Who Carries the Weight of Water? Fetching Water in Rural and Urban Areas and the Implications for Water Security

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ABSTRACT: The global burden of fetching water, particularly its effects on individuals and societies, is largely unknown because comparative analysis of the global data available is incomplete and scarce. To address this information gap, this article presents a synthesis of the data on water-fetching from households in 23 countries. In rural areas of the dataset almost 50% of the population still have to bring water from a source outside of their home or yard. Women generally carry the main responsibility for fetching water; however, in many countries and in particular in urban areas, men also take on a great share of this work. The mean single trip time to collect water ranges from 10 to 65 minutes in urban areas with an average increase or decrease of 2 to 13 minutes in rural areas. Further, up to 60% of children support the collection of wood and water, in some countries spending up to 11.3 hours per week. Water fetching continues to have the greatest impact on women and children in poorer rural areas and is likely to be a substantial barrier to household water security and sustainable development in regions most in need of sustainable development.

KEYWORDS: Water fetching, MICs surveys, global data, time, health impacts

INTRODUCTION

'Water security' is defined in this collection as 'the availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems and production, coupled with an acceptable or tolerable level of water-related risks to people, environments and economies'. We argue in this paper that in many regions of the world, continued reliance on the manual labour of fetching water to obtain water for household use is substantial, and compromises water security. Consequently, opportunities for sustainable growth which are commonly expected to occur as a result of 'improved access' to safe drinking water are not likely to occur unless the burden of the work of fetching water is recognised and reduced. Whilst there are data to support that men contribute to this work in some regions and in urban areas, global regions most in need of sustainable growth and economic development, such as rural areas of sub-Saharan Africa, most commonly rely on women to obtain and carry household water from a source located away from their homes (UNICEF and WHO, 2012). Water fetching therefore remains a significant barrier to household water security and sustainable development, particularly for rural women in middle- and low-income regions.

Improving access to safe drinking water was a key target for Millennium Development Goal 7 (MDG 7) (Moe and Rheingans, 2006). Whilst the global MDG target of halving the proportion of people without improved drinking water was reported as met in 2010, some regions did not achieve the target and regional inequalities persist (UNICEF and WHO, 2015). Some 663 million people still lacked access
to improved drinking water sources in 2015 (UNICEF and WHO, 2015) and most 'unsafe' drinking water sources are likely to be located away from a person's home or 'off-plot' at shared public access or supply points. Importantly, even improved or 'safe' water sources are frequently located off-plot, highlighting that many people must continue to travel or walk some distance to access and bring home water for drinking and general household use (Pickering and Davis, 2012; Evans et al., 2013). Off premises or 'off-plot' access has been recognised as an important issue by the WHO/UNICEF Joint Monitoring Programme (JMP), which has incorporated the location of water source and water-fetching times into their 'ladder' for household drinking water services, to improve future monitoring of inequalities in access (WHO, 2017).

For many people, off-plot access means that the final steps of the water supply chain require manual labour to transfer water into containers from a publicly shared source, and carry water-filled containers to their house for storage at home, which will influence the quantity and quality of water available to household members (Jagals, 2006; Geere et al., 2010a; Baguma, et al., 2013). Therefore, when water is obtained by water-fetching, 'the availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems and production' at the household level is dependent on the ability of household members to negotiate access to off-plot sources (Wutich, 2009; Stevenson et al., 2012; Diouf et al., 2014), carry sufficient quantities of water home (Geere et al., 2010a) and safely store it (Jagals, 2006).

Despite this crucial role in household water provision, the working conditions of carrying water and impact on the carrier have received little attention to date. Yet, with the 2013 Resolution of the International Conference of Labour Statisticians to recognise fetching water and other unpaid and informal service and production of goods as work, moving away from a sole focus on formal employment (ICLS, 2013) member states will be able to report water-fetching in the Labour Force Surveys. This would open up possibilities to look deeper into the working conditions of this female-dominated link in the water provision service chain.

The detrimental health impacts of regular water carrying are being increasingly recognised and have been investigated in small-scale studies (Geere et al., 2010a; Evans et al., 2013; Geere, 2015). The risks to personal safety that may occur in many areas have also been recognised (House et al., 2014). Any detrimental impact of water-fetching may be superimposed on other personal or household factors which limit capacity to access and carry water and exacerbate inequalities in water security and livelihoods. For example, older adults, orphans, people living with long-term conditions, disability or facing social stigma may be less able to access and carry water, and therefore particularly vulnerable to household water insecurity (Wrisdale et al., in press).

