

Issues in access to safe drinking water and basic hygiene for persons with physical disabilities in rural Cambodia

Marin MacLeod, Mala Pann, Ray Cantwell and Spencer Moore

ABSTRACT

An estimated 1.6 million people die from diarrheal diseases each year due to lack of access to safe water and sanitation, and persons with physical disabilities face additional barriers. In Cambodia, approximately 5% of the population is disabled, presenting substantial obstacles in accessing these basic services. The purpose of this study was twofold: first, to identify the challenges facing persons with physical disabilities in accessing safe household water and basic hygiene in rural Cambodia; and, second, to use these results to generate policy and practice recommendations for the water and sanitation hygiene sector implementing water treatment system interventions in rural settings. Fifteen field interviews were conducted with persons with physical disabilities. Thematic analysis was used to identify six main themes. The results indicated that environmental barriers to access were greater in the workplace than household settings and those persons with disabilities had greater awareness about safe drinking water compared to basic hygiene. Additionally, lack of physical strength, distance to water, and lack of financial means were noted as common access barriers. The findings support ongoing research and offer insight into the particular challenges facing persons with physical disabilities in rural areas in accessing safe drinking water and basic hygiene.

Key words | biosand filter, Cambodia, hygiene, low income, physical disability, water

Marin MacLeod (corresponding author)
Spencer Moore
Department of Kinesiology and Health Studies,
Queen's University,
28 Division Street,
Kingston,
Ontario, K7L 7N9,
Canada
E-mail: marinmacleod@gmail.com

Mala Pann
Clear Cambodia,
#86, St. 608,
Boeung Kakll,
Toul Kork,
PO Box: 166,
Phnom Penh,
Cambodia

Ray Cantwell
Samaritan's Purse Canada,
20 Hopewell Way NE,
Calgary,
Alberta, T3J 5H5,
Canada

INTRODUCTION

Global context

Delivering safe drinking water and basic hygiene and sanitation are key global health priorities for both governments and non-governmental organizations (NGOs). Safe drinking water and basic hygiene have been recognized as essential components to living a healthy life and ensuring environmental sustainability (Mintz *et al.* 2001). Lack of access to safe drinking water and basic hygiene and sanitation are linked to a plethora of issues including chronic diarrhea, limited education potential, and environmental concerns such as groundwater contamination and open defecation (UNICEF 2013). Household water treatment systems (HWTS), such as biosand filters (BSFs), are broadly regarded as one of the most effective solutions to increase access to safe drinking water (Hunter 2009). BSFs are generally constructed with concrete bodies and consist of layers

of gravel and sand that filter solids and pathogens from water (Dyck *et al.* 2009).

Presently, there are a number of NGOs and government initiatives working to provide safe household water for rural residents in low-income countries. However, there are numerous barriers to water and sanitation hygiene (WASH) access, such as resource limitations, lack of WASH knowledge and capacity among populations, and unsustainable WASH interventions resulting from poor infrastructure or lack of soap and other materials (Jones & Jansz 2008; Coussens 2009). Although aspects of these barriers apply to able-bodied and disabled individuals, the effects of the barriers are typically magnified for persons with physical disabilities for a number of reasons including social stigma, limited environmental accessibility, and decreased earning potential (JICA 2002). Despite the additional barriers that persons with physical disabilities

face to access safe drinking water, the majority of HWTS interventions do not specifically consider the disabled population. Most NGO and government implementers of HWTS have not considered the additional challenges that persons with physical disabilities face, and, as a result, overlook one of the most marginalized groups in society. In addition, the Millennium Development Goals (MDGs) do not take into consideration persons with physical disabilities which has generated concern among the global community (UN 2011). These knowledge and practice gaps need to be addressed to reach the most marginalized.

While there are few statistics available regarding physical disability specifically, it is worth noting that an estimated 15% of the global population has some form of disability (WHO 2012) and approximately 70% of persons with disabilities (PWDs) reside in low-income countries (UN Enable 2008). For the purposes of this paper, disability is defined using the World Health Organization (WHO) definition: 'the interaction between individuals with a health condition and personal and environmental factors (e.g. negative attitudes, inaccessible transportation and public buildings, and limited social supports)' (WHO 2012). However, as this is an umbrella term encompassing all forms of disability, it should be noted that this research is focused specifically on physical disability. The Cambodian government has segmented disability into eight categories, one being 'moving difficulties or physical impairments', but these categories have yet to be defined (JICA 2002).

