued goal (Kabeer, 1999). The gendered norms underpinning this conception are explored in the structures domain.

Kabeer (2018) identifies three components of agency: practical agency, which is the capacity to act to achieve goals; cognitive agency, which is critical analysis, reflection and goal-setting; and subjective capability, which is having a view of yourself and your place in society that enhances your ability to define and act upon your goals. Articulating these three sub-components recognizes that agency encompasses more than just observable actions, and that internal processes are equally important in the exercise of choice. Rowlands (1997) similarly recognizes the importance of both observable and internal processes, and unpacks the concept of power into 'power to', 'power over', 'power with' and 'power from within'.

Reflecting formative definitions of agency, the WASH-GEM explores intra-household dynamics related to confidence, influence, respect and autonomy (aspects of practical agency and subjective capability) as well as collective agency ('power with') and self-efficacy. Aspects of agency related to 'cognitive agency' or 'power within' are also reflected in the WASH-GEM but have been linked with critical consciousness and sit within that domain, in line with the conceptual foundations of the WASH-GEM described above.

In the Agency domain, WASH interventions are viewed as entry points for broader change. Items consider the influence of women and men in decision-making about WASH at the household and community scales. WASH programs encourage the participation of women in community fora, and in order to monitor changes in gender quality it is essential to assess whether this participation results in more equitable influence of women and men in private and public spheres (Cleaver & Hamada, 2010). The agency domain also assesses the extent to which individuals are confident in their ability to access and understand information about WASH services. This is an aspect of cognitive agency that is a pre-requisite for increased WASH resources, and one that can reveal established and potentially changing gender norms regarding technical and managerial knowledge.

Beyond WASH-specific outcomes, the WASH-GEM explores the extent to which changes in agency have extended to other aspects of life. As such, agency is a key domain through which the WASH-GEM can both validate claimed connections between WASH and broader social change (Leahy et al., 2017; Sam & Todd, 2020), and identify particular aspects of agency that may be influenced by WASH programs (and in which direction). Items in the WASH-GEM which relate to household influence and respect, autonomy in the household, collective agency, and self-efficacy encompass all agency-related gender equality outcomes linked to WASH interventions. For example, WASH interventions have been associated with increased participation in community decision-making (beyond WASH activities) in Fiji (Willetts et al., 2009), and the valuing of women's leadership in Ghana (Sam & Todd, 2020). In interpreting these links through the WASH-GEM, it will be important to acknowledge that the causal chain linking WASH programs and changes in agency is longer than might be the case for other domains (such as resources). Hence, judgements about the degree to which WASH interventions influence agency must be made with reference to appropriately nuanced theories of change.

Critical consciousness

The WASH-GEM recognizes that having an awareness of gender inequalities, and believing that they can be changed, is a key step towards gender equality. Critical consciousness refers to the processes by which people 'become aware of their own interests in relation to others' (Rowlands, 1995) and then 'intervene in reality in order to change it' (Freire, 1970). Changes to critical consciousness through the internal awareness of social oppression (Freire, 1970) leads to individuals having the confidence to enter and occupy decision-making spaces (Rowlands, 1995). In contexts with significant gender inequalities, women and men may internalize their society's views that women are of lower status. Kabeer (1999) asserts that people's ability to 'imagine the possibility of having chosen differently' rather than '[choose] their own inequality' is

an important dimension of meaningful choice and empowerment.

Many frameworks for measuring or exploring women's empowerment include critical consciousness as a sub-domain or an indicator that falls under the domain of agency, alternatively described as critical reflection (Hillenbrand et al., 2015), 'power within' (Rowlands, 1997) or cognitive agency (Kabeer, 2018). Yet this may confound measures of agency, if a measured increase in women's agency may be due to pressure and coercion rather than positive changes in gender equality (O'Hara & Clement, 2018). For example, a woman's membership of, and large contribution to, a savings and loan group may indicate her agency, but it doesn't tell us whether she is participating of her own free will or if she is being coerced (O'Hara & Clement, 2018). These distinctions have led us to include critical consciousness as a separate domain to ensure its visibility.

Increased critical consciousness would be evidenced in the WASH-GEM by a shift away from perceptions characteristic of patriarchal norms, towards those that acknowledge the intrinsic rights of women and create space for a shift in power dynamics towards greater equality. Because critical consciousness speaks to deeply held values and opinions that drive actions across all areas of life, questions in the WASH-GEM speak to patriarchal norms in general, rather than being WASH-specific. They explore perceptions about the roles of women and men in leadership, household decision-making, education, employment, care-giving and politics.