Comparison and analysis of reliable data on fetching water derived from multi-country surveys or datasets are limited, and mainly focus on countries of sub-Saharan Africa (Thompson, et al., 2000; Pickering and Davis, 2012; WHO, 2017). This article summarises descriptive data derived from a subset of 29 Multiple Indicator Cluster surveys (MICs) reported from 2010 to 2015, which included information on access to water and the work of carrying water. We focus on location of the water source, household member responsible for fetching water and time spent fetching water and use the data to illustrate and consider the implications of these specific factors for household water security. More complex analyses of relationships between water-fetching and health, utilising all MICs surveys containing relevant data and reported from 2010 to 2015, will be published elsewhere. This report answers the following questions

- What proportion of household respondents report their access to their main water supply as being from off-plot sources comparing different countries and regions?
- Who is typically responsible for water collection within households?
- How much time is spent fetching water in different countries and regions?
We then discuss the implications of water-fetching on household water security and opportunities for sustainable growth, highlighting water-fetching as a substantial challenge to both and to achievement of many of the Sustainable Development Goals (SDGs). We highlight the recently proposed JMP ladder for drinking water services, which incorporates location of water source and trip times for fetching water (WHO, 2017), and indices such as 'Percentage of population using safely managed drinking water services at home' as appropriate to monitor progress toward SDG 6 and to flag areas and regions vulnerable to household water insecurity between now and 2030.

**BACKGROUND**

Time spent fetching water and fuel reduces the time that can be devoted to generating livelihoods or in remunerated work, whether in the formal or informal economy. Poor households rely heavily on the time its members have for formal and informal work. As a result, time poverty due to the need for fetching water, firewood and other domestic chores cause trade-offs putting food security, child nutrition, health and education at risk (Kes and Swaminathan, 2006).

According to the JMP (UNICEF and WHO, 2012) about three quarters of households in sub-Saharan Africa bring water from a source located away from their home, with women and girls bearing the main responsibility for collecting water in 71% of the households. A recent JMP report highlights that in 61 DHS and MICs surveys, 73.5% of households reported women as responsible for collecting water, and in 53 out of 73 countries, over half of households without water on premises rely on women to collect water (WHO, 2017). In addition, the likelihood of a woman being the responsible person has been reported to increase as more time is needed per trip (Sorenson et al., 2011). In South Africa, in poor rural households, women who fetch water and fuelwood spend 25% less time in paid employment (Valodia and Devey, 2005).

The mean time needed to fetch water in sub-Saharan Africa is about 30 minutes per trip (UNICEF and WHO, 2012), but depending on the persons in a household and water carrying method, multiple trips per day may be required, substantially increasing the total time spent per day (Hemson, 2007; Geere et al., 2010a; Sorenson et al., 2011). Tanzanian time use data suggest that water-related infrastructure investments could free up time spent on water collection to the equivalent of, if converted into paid employment, more than half a million new full-time jobs for women (Fontana and Natali, 2008). Hutton et al. (2007) estimated that 4 billion working days would be saved by meeting the MDG target on water, equivalent of USD 15,330 million per year of global economic benefits.

Carrying water appears to have direct detrimental impacts on the physical health of the carrier (Geere, 2015), and his or her ability to participate in domestic, formal and informal work (Schatz and Gilbert, 2014). Both children and adults link persisting pain or movement problems with fetching water (Lloyd et al., 2010; Geere et al., 2010a, b) and the task may be an important factor in pain and disability linked to spinal musculoskeletal disorders and cervical compression syndromes (Evans et al., 2013).

In addition, water insecurity contributes to psychosocial and emotional distress (Wutich, 2009; Stevenson et al., 2012; Diouf et al., 2014). Stress can influence general health, disability related to musculoskeletal disorders and work performance or satisfaction. Incidents and fear of physical and sexual violence are widely reported by women and children in relation to water-fetching (Sorenson et al., 2011; House et al., 2014).