Millennium Development Goal number seven, target C is to reduce, by half, the proportion of people without access to safe drinking water and basic sanitation. The Joint Monitoring Program (JMP) report defines safe water as 'safe to drink and available in sufficient quantities for hygienic purposes' (WHO & UNICEF 2006). This definition is widely recognized; however, the difficulty arises from the fact that 'safety and quantity' are difficult to assess and measure; thus, the terms 'improved' and 'unimproved' are used more commonly. Improved drinking water sources are considered more likely to provide safe drinking water than unimproved sources, and include, but are not limited to: piped water, tubewell, protected dug well or spring, and rainwater collection. Unimproved drinking water sources include: unprotected dug well or spring, surface water, and bottled water (unless improved water is used

for cooking and family hygiene) (WHO & UNICEF 2006). The distinction between 'improved' and 'safe' drinking water is important; simply because the water source can be considered improved, does not mean that it is safe. When using 'improved' as the indicator, the MDG has been achieved for drinking water. However, if a more specific term for water safety, such as 'uncontaminated', is used, there will be an estimated 20% shortfall in achieving the MDG target by 2015 (Onda *et al.* 2012). For the purposes of this paper, safe drinking water refers to water that has been filtered using a BSF.

Cambodian context

Cambodia has the world's highest percentage of a national population living with a disability, of which nearly half consist of physical impairments (Connelly 2009). Civil war, genocide, and conflict between 1974 and 1993 have contributed to the approximately 5% of the national population with some form of disability; according to the Cambodian Ministry of Planning and National Institute of Statistics, at least 44% of PWDs are affected by a physical disability (including physical impairment 22.1%, amputation 18.2%, and paralysis 4%) (JICA 2002; Connelly 2009; DAC 2009; Handicap International 2009). Much of Cambodia's disabled population consists of landmine victims, and the nature of landmine-related injuries is that the 'standard of amputation' is generally quite poor; this can make fitting someone for a prosthetic especially challenging, in addition to the barrier of high financial cost (Harte 1999). Access to rehabilitation services for PWDs in Cambodia is very limited. This is largely due to a severe lack of financial and human resources (e.g. hospitals cannot afford to hire trained rehabilitation professionals); however, the Disability Action Council (DAC), formed in 1997, is working to address these issues for PWDs in Cambodia (JICA 2002; WHO 2011).

Cambodia has some of the lowest rates of WASH coverage and access in Southeast Asia and is also one of the least economically developed countries in the region (ISF & UTS 2011). Although the current MDG water target has been met globally (Onda *et al.* 2012), at the current pace of progress it is estimated that it will take 30 years to achieve the MDG WASH targets in Cambodia (ISF & UTS 2011). Existing government and NGO funding for WASH activities is

considered to be inadequate to meet the current WASH sector needs in Cambodia; as a result many families are solely responsible for the associated costs of making WASH services accessible for persons with physical disabilities (Jones *et al.* 2003). That said, many persons with physical disabilities design their own low-cost personal assistive devices to increase their accessibility level to household WASH. These devices are often specific and reflect the needs of the individual and their specific physical impairment (Jones *et al.* 2003).

The Cambodian national government has dedicated few resources to assist persons with physical disabilities, and, as a result, NGOs provide the bulk of support and resources (Thapa 2011). Few laws or policies exist to protect the human rights of persons with physical disabilities in Cambodia. The laws that are in place are insufficient to address the current WASH needs of persons with physical disabilities and directly reflect very limited government resources (Connelly 2009). WASH solutions tailored to persons with physical disabilities are essential if this vulnerable segment of the population is to achieve sustained access to basic WASH.

In summation, WASH access is a global priority, but current efforts in Cambodia in particular are not sufficient to meet the needs of persons with physical disabilities. In addition, a disability focus is lacking from NGO and government interventions and the global MDGs. The purpose of this study was twofold: first, to identify the challenges that persons with physical disabilities face in accessing safe household water and basic hygiene in rural Cambodia; and, second, to use these results to generate policy and practice recommendations for WASH sector members implementing water treatment system interventions in rural settings.

METHODS

Site and sample

The study was conducted in July 2012 and, due to resource limitations, the focus was on one rural village in Kampong Thom Province, Cambodia. The majority of PWDs in this village happen to be male conflict victims; however, this was not an inclusion criterion for our study. This village

was selected because there were: (i) a number of villagers who had participated in the Clear Cambodia HWTS program and received BSFs 7 years earlier; and (ii) a high percentage of persons with physical disabilities residing in the village. Eligible respondents were all persons with physical disabilities. Respondents were recruited by the village leader for the study and the researcher interviewed all of the available persons with physical disabilities in the village. Ten of the 15 respondents had a BSF. Interview respondents were male, with the exception of one female who acted as a proxy respondent for her husband who was away at the time of the interview. All 15 of the respondents had some form of physical impairment, resulting mainly from land-mines and bullet or shrapnel wounds. One participant also had a visual impairment. Free and informed consent of the participants was obtained, and the study protocol was approved by the General Research Ethics Board at Queen's University, Ontario, Canada, Ethics ROMEO #6007159, approved 16 July 2012.