The capacity for WASH programs to influence critical consciousness is highly variable. It depends on the focus and nature of the program, including the modes of engagement with actors at different levels. As such, we would not necessarily expect to see changes in this domain during a program timeframe. Our interpretations of findings about critical consciousness are therefore intended to inform our interpretations of findings in other domains. For example, if we find low levels of critical consciousness in a particular context, we may conclude that changes in agency indicate a superficial alignment with program demands rather than a deeper shift in perspectives. We also hope that the WASH-GEM can test the extent to which WASH programs can influence critical consciousness for some participants, given the increasing trend for WASH programs to seek transformative gender outcomes (MacArthur et al., 2020).

Structures

In order to assess gender equality, we need to consider of the structures that enable or constrain an individual's life choices. We believe inequality is socially constructed, and therefore we include 'structures' as a domain in the WASH-GEM. Kabeer describes 'structures of constraint' as being 'gendered', and she distinguishes between two categories of constraint; 'those rooted in the informal and intrinsically gendered institutions of family, kinship and community and those embodied and enacted in the formal and purportedly impersonal domains of states, markets and civil society' (Kabeer, 2018). Kabeer asserts that these two spheres (private and public) are linked, and that norms may initially be enforced within families before being reproduced in public domains (Kabeer, 2018).

Applying this theory in a quantitative evaluative measure poses considerable challenges, both conceptual and practical, and early pilot data was difficult to interpret. Reflecting on Hillenbrand et al.'s (2015) definition of structures as "the informal and formal institutional rules that govern collective, individual and institutional practices, such as environment, social norms, recognition and status", we chose to focus on items about gender norms as critical informal drivers of gender equality. This reflects the structural dynamics that WASH programs commonly seek to influence. For example, they often aim to shift norms around menstrual hygiene management, or responsibility for water collection. WASH programs, particularly those seeking to strengthen governance systems, also have the potential to influence more formal structures such as policies and laws. However, exploration of informal norms is more appropriate for the WASH-GEM, given its measurement focus is at the scale of the household and individual experiences.

Gender norms are addressed with reference to both 'typical' WASH-specific roles and practices, and household roles more generally. This is based on the understanding that a change in WASH can trigger broader social evolution. The expectation that WASH programs can influence community social norms may be unrealistic in a particular situation. If this is the case, then this domain is treated differently to the others and used as a point of reference rather than with an expectation that changes will be observed. Social norms are also explored with reference to mobility, given the direct links between gender, mobility and WASH (Kabeer et al., 2018; Mahmud et al., 2012; Mahmud & Tasneem, 2014; Schuler et al., 2010; van Houweling, 2015). We originally included gender-based violence norms in this domain, but subsequently excluded these for reasons of safety and 'do no harm' principles. In the WASH-GEM, an evolution in responses from alignment with patriarchal norms, towards divergence from them, would indicate greater gender equality.

Wellbeing

The WASH-GEM adopts the World Health Organization's definition of wellbeing as a state of positive mental health that is essential if individuals are to realize their abilities, cope with the normal stresses of life, work productively and fruitfully, and make a contribution to their community (World Health Organizaiton, 2018). We have emphasized experiences of individual dignity in our measure. We consider a person to possess dignity if they see themselves as being worthy of respect, and if others see them in the same way (Barrington et al., 2017).

The inclusion of a wellbeing domain was driven by two imperatives: (i) humanist, feminist thinking about capabilities and achievements that result from gender equality or empowerment, and (ii) recent evidence on the gendered impacts of WASH on psychosocial health. For the first of these, we draw on Kabeer's (1999) conceptualization of 'achievements' which links closely to Sen's work on 'capabilities' or 'functioning achievements' (Sen, 1999). Both Sen and Kabeer see empowerment as a process (Kabeer, 1999) and they note that capabilities or achievements are the outcome of a combination of resources and agency, and cannot be pre-empted or prescribed. While this perspective is important, working within a given sectoral domain (namely WASH), there are certain capabilities or achievements with gendered aspects we considered important to measure.

The second imperative is based on recent literature on psychosocial outcomes associated with WASH (or poor access to WASH), which highlight gendered impacts on physical and mental health. An increasing body of evidence is exploring the ways in which WASH services (or lack thereof), and WASH interventions, can influence levels of psychosocial stress (Caruso et al., 2018; Bisung & Elliott, 2017; Hirve et al., 2015). Bisung and Elliott (2017) conceptualize WASH-related psychosocial stress as "an outcome that arises through cultural and social norms, responsibilities and expectations regarding water and sanitation use, as well as physical barriers that limit adequate access or use". Experiences and associated distress are produced through everyday WASH realities, for example access, negotiations and levels of control over water resources (Cleaver & Hamada, 2010).

Increased wellbeing would be evidenced in the WASH-GEM by women and men similarly experiencing increasing positive emotions and decreasing negative feelings, driving overall sense of quality of life and resilience. Items in the wellbeing domain are: privacy in defecation, bathing and menstrual hygiene management; stress related to WASH activities; the presence of WASH-related conflict or harmony in the household; levels of satisfaction with life in general; physical health; and the presence of feelings of ease or worry. Given the demonstrated links between WASH experiences and individual wellbeing, our assumption is that WASH programs have the potential to directly (in the relatively short term) influence wellbeing. We intend that the WASH-GEM will

inform ongoing research, including research into the extent to which WASH-specific wellbeing influences wellbeing more generally.