The effects of fetching water on women’s health and abilities to work are likely to be more pronounced in low- and middle-income countries where a greater proportion of people are engaged in physically demanding, informal or poorly regulated work environments (Hoy et al., 2014). Furthermore, since economic, political and social inequalities are reflected in the access to drinking water (UNICEF and WHO, 2015), it is likely that marginalised groups suffer disproportionately from the negative economic and health impacts of fetching water.
Reducing the time, distance and impact of water-fetching has a double effect: on the practical side, it can improve the quality and quantity of water supply, and on the strategic side, it has been demonstrated to have "an impact on gender/power relations both at the household and community levels and has also contributed towards greater gender equity in terms of women’s decision-making and participation in local water management" (Mishra Panda, 2007). To develop effective processes and strategies for improving household water security, we must estimate the global burden of work involved in fetching water, and understand who is doing it.

**METHODS**

Datasets derived from 29 MICs conducted in 23 countries were purposively selected as a subset of those reported and available through UNICEF in a five-year time span (2010-April 2015). The sample was chosen to ensure representation of countries classified in the UN MDG categories of 'developed countries' (n4) and 'developing' countries (n25), which include regions of sub-Saharan Africa (n10), as well as other regions (n15). The distribution of extracted survey responses per country and MDG region (UNICEF and WHO, 2015) is visualised in Figure 1.

Of these 29 surveys 20 were national surveys and 9 were limited to either a region of a country (8) or to a specific ethnic group within a country (1). A Table of the MICs questions derived for the analysis of this article can be found in Annex 1.

Figure 1. Multiple Cluster Indicator surveys (MICs); % households per region and survey.

The datasets of MICs were downloaded using the Statistical Package for the Social Sciences (SPSSv22) software and data files recording household-level variables related to access to water, women’s health, and information on child health for each individual country or regional survey and were merged and prepared for analysis. All surveys were then merged for comparison.

In the household survey of the MICs the question WS3 'what is the location of the water source?' with response options 'house', 'yard', or 'elsewhere', is only asked of respondents without piped water to their house, yard, or neighbour (determined in question WS1). Therefore, variables WS1 and WS3

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1 The complete MICs survey tools can be accessed at [http://mics.unicef.org/tools](http://mics.unicef.org/tools).
were merged to create a new variable, so that wherever possible any household without WS3 responses had their WS1 response re-categorised to indicate at-house, in yard, or 'elsewhere' location of water source. Respondents who had not answered WS3 but for WS1 reported their main drinking water source as a public standpipe, kiosk, tanker truck, cart with small tank/drum, filter plant, bottled or sachet water, or reverse osmosis and in Sudan and South Sudan as a ‘water yard/hand pump' were deemed as getting their water from 'elsewhere' as these sources are unlikely to be accessed from within the house or yard. Other sources (protected/unprotected well or spring, rainwater, surface water or 'other') which could be accessed either on or off-plot were designated as 'missing'. However, most of these were wells or springs, many likely located outside of the house or yard to be situated 'elsewhere' or 'off-plot'.

In the original surveys of MICs, only respondents who did not report their main drinking water source as piped to their house, yard, or neighbour in question WS1 were asked about the location of their water source (question WS3) and only those responding 'elsewhere' to WS3 were asked about the person responsible for collecting water. As a result, because of the way in which the surveys are administered, the number of respondents to this question is reduced.

The mean time to get water and return home in minutes (question WS4) was asked of household respondents who reported obtaining their main drinking water from 'elsewhere' (i.e. neither in the house nor yard). In households with children aged 5-17 years, respondents were asked whether the child had fetched water or collected wood for household use in the previous week (question CL8), and the number of hours spent fetching water or firewood in the previous week (question CL9). IBM SPSS statistics v22 were used to establish statistical significance of mean difference in time taken to get water and return, and mean difference in hours spent fetching water or firewood, comparing urban versus rural households in the different surveys.²

**RESULTS**

Altogether 371,635 household surveys were completed in the 29 MICs, with 152,073 (41%) completed in urban areas and 219,562 (59%) completed in rural areas. Further, 6943 (1.9%) surveys were classified as missing mainly due to the uncertainty about the location of wells, springs, rainwater collection, surface water and 'other' sources of water. In all surveys, except Kenya Mombasa Informal Settlement (2.5%), Sudan (19.1%) and South Sudan (39.6%), the percent of answers with unknown location amounts to less than 1.0%. As a consequence, the number of households having to manually bring drinking water is most probably underestimated in areas where wells, springs, rainwater and surface water are common water sources.

**Location of main drinking water source**

Of the 371,635 households, a greater proportion of urban households compared to rural households had a water supply within their house, while a smaller proportion of urban households reported a drinking water source in their yard (Figure 2). Consequently, of the urban dwellers, only a smaller share of those without water in their homes, can access it in their yard; those in the larger share (28.8%) have to look for it elsewhere.