Questionnaire and interviews

A toolkit developed by Handicap International was consulted prior to and during the development of this study's questionnaire. The toolkit was selected because it specifically discussed questionnaire design for disabled populations and was used to ensure the questionnaire design was suitable for the study (Bakhshi *et al.* 2006). Questionnaires were translated first into Khmer and then back-translated into English to ensure linguistic appropriateness. A consent form was used and, to ensure cultural appropriateness and be inclusive of those with low literacy levels, respondents were asked to use their thumb print to indicate consent once they had read, or had read to them, the form and letter of information.

Semi-structured interviews were conducted in the respondents' native language of Khmer and the responses were translated into English by an experienced Khmer translator in the field. The oral format of the interviews allowed literate as well as illiterate individuals to participate. The interview script was segmented into the following sections, including: (1) basic socio-demographic information, for example, 'How many family members do you live with?' (2) mobility constraints, for example, 'Is physical strength

or ability limiting your ability to access safe household water?’ (3) current WASH accessibility level, for example, ‘Is it easier/the same/harder for you to access safe household water than it is for other village members who do not have a physical disability? Or if your disability was recent, is it more difficult to access safe household water than before your disability?’ (4) challenges faced in terms of WASH access, for example, ‘Is lack of money preventing you from accessing clean household water? If so, how would you use additional money to get access to safe drinking water? If not, what is the biggest barrier?’ and ‘Does the design/nature of the water source affect your ability to access it (i.e. height of tap, lack of hand rails, rough terrain, etc.)?’ and (5) previous exposure to WASH training/programming, for example, ‘Did you participate in the Clear/Hagar water classes and BSF construction? If so, did your disability prevent you from fully participating?’ and ‘Can you tell me when you wash your hands? Do you use soap (or ash) when you wash your hands?’ Each interview lasted approximately 30 minutes, and only the respondent, the interviewer and the translator were present.

Analysis

Given the formative nature of the research, thematic analysis techniques were employed to examine the interview data. Thematic analysis, particularly in the early stages of research inquiry, allows researchers to collect and use qualitative information in a way that facilitates communication of findings between scholars in different fields, and accessibility of such results to the public more generally (Boyatzis 1998). For our purposes, thematic analysis provided a useful method by which to identify key patterns in participants’ understandings of WASH-related activities.

Analysis of the raw data identified six main themes by noting key words and segmenting them into groups based on the type of barrier to which they related. For each theme, a code was devised which included a label, a definition, indicators, exclusions, and specific examples from the text. The development of specific codes helped to ensure internal validity of the themes. All coding and analysis was conducted in English. The six themes were: (1) social support; (2) perceived importance of safe drinking water; (3) hygiene practice; (4) physical strength barriers to

access; (5) environmental barriers; and (6) financial situation of the family.

RESULTS

Social support (Theme 1)

Segmented into two subthemes: (a) social support in the household, which was defined as the respondent explaining that his family and/or community helped him to access drinking water in the household; and (b) social support in the workplace, which was defined as the respondent explaining that he had increased difficulty in accessing safe drinking water at his workplace compared with the household environment.

Eight respondents did not report working outside the household environment. Data suggested that all barriers were generally magnified in the workplace environment, such as the distance from the respondent’s home to the water source; increased fatigue, likely caused from added physical demands of working outside of the home; and reduced social support. For example, one respondent commented, ‘At home my wife helps to get clean water, but at my (work) station I must get my own.’ Four of the respondents indicated that they experienced increased difficulty in accessing safe drinking water while at work compared to their household environment. For example, another respondent noted, ‘At home the water source is pretty close, but when I am at work it is around 100 meters away and it is a muddy pond that I must drink from.’

Results indicated that all respondents had family and social supports within the household environment. Respondents noted that they were often able to access safe drinking water on their own, but if they needed assistance it was almost always available to them. One issue that did arise was the fact that some of the respondents had wives who were working outside of the home and that when the wife was away at work, the respondents were often left on their own to access safe drinking water. For example, ‘My family helps, especially my wife, but I am on my own when she goes to work.’ Many participants were able to filter their own water, but collection from the source was difficult. For example, one respondent

noted, 'I have a well at home, but hard to collect water from the well and to carry it.'

Perceived importance of safe drinking water (Theme 2)

Defined as the respondent explaining the personal need for safe drinking water and describing how his family made it a priority. Comments related to this theme included, but were not limited to, mentioning the importance of safe drinking water and the acknowledgement of the health risks associated with consuming unsafe water.

Twelve of the respondents demonstrated positive attitudes towards safe drinking water and BSFs (where applicable). For example, one respondent commented, 'Financial situation of family is difficult, but we worked hard to get BSF because I think it's important for my family to drink safe water.' All respondents who did possess a BSF perceived it in a positive way and reported using it regularly.

