

WaSH Policy Research Digest

ISSUE #12, JULY 2019: HEALTH EFFECTS OF CARRYING WATER

Detailed Review of a Recent Publication: Carrying water, particularly on the head, can lead to serious neck and spine injury

[Geere, J.-A., Bartram, J., Bates, L., Danquah, L., Evans, B., Fisher, M.B., Groce, N., Majuru, B., Mokoena, M.M., Mukhola, M.S., Hung Nguyen-Viet, Phuc Pham Duc, Rhoderick Williams, A., Schmidt, W.-P., Hunter, P.R. \(2018\). Carrying water may be a major contributor to disability from musculoskeletal disorders in low income countries: a cross-sectional survey in South Africa, Ghana and Vietnam. *Journal of Global Health* 8\(1\), 010406. doi:10.7189/jogh.08.010406.](#)

This paper describes the first large scale study to identify adverse health impacts on people who carry water. Information was collected on pain, disability, general health status and history of water carrying from almost a thousand respondents who carried water, either currently or in the past, in low-income districts in South Africa, Ghana and Vietnam. The majority of respondents (79%) were female, which is consistent with past findings by the Joint Monitoring Programme that women and girls are responsible for water collection in eight out of ten households in which water is not available on the premises, and must be carried (WHO and UNICEF, 2017).

The sampling included an equal number of households with water supplies at home and households who used water supplies off their premises. Using a household survey questionnaire, respondents were asked about their water supply, whether they currently or had ever carried water, and for how long, and their usual method of water carriage. Respondents were asked whether they had difficulty in carrying out certain activities such as walking, climbing steps using their legs or arms, and their general perception of their health. An important approach to data collection was to ask respondents about the perceived severity, frequency and duration of pain

Key Policy and Programmatic Takeaways

- Fetching water is associated with a variety of negative health outcomes in water carriers, and also with physical, sexual or emotional abuse.
- The health problems associated with water carriage can only be eliminated if all households have water on premises, which is one of the parameters of “safely managed” water called for under the Sustainable Development Goals.
- In areas where water fetching must continue, strategies should focus on reducing the distance to water sources, providing alternatives to carrying water on the head, such as wheelbarrows, and eliminating gender-based violence.

in particular locations in their bodies, which allowed a comparison of pain sites and water carrying history.

The authors found that people reporting that they currently carried water, or had in the past, were much more likely to report pain in locations typically associated with compression of the neck and upper back.

The authors explain that carrying water containers, particularly on the head (head loading), may impart physical stress to the bones and soft tissues of the neck and upper back through vertical compression, also called ‘axial loading’ or ‘axial compression.’ Loading stress can cause pain to be perceived in the head, upper back and chest region, or in the hands; pain may be perceived at a location other than the site of its origin through a mechanism called pain referral. Compared to people who had never carried water, people who currently carried water, were found to have an increased relative risk of reporting pain in the head, chest or ribs, upper back and hands, a pattern associated with axial compression. Similarly, people who previously carried water had increased relative risk of reporting pain in the upper back and hands. And, not surprisingly, pain locations associated with axial compression were significantly more likely to be reported among people who currently carried water by head loading.

The authors explain that adverse effects due to axial loading stress could occur gradually, leading to degenerative changes, resulting in a condition known as cervical spondylosis. The authors cite previous research that shows that “particularly in Africa, regular head loading has been linked to cervical spondylosis and very heavy cervical loading to severe trauma and death. People with cervical spondylosis [...] have been shown to be more at risk of serious spinal cord injury and its severely disabling consequences after even minor, indirect trauma to the cervical spine.” Compression of the neck and spine can thus lead to serious long-term disability in later life. The authors note that this may be particularly dangerous for pubescent females who have more slender spines than adults, which is of concern as in many households it is young girls who carry water for their families (WHO and UNICEF, 2017).

An interesting finding was that not only households with off-premises supply reported they carried water —many who currently had water piped to their houses had carried water regularly in the past, and even those with on-premises supply carried water sometimes due to interruptions. Episodes of interruption to water supplies at home requiring water carriage from off-plot

sources were reported from Ghana and South Africa. The research indicated that those with on-plot supply in South Africa seemed less prepared for water carriage and usually head loaded water, while over 40 % of those without on-plot supply used wheelbarrows. The authors suggest that unreliable water supply may affect water carriage patterns in an additional way, as this “could force women to collect as much water as possible when it is available, rather than pacing their work to avoid fatigue or pain due to tissue overload.”

The methodology used in the study had some limitations. Importantly, there was no assessment of participants by health professionals; the assessment of pain and disability was based on self-reporting (that is, what respondents told the enumerators). The authors also point out that they did not include questions about other items that were carried, such as firewood, which is also often head loaded.

The authors conclude by pointing out that musculoskeletal disorders are within the top ten causes of years lived with disability in developing countries. Combined with fractures and soft tissue injuries, they have been estimated to account for over a fifth of global years lived with disability. The authors state that “it is likely that the burden of musculoskeletal disease from water carriage is substantial.”