In all surveys a greater percentage of urban compared to rural households reported having their main drinking water supply in their house. However, there was no such consistent trend regarding the proportions of urban versus rural households accessing drinking water in their yards. The combined findings overall will be influenced by the large proportion of data from Pakistan Punjab (Figure 1).

² The assumption of equal variances was assessed using Levene’s test, to reduce the risk of a type I error. If Levene’s test gave p>0.05, homogeneity of variance assumption was assumed; if Levene’s test gave p< 0.05, equal variances are not assumed.
In most surveys, proportionately fewer households in urban areas obtain their drinking water from 'elsewhere' compared to rural households. The exceptions are for Serbia, Pakistan Punjab and most noticeably in South Sudan. The South Sudan findings may be due to the greater proportion of rural data which had to be categorised as missing for the analysis due to the main water source being categorised as a spring or well, which could be located within the yard or elsewhere (see Figure 3). However, in some surveys (Indonesia West Papua, Lao PDR, Pakistan Punjab, Montenegro, and Serbia) the difference between percentage of urban versus rural households obtaining water from elsewhere is very small (Annex 2). In urban areas of countries of developed regions it is likely that a substantial proportion of water sourced from 'elsewhere' is bottled water, which may not require a household member to physically carry a container from a shared water source. For example, of households in urban areas of Montenegro obtaining water from elsewhere, 61.3% obtained their water from a protected spring and 35.4% had bottled water, compared to rural households where water was obtained from a greater range of sources with 46.9% using a protected spring and 30.5% using bottled water. In Serbia 80.8% of urban households obtaining water from elsewhere used bottled water, compared to 57.2% in rural areas.

Because fetching water from off-plot sources is generally accepted to be more common in rural areas, and a potentially neglected issue in urban areas, we compared location of water source in urban areas of different surveys, to highlight the extent to which water-fetching can be required in urban areas. Comparing the location of the main drinking water source in urban areas only, eight surveys (Ghana, Indonesia Papua, Kenya informal settlement, Lao, Mongolia Khuvsgul Aimag, Mongolia, Nigeria, and Sierra Leone), indicated that the largest proportion of urban households obtained their drinking water from elsewhere (i.e. outside of their own house or yard), with six of the surveys having the majority (>50%) of urban households obtaining their water from 'elsewhere' (Figure 3). In these surveys the proportion of urban households obtaining drinking water outside of their home or yard ranged from 41 to 93% of surveyed households (Figure 3).
Figure 3. Surveys in which biggest proportion of urban households obtain water from elsewhere.

Person responsible for collecting water

From all surveys and in both the urban and rural areas of 127,271 households that provided information on the main person responsible for collecting water, the greatest proportion of households identified an adult woman as the main person responsible. In urban areas however, the proportion of households who identified men as the main person carrying water is almost equal to the proportion of households identifying a woman as the main person carrying water. In rural areas approximately twice as many households identify women as main carriers of water than men (Figure 4).

Figure 4. Person responsible for collecting water in percent, urban and rural areas.
In all surveys adults were most often identified as the main person responsible for collecting water; however, the proportion of households reporting a woman or a man as that person varied between surveys, and in some regions differed between rural and urban areas. In 15 surveys (Ghana, Indonesia Papua, Lao PDR, Nepal, Nigeria, Sierra Leone, Serbia Roma, Somalia (North East), Somalia (Somaliland), Sudan, South Sudan, Suriname, Swaziland, Vietnam, and Zimbabwe) proportionately more households surveyed identified a woman as responsible in both urban and rural areas; in nine surveys (Iraq, Jamaica, Kazakhstan, Mongolia Khuvsgul Aimag, Mongolia, Montenegro, Saint Lucia, Serbia, and Ukraine) proportionately more households identified a man as responsible for collecting water in both rural and urban areas; and in four surveys (Pakistan Baluchistan, Pakistan Punjab, Indonesia West Papua, and Afghanistan) proportionately more households identified a man as responsible in urban areas and a woman in rural areas. The Mombasa informal settlement includes only urban households, and more households reported men as responsible for collecting water (Figure 5, Annex 5).

Figure 5. Person responsible for fetching water.