Hygiene practices (Theme 3)

Segmented into two subthemes, (a) practice of hand washing and (b) the use of soap, hand washing was defined as the respondent meeting the hand washing criteria established by the United States Agency for International Development. Criteria stipulate washing hands: (1) after defecation; (2) after cleaning a child; (3) before food preparation; (4) before feeding a child; and (5) before eating (Hernandez 2010). However, only 'after defecation', 'before eating', and 'before food preparation' were required responses in this study. In addition, 'after work' was accepted alongside 'before food preparation' since all of the respondents were male and many of them worked outside the household setting and were not responsible for food preparation or daily childcare. The qualification of the code was that a respondent must mention all three of the criteria so as to be coded positively for the theme. 'Use of soap' was defined as the respondent using soap or ash when washing his hands almost all of the time. Using ash instead of soap to wash hands is common in Cambodia and is an accepted practice for halting disease transmission (Hernandez 2010).

Only one respondent met the hand washing criteria; the remaining 14 respondents did not report proper hand

washing practices. All of the respondents noted washing hands prior to eating, but significantly fewer noted washing their hands after defecation, and fewer still noted washing their hands after work/before food preparation. The majority of respondents, 10, did not report using soap or ash to wash their hands. For example, 'I rarely use soap because my family doesn't usually have it.' However, this does not explain why respondents did not use ash in lieu of soap. Clear Cambodia provides basic hygiene lessons to BSF owners as part of the participatory component of receiving their filters and most people found the hygiene training to be helpful and applicable to persons with physical disabilities. However, much of this training occurs in central locations and persons with physical disabilities reported difficulty in travelling to these central locations. This can be noted by comments such as, '[the hygiene lesson was] Difficult to attend because of distance, it was four to five kilometers away. Would rather it closer' and 'My wife went in my place, too far from home for me. I would have liked to have been involved.' Overall, the results indicated that understanding of proper hygiene practices was lacking in comparison to knowledge and perceptions on the importance of safe drinking water.

Physical strength barriers to access (Theme 4)

Segmented into two subthemes, (a) barriers in the household environment and (b) barriers in the workplace setting, physical strength barriers in the household setting were defined as a respondent being limited in his ability to access safe drinking water due to a lack of physical strength. Barriers in the workplace were defined as a respondent being limited due to physical strength in his ability to access safe drinking water in the workplace setting.

Results for physical strength as a barrier in the household setting indicate that nine respondents were limited in their ability to access safe drinking water as a result of limited physical strength and other associated physical barriers. An example of subtheme 4(a) can be seen in two respondents' statements, 'physical strength is a problem in accessing water' and 'a concrete well with a waist high ring for support (would be more accessible). Wells flush with the ground make it difficult to access the water. I must get very low to the ground; it is hard to get water

this way.' These particular comments are related to the physical environment and how increasing accessibility to the water source will facilitate access to safe drinking water among persons with physical disabilities.

In addition, three of the seven respondents who work outside the home reported that physical strength limited their ability to access safe drinking water in the workplace environment. An example of subtheme 4(b) was shared by a respondent who said that 'physical strength is a factor. When I am away from the home working I become very fatigued and don't have the strength to boil my water.' This lack of strength refers to the required energy to collect firewood. Lastly, it is important to note that many respondents (eight) were unable to work outside of the household environment as a result of their disability.

Environmental barriers (Theme 5)

Segmented into two subthemes: (a) distance to the water source and/or BSF, defined as a person having difficulty in accessing safe drinking water due to the distance to the water source and/or BSF; and (b) use and maintenance of the BSF (pouring water through the filter and cleaning the sand).

Results for theme 5(a) indicated that six of the respondents found that distance to the water source was a barrier to accessing safe drinking water. A sample response was that 'I am about 20 meters away from water source and I find it very difficult to access'. Another respondent reported, 'The well is five to ten meters away and it is not difficult (to access)'. The results for theme 5(b) indicated that only one respondent, out of a possible 10 who possessed BSFs, found that using and/or maintaining the BSF was a barrier to accessing safe drinking water. One of the participants who did not find using and/or maintaining the filter to be a barrier said, 'Yes, I can pour water through filter independently without added support... Yes, I can also clean the sand in my filter on my own, but usually my family does it.'

Financial situation of the family (Theme 6)

Defined as the lack of financial means to access safe drinking water, the results illustrated that 13 out of 15 respondents recognized a lack of finances as a barrier. As an example, one respondent said that 'lacking money has

blocked me from accessing clean water because of not having money, haven't been able to get filter so far'. Despite the fact that many people recognize the importance of WASH for their families, they simply do not have the money to spend on hardware such as a BSF or firewood.