The results of this research underline the importance of providing water on premises, as called for in Sustainable Development Goal (SDG) 6. The Joint Monitoring Programme estimates that in 2017 a quarter of the world’s population still used water sources some distance from their homes, and in rural areas, 40% of people were obliged to fetch water from a source off-premises. In 2017 there were still over 200 million people worldwide who walked more than 30 minutes round trip to collect water (WHO and UNICEF, 2019). The authors suggest that “where people must continue to access their water from off-plot sources, enabling them to use alternative water carriage methods rather than head loading is a good first step. This could involve provision of affordable equipment, such as wheelbarrows, improving access pathways to facilitate their use.”

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Literature Review: Water carriage and water carriers’ health

The work of carrying water from off-plot sources is mainly done by women and children, particularly in sub-Saharan Africa and in rural areas (WHO and

UNICEF, 2017). Concerns have been raised about the physical burden and time costs of fetching water, and—as the paper reviewed in detail in the first part of

this Digest shows—evidence is emerging on the adverse effects on the health of the person who collects and carries water home.

A systematic review of 42 studies supported the view that fetching water is associated with water carriers experiencing and reporting health problems (Geere et al. 2018), despite the fact that many of the studies were unable to follow people over time as they developed health problems, or take into account reporting biases due to poor memory of their symptoms or inaccurate accounting. There might have been other unknown or unmeasured reasons for their health problems.

Despite these limitations, Geere et al. found that there is strong qualitative evidence, gathered mainly from one-on-one or group interviews, and moderate quantitative evidence gathered mainly from structured surveys, that fetching water is associated with water carriers experiencing pain or injury and fatigue. In a study of water carrying among children in Malawi, researchers found that one in three children reported pains and health problems as their biggest difficulty faced in carrying water, with headaches and neck aches being the most frequently cited problems for one-quarter of children (Robson, et al., 2013). An assessment of gender implications of water carriage in Nigeria found that 788 of the 800 girls studied reported experiencing neck and back pain from carrying an excessive load of water (Ayoade et al., 2017). Ayoade et al. also report that 90% of girls interviewed said they had experienced some form of violence or injury while carrying water; a fifth of them reporting injuries from physical fights at water points. Tiredness or fatigue was a common complaint, not surprising as water collection starts very early in the morning and can take as much as eight hours for a return trip (Robson et al., 2013, Zolnikov and Blodgett Salafia, 2016). Study participants also reported pain developing over time as age related or arthritic changes in joints made carrying heavy containers difficult (Schatz and Gilbert, 2014).

Similarly, evidence suggests that when women who are responsible for fetching water are pregnant or caring for very young children, they report poorer health (Mukuhlani and Nyamupingidiza, 2014). In addition, their water carrying responsibilities may create obstacles to accessing health and social care services. In rural

South Africa, research showed that if making a trip to the health clinic affected their daily water fetching tasks, women were less likely to utilise prenatal care (McCray, 2004). A study in Kenya showed that married women whose husbands did not help fetch water were significantly less likely to give birth in a health care facility (Ono et al., 2013).

Studies conducted in many countries indicated that people can experience physical, sexual or emotional abuse during water fetching trips (Ayoade et al., 2017; Krumdieck et al., 2016). The evidence also revealed that people with disability, with long term health conditions such as HIV/AIDs, or belonging to specific social groups face discrimination during water fetching. For instance, HIV- and AIDs-affected households in Ethiopia indicated that their status compromised their access to water resources (Yallew et al., 2012) and Dalit women in India frequently experience discrimination and abuse, most often from women of other castes, while fetching water (House et al., 2014).

Four studies found that water carriers had higher levels of stress (Belue, et al. 2008; Henley, et al. 2014, Zolnikov and Blodgett Salafia, 2016; Stevenson, et al., 2012). They highlighted that the stress associated with water carriage could be due to reduced family time and poorer interpersonal relationships at home, conflicts which arise in the community or at home over water use and domestic tasks, the physical challenges of collecting water, and the lack of safety during water fetching trips.

Research has also revealed that water carriers have poorer general health when people were asked to remember and rate their health over time. For instance Hemson (2007) found that three-quarters of South African children reporting worsened health were spending more than 14 hours a week collecting water, and 87% of these children stated that their health was compromised by collecting water.

The literature shows that fetching water is a barrier to achieving SDG 3 (“ensure healthy lives and promote wellbeing for all at all ages”) because of its association with health problems. The burden of water collection, and the fact that it falls disproportionately on women and girls, is also a barrier to achieving target 1 of SDG 6 (“universal and equitable access to safe and affordable drinking water for all”).