Time to fetch water

The mean time taken for urban households to get water from an off-plot water source (i.e. 'elsewhere') and return home ranged from 10 minutes in Lao PDR to 65 minutes in Somaliland (Annex 3). Significant differences in urban versus rural mean time to collect water and return occur in 18 of the 28 surveys with urban and rural households. Significant mean time difference between urban and rural water collection time within each survey ranges from 2-13 minutes and can be either increased or decreased in urban areas (Figure 6; Annexes 3 and 4). In Indonesia Papua, Indonesia West Papua, Jamaica, Kazakhstan, St Lucia, Serbia, Somalia (NE), Somalia (Somaliland), South Sudan and Suriname no significant difference was found.
Children and water collection

In 23 MIC surveys, children between 5 – 17 years of age were asked if they had worked to collect water or firewood in the previous week and in 22 surveys responses of children in rural versus urban households could be compared. Children who had worked fetching water or firewood in the previous week were asked how many hours they had spent working at that task. Disproportionately, children in rural rather than urban areas had spent time collecting firewood or water in the previous week. In urban areas the proportion of children engaged in this work ranged from 1% in Serbia to 60% in Mongolia Khuvsgul Aimag.

The mean number of hours spent collecting water or firewood in the previous week ranged from 1 (St Lucia) to 11.3 hours (Somalia NE). In St Lucia, Serbia Roma and Serbia the number of children reporting hours spent fetching water or firewood was small. There were significant differences in the mean number of hours spent fetching water or firewood in the previous week between children from urban and rural households in all survey responses except Jamaica, Montenegro, Saint Lucia, Serbia, Suriname, Ukraine and Vietnam. The significant mean differences in hours spent in the previous week ranged from 0.4 hours or 20 minutes in Sierra Leone (greater in rural areas) to 4.2 hours in Serbia Roma (greater in urban areas).

DISCUSSION

Location of main drinking water source

Within MICs surveys, information about the location of water source is only asked of households reporting access to their main source of drinking water from public standpipes or other non-piped sources. However, within the MICs surveys included in this study, there was a large proportion of
missing data in some areas. For example, with South Sudan and Sudan, types of water source commonly reported (well or spring) did not also indicate whether the source was on or off plot. If we had treated all such indeterminate data as off-plot rather than 'missing' data, we would have larger proportions of households accessing water 'elsewhere' and therefore likely to be engaged in the work of fetching water. Even with this potential underestimation, our findings are consistent with the 2015 update of progress on sanitation and drinking water (UNICEF and WHO, 2015) which highlights that despite important improvements in the last 15 years, rural-urban disparities persist. Our findings also highlight the importance of obtaining information about the on-plot or off-plot location of springs, wells and rainwater sources in household surveys to more accurately indicate the burden of work in fetching water.

While in most global regions urban coverage of piped water on premises remains higher than in rural areas (UNICEF and WHO, 2015), our findings highlight that coverage within urban areas may still be poor in developing regions, particularly in informal settlements. Informal settlements are a very specific type of urban space that generally does not have access to basic services because the settlement is 'illegal'. Although this makes it difficult to compare the situation of informal settlements with other urban areas that would include both informal and formal urban areas, our analysis indicates very clearly that there are stark differences even within cities. This finding is particularly important when considering the challenges of maintaining public health in urban areas of developing countries, which can be affected by high rates of rural-urban migration (Bieker et al., 2010), protracted armed conflict (ICRC, 2015), and epidemics of infectious diseases (Brainard et al., 2015).

**Person responsible for collecting water**

For both urban and rural areas the greatest proportion of households identified an adult woman as the main person responsible for collecting water and in all individual surveys an adult was most often identified as the main person responsible for collecting water. However, the gender of the person responsible for collecting water in most households varies between both countries and regions.

In 15 surveys, including all of those from sub-Saharan Africa except the informal settlement of Mombasa, Kenya, water collection is more commonly reported as a woman’s responsibility in both rural and urban areas. Surveys from the remaining 14 developed and developing regions had proportionately more households indicating a man as the main person responsible for collecting water in urban areas, and in rural areas of just four of these, proportionately more households identified a woman as responsible for collecting water. Thus, contrary to many reports (Ferguson, 1986; Crow, 2001; Buor, 2004; Sultana, 2009; Baguma et al., 2013), our findings indicate that in many regions, the majority of households do not report collecting water is a woman’s responsibility.