DISCUSSION

This study's main purpose was to identify issues that lead to difficulties in accessing safe household water and basic hygiene, particularly among persons with physical disabilities in rural Cambodia. The results indicated that environmental barriers to access were greater in the workplace than household setting and that there was increased social and family support in the household environment. Generally, persons with physical disabilities also indicated greater awareness about safe drinking water compared with basic hygiene. Several other common barriers to access were also noted, including lack of physical strength, distance to safe water sources, and lack of financial means.

The knowledge discrepancy between safe drinking water and basic hygiene is troubling since it indicates that reaching the MDG target may be a greater challenge than many experts believe, especially among the disabled population. Twelve out of 15 of the respondents had knowledge and awareness about safe drinking water. In contrast, knowledge about proper hand washing protocol was minimal, with only one respondent reporting compliance. Yet poor hygiene practices do not seem to be limited to persons with physical disabilities. For example, a study completed by Adventist Development and Relief Agency found that only about 25% of rural Cambodians have appropriate hand washing behavior (Sin *et al.* 2008). Use of soap for hand washing seems to be practiced more consistently among the able-bodied population with about 85% of able-bodied individuals (compared with 33% of persons with physical disabilities in this study) using some form of soap, according to a study conducted in rural Cambodia (Jenkins *et al.* 2013). In addition, lack of soap and lack of finances to purchase soap have been identified in the literature as barriers to hand washing with soap among both the able-bodied and disabled populations (Groce *et al.* 2011; Jenkins *et al.* 2013). A recent observational study completed in rural Bangladesh found only two critical

times for hand washing that were associated with reduced diarrhea incidence rates in children: before food preparation and after defecation (Luby *et al.* 2011). The implications of this are that perhaps the critical times for hand washing may not be universally applicable.

The literature indicates a trend in Cambodia: there seems to be greater priority and knowledge regarding drinking water compared with hygiene and sanitation practices among the population. Approximately 49% of the population has access to an improved water source while only 35% have access to an improved sanitation facility (ISF & UTS 2011). Increasing availability and affordability of soap, or promoting low-cost alternatives such as ash, for persons with physical disabilities appears to be of great importance to increase compliance. Improving WASH knowledge, particularly regarding hygiene and sanitation, should be another target area moving forward in WASH program activities specifically targeting persons with physical disabilities.

Lack of physical strength was a recognized barrier to accessing safe drinking water for persons with physical disabilities, a finding related to the environmental barriers that were also identified. In rural household settings, proximity to the water source has been found to be a significant determinant of accessibility for persons with physical disabilities. A distance of up to 20 meters is often considered to be a reasonable proximity to facilitate accessibility (Jones *et al.* 2003) and this was also supported in the present study. Furthermore, previous research has shown an inverse relationship between distance to the water source and amount of water consumed (Cairncross 1987). This relationship is likely stronger for persons with physical disabilities in that the distance to the water source will acutely affect their water consumption.

Ensuring an unencumbered pathway to a water source is essential (Jones *et al.* 2003). This path should be free of debris and suitable for either crutches or potentially a wheelchair. The literature has also illustrated the importance of having accessible latrines. Latrines should be easy to enter and large enough for a wheelchair or an individual with crutches to maneuver inside (Jones *et al.* 2003). A large percentage of the rural Cambodian population defecates openly due to lack of proper latrine facilities (ISF & UTS 2011). This not only poses environmental health risks, but also considerable physical risks to individuals, particularly lower limb

amputees who rely on their hands to move through brush and debris to find privacy. Issues of environmental accessibility have implications for those dealing with water in a variety of settings. This study focused primarily on the household environment, but the same type of effort is also needed for governments and NGOs working outside the household setting to provide WASH access to persons with physical disabilities.

An encouraging finding from the study was that all but one of the respondents who possessed a BSF were able to use (pour water through the filter) and maintain (clean the sand) it. This further supports the literature in that often low-cost, simple solutions are appropriate and effective when working to reach those most marginalized, in this case PWDs (Pradhan & Jones 2008; Groce *et al.* 2011). Acknowledging that the WASH access needs of persons with physical disabilities can be met most often through affordable and easily implemented technologies is an initial step forward in ensuring full accessibility for persons with physical disabilities.

Financial barriers limit WASH access among both disabled and able-bodied populations, but are accentuated for persons with physical disabilities. In terms of participants' responses, finances were most frequently identified as a barrier for persons with physical disabilities in their struggle to access safe drinking water, with 13 out of 15 respondents noting finances as a barrier. As a result, intervention strategies to address income disparities may need to be further integrated into ongoing WASH programs, for example improving promotion and availability of low-cost options such as BSFs and ash. Study findings were supported by information gleaned from a literature review on the topic that highlighted the profoundly high unemployment rate among PWDs in rural Cambodia (JICA 2002). Ensuring that one's family has food and shelter is often deemed of greater priority when compared with WASH accessibility and items such as soap and filtered water (Pradhan & Jones 2008).