Summary of the domains

Table 1 summarises the domain definitions, preferred directions of change, and relevant themes.

Conclusion

This article presented the conceptual underpinnings of a new measure — the WASH-GEM — intended for application in WASH programs to inform activities and assess their contributions to changes in gender equality. The theoretical foundations of the WASH-GEM draw from feminist and human development perspectives, and focus on the importance of gender equality for human flourishing. The measure is structured according to five domains that speak to its conceptual basis:

Table 1
WASH-GEM domains and definitions.

Domain	Definition	Direction of change	Included themes
Resources	Tangible and intangible material, human and social resources that someone has, owns or uses individually or collectively in exercising agency. Gained through social relationships in different domains of society (family, market, community). They include material resources in the conventional economic sense, and also various human and social resources (Kabeer, 1999).	Increased gender equality in relation to resources would be evidenced by adequate material, human and social resources which have the potential to enhance the ability to exercise choice, enjoyed by women and men similarly.	♦ Access to WASH ♦ Financial and time resources ♦ Social capital
Agency	Agency is described as the ability to define goals and act upon them through processes of decision-making, bargaining, negotiation and resistance (Kabeer 1999). This can be in the form of practical agency which is the capacity to act to achieve goals, but it can also be in the form of subjective capability which is having a view of yourself and your place in society that enhances your ability to define your goals and take action to achieve them (Kabeer 1999; Kabeer 2018).	Increased gender equality in relation to agency would be evidenced by changes that indicate that women and men are demonstrating increasingly similar levels of ability to define goals and act upon them, including in relation to desired or valued roles that may be beyond current norms.	♦ Household and community WASH decisions ♦ Access to WASH knowledge ♦ Household influence and respect ♦ Autonomy in household ♦ Self-efficacy ♦ Collective agency
Critical consciousness	Processes by which people "become aware of their own interests in relation to others" (Rowlands, 1995). For gender equality, critical consciousness requires perceiving that gender norms and inequalities exist and can be changed. In contexts with high gender inequality, women and men can internalize their society's views that women are of lower status. Kabeer (1999) therefore discusses the ability to "imagine the possibility of having chosen differently" as an important dimension of meaningful choice and empowerment. Our definition incorporates Kabeer's (2018) description of cognitive agency or capacity for critical analysis and reflection, and a critical awareness of choices, alternatives and values (Kabeer, 2018).	Women and men displaying increasing levels of critical consciousness that recognize gender inequality and support women to occupy decision-making spaces and change the world they live in.	♦ Awareness of, and extent of agreement with, patriarchal norms
Structures	Structures are the informal and formal institutional rules that govern collective, individual and institutional practices, such as social norms, recognition and status. In our measure we focus mostly on social norms embedded in what Kabeer describes as informal and intrinsically gendered institutions of family, kinship and community (Kabeer 2018).	Structures are increasingly supportive of and conducive to gender equality and women's empowerment	♦ Gendered WASH norms ♦ Community gender norms ♦ Mobility
Wellbeing	A state of positive mental health that is foundational for individuals to realize their abilities, cope with the normal stresses of life, work productively and fruitfully, and make a contribution to their community (World Health Organization 2020). We have emphasized experiences of individual dignity in our measure. A person is considered to possess dignity if they see themselves as being worthy of respect, and if others see them in the same way (Spiegelberg 1986, referenced in Barrington 2017).	Women and men similarly experience increasing positive emotions and decreasing negative feelings, driving an overall sense of quality of life and resilience	♦ WASH related wellbeing or stress ♦ Life satisfaction ♦ Physical health ♦ Emotional and mental health

resources; agency; critical consciousness; structures; and wellbeing. It is designed to enable exploration of gender equality dynamics across the individual, relational and collective spheres of female-male dyad pairs in households whose lives are impacted by WASH programs. The WASH-GEM is structured to include both WASH-specific gender equality changes and gender equality changes in other aspects of participants' lives, which the literature demonstrates could feasibly be influenced by WASH programs. With an increasing number of WASH programs addressing issues of gender equality, the conceptual foundations of the WASH-GEM offer a theoretically robust structure for the sector's measurement of gendered change.

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Ethics approval

Ethical approval for this study was obtained from the University of Technology Sydney Human Research Ethics Committee (reference ETH18-2599).

CRediT authorship contribution statement

All authors contributed to the research conception and design, literature review, conceptual development and detailed measure design. All authors contributed equally to the first draft of the manuscript. All authors read and approved the final manuscript.

Declaration of competing interest

None.

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