There are several possible explanations for our findings. Traditional cultural and religious practices may determine who is tasked with fetching water at locations away from home, and traditional practices may change over time, or with migration or urbanisation. Rural-urban migration for employment may mean that in urban areas there are more households comprising only men, or that 'traditional' gender roles for household chores typical of rural areas are not observed by younger generations living in urban areas. Increasing access to vehicles or other equipment to bring home more water more easily may also be a factor, particularly where men are more likely to have learned the skills required to drive vehicles or operate equipment. An increase in informal water vending may lead men to take responsibility for obtaining water if they control or manage household monetary transactions. In areas of armed conflict, men may replace or escort women during water collection for safety reasons, and therefore be seen as the ultimate person responsible for water collection. Alternatively, it is possible that the image of the female water carrier is simply not true in many parts of the world, and was extrapolated from observations in sub-Saharan Africa.
However, in sub-Saharan African countries water collection is most often a responsibility of women, and in rural areas of other regions (e.g. Afghanistan and Suriname), women play an important role in accessing and securing household water. In these regions, the inclusion of women’s perspectives is likely to be particularly important to voice community needs for household water security against the competing demands of other groups (Baguma et al., 2013). This is especially so, since case studies from Panama, Philippines, and Senegal indicate that as service provision is formalised and institutionalised men tend to take the lead, making skills training and affirmative actions in employment and water management intrinsic components of policies to include women in formal water work (Reyes, 2014). Since research has shown that women tend to prioritise investments in drinking water more than men and that equal participation in water and sanitation increase efficiency and sustainability (WSP and IRC, 2000; Chattopadhyay and Duflo, 2004), promoting gender equality in water management can also be a way to lift the water issue on the political agenda and to catalyse lasting improvements in access to water and sanitation services.

**Time to get water and come back**

Combining all surveys, the mean time taken to get water and come back is 28 minutes. Statistically significant differences were found in urban versus rural mean time to collect water and return in 19 surveys. However, the actual mean time differences are not large (ranging from 2 to 13 minutes) and indicate that once water must be sourced from out of the home or yard, return trip water collection times are similar in rural and urban areas. The data cannot demonstrate whether this is due to similar distances to off-plot water sources in rural and urban areas, or other factors. For example, it is possible that crowding and queueing times may be longer in urban areas, even if actual distances to water points are reduced. It is probable that people in rural areas also need to collect firewood or perform other types of informal reproductive or manual labouring work that takes up their time and energy. Particularly if combined with poorer health, limited access to health services and poverty, as is often the case in low-income households of rural areas and some urban areas, fetching water may exacerbate water insecurity and be a barrier to sustainable development. These differences are likely to cement existing inequalities or poverty and increase the risk of them being transferred across generations.

The data are also limited in that they indicate only the time taken for one trip for water collection. The surveys do not account for the number of trips required to obtain sufficient water for household needs or differences which create barriers to access for vulnerable people. Household needs are likely to vary greatly according to the number of people in the household, activities performed in the household, and the health of household members. Barriers to access can be due to environmental factors affecting safety or physical exertion required for water collection (Geere et al., 2010a; Geere, 2015; ICRC, 2015) and in many regions create particular challenges for people with disability (Groce et al., 2011). The number and timing of trips for water collection may also be influenced by the reliability of water supplies. A strategy which has been reported in regions where household water supplies are unreliable, is to collect as much water as possible over many trips for storage at home to cover periods when a public service has broken down (Geere, 2015). These differences in household needs and service reliability may create substantial inequalities in access to safe drinking water which are not reflected by the mean time taken for one trip for water collection (Geere, 2015).

**Children and water collection**

In all of the 22 surveys with rural-urban comparisons, proportionately more children in rural areas had spent time collecting firewood or water (Annex 6). There were statistically significant differences in the mean number of hours spent fetching water or firewood in the previous week between children from urban and rural households in 15 surveys.
The marked differences in time spent fetching water and firewood between countries may influence the impact which this activity has on childhood growth, health and development. The data cannot indicate how well matched the work of water-fetching is to a child’s capacity to safely perform the task, which may vary greatly depending on the child’s age, health, and circumstances (Geere et al., 2010a). In some regions, it may take up important opportunities to spend time on other activities, such as completing school work or doing sports activities, and expose children to environmental hazards, physical jeopardy, or physical strain and pain (Hemson, 2007; Geere et al., 2010b). Alternatively, it may be seen as a valuable use of time which makes life better through participation in physical activity and household tasks, or through remuneration (Geere et al., 2010b). Nevertheless, given their greater vulnerability and reduced physical strength compared to adults, it is hard to understand how reliance on children as a labour force to obtain sufficient water for household needs and development can be deemed secure, safe or sustainable.