Recommendations

Equipping and training staff

The availability of appropriate training, equipping, and planning for implementers is necessary. Currently, knowledge

and awareness about all PWDs is essentially non-existent, posing a serious barrier to PWDs in improving their living conditions and raising their profile among the able-bodied community (Connelly 2009). Changing attitudes and perceptions about all PWDs is needed within communities, and especially in workplaces, to increase social support for PWDs. Staff education about the WASH issues faced by all PWDs and establishing community contacts and representatives for the disabled population are essential for dealing with these issues (Norman 2010).

Engaging NGO staff in conversations about all PWDs is critical to 'creating a presence' for PWDs. To help initiate a dialogue that will in turn contribute to a more positive and understanding social environment for PWDs, stakeholders are encouraged to ask questions such as: What do you think about PWDs? Why do you think that? How can you interact with PWDs in a more positive and proactive way? These recommendations are based on findings that link the presence of social support to WASH accessibility levels, especially in the workplace environment. Creating a sense of understanding in the community, particularly among WASH implementation leaders, will help to facilitate growth in social support for PWDs and thus increase their level of access.

An additional point of consideration for NGO staff and implementers is that home-based programs and lessons are important when working with persons with physical disabilities. Hygiene lessons often occur in village centers but, based on this study's findings, many persons with physical disabilities find it difficult to access these centers due to lack of transportation and, often, their inability to walk. The inaccessibility of education and training sites contributes to the lack of knowledge and understanding of WASH-related issues among persons with physical disabilities including topics such as the importance of safe drinking water and proper hand washing protocol. Ensuring that persons with physical disabilities are able to attend WASH training events will undoubtedly help increase their awareness of such issues.

Technical intervention

Water pumping at source sites and transportation of water to households have been identified as barriers for persons

with physical disabilities in accessing safe drinking water (Jones *et al.* 2003) and need to be examined (WaterAid 2007). For example, when asked about the design/nature of their water source, several of the respondents commented that having a concrete ring around their well would greatly increase its accessibility. Moving forward, governmental organizations, NGOs, and other implementers should focus not only on ensuring that there is a water source but, more importantly, that persons with physical disabilities can access this water source. This can be done through discussions with persons with physical disabilities about their accessibility needs and through the inclusion of all disabled populations in community needs assessments. The Water Engineering and Development Centre, in collaboration with WaterAid, has developed a series of useful tools to assess the safety and accessibility of latrines and water points for physically vulnerable populations such as persons with disabilities and the elderly (House *et al.* 2014). These tools would be relevant for WASH sector implementers to leverage as they strive to build safe and accessible WASH infrastructure. In addition, information dissemination is lacking in terms of low-cost and low technology solutions across implementation sites and geographic regions (WaterAid 2007), something that could be mitigated with the use of a centralized database for information and increased networking among NGOs and other implementers in the field.

Incorporating disability perspective

It is imperative to incorporate the perspectives of all PWDs into the development of WASH program activities. Incorporating a 'disability perspective' refers to the interaction between PWDs and NGO and government WASH implementers. Incorporating a disability perspective is crucial to progress in the field of accessibility for PWDs as it provides an opportunity for PWDs to be consulted about the issues that directly affect their quality of life and health status (Pradhan & Jones 2008). Organizations should start by having a discussion with all PWDs about their capabilities, needs, and barriers that they face to WASH access. Information gleaned from such encounters, for example focus groups or interviews, is invaluable to moving forward with the disability development agenda (Jones *et al.* 2003; Groce *et al.* 2011). An example based on this study's findings

is that persons with physical disabilities reported ability to treat their drinking water (using a BSF), but many respondents noted a barrier in accessing a water source because of ground level wells. Through such discussions, implementers are better able to focus their intervention and more effectively meet the needs of those with disabilities.

Needs assessments must also include identifying the presence of all PWDs in rural communities. Without the initial knowledge of their presence, very little can be done to target the needs of PWDs. Building upon this recommendation, the next step is to have a plan in place for policy and program implementation for those with disabilities, including consideration of legal rights (Connelly 2009). These recommendations are in response to the lack of knowledge surrounding WASH topics. Although this issue concerns able-bodied and disabled individuals, the lack of knowledge and compliance with appropriate protocols is heightened for PWDs.