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References

- Ayoade, A., Sikiru, S., Okanlawon, P.O. (2017). [Assessment of water provision and associated risks among children in Abeokuta peri-urban, Ogun state, Southwestern Nigeria: The gender implications](#). *The Journal of Gender and Water* 4(1), 73–81.
- BeLue, R., Schreiner, A.S., Taylor-Richardson, K., Murray-Kolb, L.E., Beard, J.L. (2008). What matters most: An investigation of predictors of perceived stress among young mothers in Khayelitsha. *Health Care for Women International* 29, 638–648. [doi:10.1080/07399330802089198](#).
- Geere, J.-A.L., Cortobius, M., Geere, J.H., Hammer, C.C., Hunter, P.R. (2018). Is water carriage associated with the water carrier's health? A systematic review of quantitative and qualitative evidence. *BMJ Global Health* 3, e000764. [doi:10.1136/bmjgh-2018-000764](#).
- Geere, J.-A.L., Bartram, J., Bates, L., Danquah, L., Evans, B., Fisher, M.B., Groce, N., Majuru, B., Mokoena, M.M., Mukhola, M.S., Hung Nguyen-Viet, Phuc Pham Duc, Rhoderick Williams, A., Schmidt, W.-P., Hunter, P.R. (2018). Carrying water may be a major contributor to disability from musculoskeletal disorders in low income countries: a cross-sectional survey in South Africa, Ghana and Vietnam. *Journal of Global Health* 8(1), 010406. [doi:10.7189/jogh.08.010406](#).
- Hemson, D. (2007). The toughest of chores: policy and practice in children collecting water in South Africa. *Policy Futures in Education* 5(3), 315–326. [doi:10.2304/pfie.2007.5.3.315](#).
- Henley, P., Lowthers, M., Koren, G., Fedha, P.T., Russell, E., VanUum, S., Arya, S., Darnell, R., Creed, I.F., Trick, C.G., Bend, J.R. (2014). Cultural and socio-economic conditions as factors contributing to chronic stress in sub-Saharan African communities. *Canadian Journal of Physiology & Pharmacology* 92, 725–732. [doi:10.1139/cjpp-2014-0035](#).
- 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](#). London: WaterAid/SHARE.
- Krumdieck, N.R., Collins, S.M., Wekesa, P., Mbullo, P., Boateng, G.O., Onono, M., Young, S.L. (2016). Household water insecurity is associated with a range of negative consequences among pregnant Kenyan women of mixed HIV status. *Journal of Water and Health* 14(6), 1028–1031. [doi: 10.2166/wh.2016.079](#).
- McCray, T. M. (2004). An issue of culture: the effects of daily activities on prenatal care utilization patterns in rural South Africa. *Social Science & Medicine* 59, 1843–1855. [doi:10.1016/j.socscimed.2004.02.033](#).
- Mukuhliani, T., Nyamupingidza, M.T. (2014). Water scarcity in communities, coping strategies and mitigation measures: the case of Bulawayo. *Journal of Sustainable Development* 7, 144–160. [doi:10.5539/jsd.v7n1p144](#).
- Ono, M., Matsuyama, A., Karama, M., Hond, S. (2013). Association between social support and place of delivery: a cross-sectional study in Kericho, Western Kenya. *BMC Pregnancy and Childbirth* 13, 214. [doi:10.1186/1471-2393-13-214](#).
- Robson, E., Porter, G., Hampshire, K., Munthali, A. (2013). Heavy loads: children's burdens of water carrying in Malawi. *Waterlines* 32(1), 23–35. [doi:10.3362/1756-3488.2013.003](#).
- Schatz, E., 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. [doi:10.1080/07399332.2014.900064](#).
- Stevenson, E.G., Greene, L.E., Maes, K.C., Ambelu, A., Tesfaye, Y.A., Rheingans, R., Hadley, C. (2012). Water insecurity in 3 dimensions: an anthropological perspective on water and women's psychosocial distress in Ethiopia. *Social Science & Medicine* 75, 392–400. [doi:10.1016/j.socscimed.2012.03.022](#).
- United Nations Children's Fund (UNICEF) and World Health Organization (WHO). (2017). [Safely managed drinking water – thematic report on drinking water 2017](#). Geneva: World Health Organisation.
- United Nations Children's Fund (UNICEF) and World Health Organization (WHO). (2019). [Progress on household drinking water, sanitation and hygiene 2000-2017: Special focus on inequalities](#). New York: WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene.
- Yallew, W.W., Terefe, M.W., Herchline, T.E., Sharma, H.R., Bitew, B.D., Kifle, M.W., Tetemke, D.M., Tefera, M.A., Adane, M.M. (2012). Assessment of water, sanitation, and hygiene practice and associated factors among people living with HIV/AIDS home based care services in Gondar city, Ethiopia. *BMC Public Health* 12, 1057. [doi:10.1186/1471-2458-12-1057](#).
- Zolnikov, T. R., Blodgett Salafia, E. (2016). Improved relationships in eastern Kenya from water interventions and access to water. *Health Psychology* 35(3): 273-280. [doi:10.1037/hea0000301](#).