Monitoring and evaluation of access to water and fetching water

MIC surveys provide a valuable source of basic information about access to water and time per trip in fetching water in many countries. However, it is clear that more detailed information is needed to understand the true impact of the work of fetching water on household resources and individuals and to understand which regions, communities and households face water insecurity. In particular, the following information would provide more insight into the impact of this work:

- Usual number of trips in fetching water per day or week, to estimate total time required for work on fetching water.
- Measured distance to water source or time taken for water-fetching, as self-reported travel time for fetching water may be influenced by recall and has been shown to be an inaccurate indicator of distance to water source (Ho et al., 2014).
- Method of carrying water, as access to equipment which would reduce the strain of carrying water is likely to be affected by poverty and gender (Geere et al., 2010a).
- Health and disability status of individuals in the household and of those who carry water, as this may influence capacity to obtain sufficient water for household needs and effect quantities of water required to maintain household health (Geere, 2015).
- Safety of individuals engaged in fetching water from off-plot sources, which can indicate quality of work and highlight risks related to the working environment.

Disaggregation by social categories, such as ethnicity, race, capabilities, and economic quintile, would enable a better understanding of how different social and cultural groups are affected. This would greatly support efforts to develop differentiated strategies focused on the most marginalised groups in society, in line with the intent of SDG 7 and the Human Rights to Water and Sanitation. Issues related to the working conditions of carrying water could also be strengthened or integrated in the MICs, but considering the recognition of water-fetching as work by the International Conference of Labour Statisticians, the Labour Force Surveys could also provide a suitable framework to look at aspects such as method of fetching, health and safety issues and use of time. In such a case harmonisation of methods to enable comparability will be key.

New approaches to data collection are needed to supplement the information gathered in MIC surveys if we are to better understand the impact of fetching water on water security and sustainable development. Improved data collection could also reduce the overall burden of work due to carrying water, by facilitating improved levels of water service provision and maintenance. Mobile devices and networks have revolutionised communication globally, particularly in sub-Saharan Africa. Researchers have begun to explore their potential to improve monitoring, evaluation and maintenance of water...
services, and to leverage improved access to water. For example, mobile devices have been used to support operational management of water distribution in Colombia, monitor data on water level in The Netherlands, advise farmers in Ethiopia and provide urban flood warnings to citizens in Dhaka, Bangladesh (Jonoski et al., 2012) and also to monitor WaSH services in some areas (Tomlinson et al., 2009; Kumpel et al., 2015; Van-Ess et al., 2015).

Mobile devices and networks may provide ways to improve water service provider and user communications for better information-sharing and strengthened partnerships. They may also enhance local capacity to identify and voice community needs for household water security against competing demands of other groups, particularly by engaging water carriers in service monitoring. Improved service monitoring could substantially mitigate detrimental effects of carrying water, by improving reliability and maintenance of water supply systems, and through better communication, enabling households to choose appropriate coping strategies during service disruptions.

Finally, if we are to meet the SDGs and reduce inequalities, estimating the scale of global work on fetching water, and the proportion of households accessing water off-plot to identify who has what he or she needs will be crucial; thus, the importance given to the development of indicators for the 17 goals. With better information and understanding of the constraints under which different groups live we can move forward to SDG 5 on gender, SDG 6 on water and SDG 8 on decent work and economic growth by reducing the global need for fetching water. In particular, proposed changes to monitoring and reporting incorporated in the JMP’s ‘ladder’ for household drinking water (WHO, 2017) which will identify the ‘Percentage of population using safely managed drinking water services at home’ are appropriate and important strategies to monitor the extent of water-fetching, progress toward SDGs and to flag areas and regions vulnerable to household water insecurity because of location of source of water between now and 2030.

LIMITATIONS

The data represented in figures with combined information from all surveys included in this study were not weighted, and will be influenced by differences in proportional representation of surveys within this dataset. The summary figures are used to indicate the unadjusted data from the surveys included in this report and cannot be generalised to indicate a global picture. However, individual MICs surveys are conducted to a rigorous standard and provide data representative of the country or region of the survey indicated by the survey title, such that it is appropriate for comparisons between surveys to be made.