Future research

Future research is essential to increase the knowledge and understanding about the barriers and issues all PWDs encounter in their struggle to attain basic WASH services (Groce *et al.* 2011). As a follow-up research study it would be particularly useful to examine sanitation access with reference to PWDs. Also, the workload of family members of PWDs; in particular, to note if there is an added burden on children, and what the implications are on gender-specific workload. Lastly, larger longitudinal studies are thought to be a fruitful source of information about the long-term impacts of interventions, and the direct effects of the interventions and treatment systems, on PWDs and their larger social support systems (Groce *et al.* 2011).

Limitations

There were several limitations to the study. First, due to the mobile nature of much of Cambodia's work force, only 15 respondents were available for interviews. Second, respondents were drawn from convenience and not a random sample of persons with physical disabilities in rural Cambodia, and all respondents were male which limits the generalizability of the findings to other groups such as

females with physical disabilities. Nevertheless, the problems faced by persons with physical disabilities are relatively similar across geographic regions in rural communities (WaterAid 2007). Information gleaned from this sample is thus likely relevant to other people with physical disabilities in rural areas, and agencies striving to increase access to WASH services in the region. Third, the primary researcher was not Cambodian, and linguistic and cultural differences may have had an effect on the data collection and analysis. Back translation of the questionnaire was performed and a local translator was employed to facilitate the interview process and translate respondent statements. However, translational issues should be kept in mind when reviewing the study findings. Fourth, the study is limited to the analysis and interpretation of reported hygiene practices with no actual assessment of practices. This is a limitation because reported and observed hand washing practices can vary greatly (ISF & UTS 2011; Jenkins *et al.* 2013). An observational component, or more in-depth interview process, could perhaps have verified the responses, or may have provided more insight into the reasons for such low reported hand washing.

CONCLUSION

Despite these limitations, the study is unique in that there are few qualitative studies examining WASH access for persons with physical disabilities in rural areas. The qualitative nature of the study allowed the researcher to attain an in-depth understanding of the lives of persons with physical disabilities in relation to WASH access in rural Cambodia and to identify several critical barriers they face in this regard. First, substantial environmental barriers exist to accessing safe drinking water in the home and work environments, although persons with physical disabilities have greater family and social supports within the household environment. Second, persons with physical disabilities had greater awareness about safe drinking water compared with basic hygiene. Third, lack of physical strength and distance to the water source were found to be common barriers to WASH accessibility. Fourth, lack of financial means was found to be a significant barrier to

accessibility of safe drinking water for persons with physical disabilities.

Three main recommendations emerged from these conclusions. The first recommendation is to equip and train NGO and implementation staff about issues of WASH accessibility faced by persons with physical disabilities. This training is essential to create a sense of understanding in the community and increase social support and thus accessibility. Second, when considering technical interventions, implementers need to prioritize not only the provision of a water source, but also the accessibility of that particular water source for persons with physical disabilities. Third, incorporating a disability perspective into the WASH discourse is essential to capture the differences in accessibility for able-bodied people and persons with physical disabilities to safe drinking water and basic hygiene and sanitation services. There is not only a responsibility for NGOs and other implementers to address the current WASH needs and issues of accessibility for persons with physical disabilities, but also an opportunity for these organizations to be leaders in the field and to make a substantial difference in the lives of many who are often marginalized and forgotten.

ACKNOWLEDGEMENTS

The authors wish to thank the Canadian Merit Scholarship Foundation, Samaritan's Purse Canada, Clear Cambodia, and the Arthur J. E. Child Foundation for their financial contributions which facilitated the field research component of this work, as well as Clear Cambodia and Samaritan's Purse Canada for field-level support. The authors declare no conflicts of interest.

REFERENCES

- Bakhshi, P., Trani, J. F. & Rolland, C. 2006 *Conducting Surveys on Disability: A Comprehensive Toolkit*. Handicap International, France.
- Boyatzis, R. 1998 *Transforming Qualitative Information*. Sage Publications, London.
- Cairncross, S. 1987 The benefits of water supply. In: *Developing World Water* (J. Pickford, ed). Grosvenor Press International, Hong Kong, pp. 30–34.
- Connelly, U. 2009 Disability rights in Cambodia: using the convention on the rights of people with disabilities to expose human rights violations. *Pacific Rim Law & Policy Journal* 18, 123–153.
- Coussens, C. 2009 *Global Environmental Health: Research Gaps and Barriers for Providing Sustainable Water, Sanitation, and Hygiene Services: Workshop Summary*. Institute of Medicine, Washington, DC.
- DAC 2009 Inclusion of People with Disabilities in Cambodia, October 2009. Retrieved from http://www.ilo.org/wcmsp5/groups/public/@ed_emp/@ifp_skills/documents/publication/wcms_115096.pdf.
- Dyck, K., Cantwell, R. & Vreeken, A. 2009 Samaritan's Purse strategic implementation of the biosand filter. In *Proceedings of the WEF/IWA/AWWA Disinfection 2009 Specialty Conference*, February 2009, Atlanta, Georgia.
- Groce, N., Bailey, N., Lang, R., Trani, J. F. & Kett, M. 2011 Water and sanitation issues for persons with disabilities in low-and middle-income countries: a literature review and discussion of implications for global health and international development. *Journal of Water and Health* 9, 617–627.
- Handicap International 2009 *Briefing Paper: Disability Facts in Cambodia*. Handicap International, France.
- Harte, C. 1999 Prosthetics and orthotics services in landmine-affected countries in the developing world: a personal view from Cambodia. *Victim and Survivor Assistance* 3. Retrieved from <http://www.jmu.edu/cisr/journal/3.3/focus/newharte.htm>.
- Hernandez, O. 2010 *Access and Behavioural Outcome Indicators for Water, Sanitation and Hygiene*. United States Agency for International Development, Washington, DC.
- House, S., Ferron, S., Sommer, M. & Cavill, S. 2014 *Violence, Gender & WASH: A Practitioner's Toolkit – Making Water, Sanitation and Hygiene Safer through Improved Programming and Services*. WaterAid/SHARE, London.
- Hunter, P. 2009 Household water treatment in developing countries: Comparing different intervention types using meta-regression. *Environmental Science and Technology* 43, 8991–8997.
- ISF & UTS 2011 *Cambodia Water, Sanitation and Hygiene Sector Brief*. Australia: Institute for Sustainable Futures and the University of Technology, Sydney.
- Jenkins, M. W., Anand, A., Revell, G. & Sobsey, M. D. 2013 Opportunities to improve domestic hygiene practices through new enabling products: A study of handwashing practices and equipment in rural Cambodia. *International Health* 5, 295–301.
- JICA (Japan International Cooperation Agency) 2002 Country Profile on Disability: Kingdom of Cambodia. JICA Planning and Evaluation Department.
- Jones, H. & Jansz, S. 2008 *Disability and Sanitation: Soap and Toilet Briefing Note 3*. WaterAid, London, UK.
- Jones, H., Reed, R. & House, S. 2003 Water Supply and Sanitation Access and Use By Physically Disabled People, Report of Field Work in Cambodia. WEDC, Loughborough University, UK.

- Luby, S., Halder, A., Huda, T., Unicomb, L. & Johnston, R. 2011 The effect of handwashing at recommended times with water alone and with soap on child diarrhea in rural Bangladesh: An observational study. *PLoS Medicine* **8**, 1–12.
- Mintz, E., Bartram, J., Lochery, P. & Wegelin, M. 2001 **Just a drop in the bucket: Expanding access to point-of-use water treatment systems.** *American Journal of Public Health* **91**, 1565–1570.
- Norman, W. R. 2010 *Water, Sanitation and Disability in Rural West Africa: Enhancing Access and Use of the WASH Facilities.* Messiah College, Grantham, PA.
- Onda, K., Lo Buglio, J. & Bartram, J. 2012 **Global access to safe water: accounting for water quality and the resulting impact on MDG progress.** *International Journal of Environmental Research and Public Health* **9**, 880–894.
- Pradhan, A. & Jones, O. 2008 *Creating User-friendly Water and Sanitation Services for the Disabled. The Experience of WaterAid Nepal and its Partners.* WaterAid, Nepal.
- Sin, S., McGill, N. & Mayr, H. 2008 Handwashing perceptions and practices among rural Cambodian people. In Study presented by ADRA at the WFP/PHA/APHA Annual International Health Breakfast, December 2008, San Diego, California.
- Thapa, R. 2011 *Victim Assistance in Cambodia: The Human Face of Survivors and their Needs for Assistance.* Handicap International, Brussels.
- UN 2011 *Disability and the Millennium Development Goals.* Department of Economic and Social Affairs, New York.
- UN Enable 2008 Factsheet on Persons with Disabilities. Retrieved from <http://www.un.org/disabilities/default.asp?id=18>.
- UNICEF 2013 *Water, Sanitation and Hygiene Annual Report 2012. UNICEF WASH Section Program Division,* New York.
- WaterAid 2007 *All People, One Goal, All Access: Water and Sanitation Access for People with Disabilities.* WaterAid, Mali.
- WHO (World Health Organization) 2011 *World Report on Disability.* WHO, Geneva.
- WHO 2012 Disability and health: Fact sheet N352. Retrieved from <http://www.who.int/mediacentre/factsheets/fs352/en/>.
- WHO & UNICEF 2006 *Meeting the MDG Drinking Water and Sanitation Target: The Urban and Rural Challenge of the Decade.* WHO and UNICEF, Switzerland.

First received 8 January 2014; accepted in revised form 11 May 2014. Available online 31 May 2014