CONCLUSIONS

The synthesis of MICs data demonstrates that, even if the MDG target on access to safe drinking water has been met, large populations globally still have to physically bring water to their homes. In most countries, this responsibility is predominantly carried by women, particularly in rural areas, yet in urban areas men also take on a substantial share of the burden. The detrimental health and security implications that arise from this informal water provision work highlight an often overlooked dimension related to the definition of ‘access to safe drinking water’ and one which is a substantial barrier to household water security, sustainable development and achievement of the SDGs. Our findings support the implementation of the JMP’s drinking water services ladder and use of ‘Percentage of population using safely managed drinking water services at home’ as appropriate indicators to monitor progress toward SDGs and to flag areas and regions with substantial numbers of households vulnerable to water insecurity between now and 2030.
ACKNOWLEDGEMENTS

This article presents one part of findings from the International Labour Organization (ILO) and UNDP-SIWI Water Governance Facility (WGF) research partnership Women, informal work and water – drudgery and risks related to water-fetching: A systematic literature review and secondary data analysis. Principal investigator: Jo-Anne Geere, University of East Anglia (UEA). Crucial support and input has been provided by Carlos Carrión, ILO, Jack Morris and Paul Hunter, UEA.

REFERENCES


Jagals, P. 2006. Does improved access to water supply by rural households enhance the concept of safe water at the point of use? A case study from deep rural South Africa. Water Science and Technology 54(3): 9-16.


Schatz, E. and Gilbert, L. 2014. “My legs affect me a lot. ... I can no longer walk to the forest to fetch firewood”: Challenges related to health and the performance of daily tasks for older women in a high HIV context. Health Care for Women International 35(7-9): 771-788.


## Annexes

### Annex 1. MICs questions used for the analysis

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
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| **WS1**. What is the main source of drinking water for members of your household? | - Piped water: Piped into dwelling........................................11 11⇒WS6  
- Piped into compound, yard or plot ................................12 12⇒WS6  
- Piped to neighbour ................................................................13 13⇒WS6  
- Public tap/standpipe ................................................................14 14⇒WS3  
- Tube Well, Borehole .........................................................21 21⇒WS3  
- Dug well: Protected well .....................................................31 31⇒WS3  
- Unprotected well .....................................................................32 32⇒WS3  
- Water from spring: Protected spring .......................................41 41⇒WS3  
- Unprotected spring ..................................................................42 42⇒WS3  
- Rainwater collection ................................................................51 51⇒WS3  
- Tanker-truck ...........................................................................61 61⇒WS3  
- Cart with small tank/drum .....................................................71 71⇒WS3  
- Surface water (river, stream, dam, lake, pond, canal, irrigation channel) ..............................................81 81⇒WS3  
- Bottled water ...........................................................................91 91⇒WS3  
- Other (specify) .........................................................................96 96⇒WS3  |       |
| **WS3**. Where is that water source located?                          | In own dwelling ...........................................................................1 1⇒WS6  
- In own yard/plot .......................................................................2 2⇒WS6  
- Elsewhere ....................................................................................3  |       |
| **WS4**. How long does it take to go there, get water, and come back? | Number of minutes ......................................................................... __ __ __  
- Don’t know ...............................................................................998  |       |
| **WS5**. Who usually goes to this source to collect the water for your household? | Adult woman (age 15+ years) .........................................................1  
- Adult man (age 15+ years) .......................................................2  
- Female child (under 15) .........................................................3  
- Male child (under 15) ............................................................4  
- Don’t know ..............................................................................8  |       |
| **CL8**. Since last (day of the week), did (name) fetch water or collect firewood for household use? | Yes .............................................................................................1 1⇒CL10  
- No ............................................................................................2 2⇒CL10  |       |
| **CL9**. In total, how many hours did (name) spend on fetching water or collecting firewood for household use, since last (day of the week)? | Number of hours ........................................................................... __ __  |       |
### Annex 2. Location of main drinking water source rural vs. urban

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### ANNEX 3. TIME TO GET WATER AND RETURN (IN MINUTES)

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Geere and Cortobius: Who carries the weight of water
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*Rural value cannot be computed for Kenya Mombasa Informal settlement.*
# ANNEX 4. TIME TO GET WATER AND RETURN (IN MINUTES)

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Geere and Cortobius: Who carries the weight of water  Page | 535
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Geere and Cortobius: Who carries the weight of water Page | 537
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