Research Paper

Backpack use as an alternative water transport method in Kisumu, Kenya

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ABSTRACT

In developing countries, most households transport water from distant sources, placing physical burdens on women and children, who commonly carry water on their heads. A lightweight backpack was developed to alleviate physical stress from water carriage and provide a safe storage container. In 2015, we conducted a baseline survey among 251 Kenyan households with children <5 years old, distributed one backpack per household, and made 6 monthly home visits to ask about backpack use. At baseline, the median reported water collection time was 40 minutes/round trip; 80% of households reported collecting water daily (median 3 times/day). At follow-up visits, respondents reported backpack use to carry water ranged from 4% to 20% in the previous day; reported backpack use for water storage in the previous day ranged from 31% to 67%. Pain from water carriage was reported at 9% of all follow-up visits. The odds of backpack use in the past day to collect water were lower during rainy season (OR: 0.3, 95% CI: 0.2–0.3) and not associated with reported pain (OR: 1.7, 95% CI: 0.9–3.3). Our study suggests that participants preferred using the backpacks for storage rather than transport of water. Further dissemination of the backpacks is not recommended because of modest use for transport.

Key words | backpack, Kenya, musculoskeletal pain, water storage, water transport

HIGHLIGHTS

- A backpack for water carriage which was already distributed to several poor countries has not been objectively evaluated.
- Backpack use for water transport was modest in Kenya.
- This study suggests that participants preferred using the backpacks for storage rather than transport of water.

INTRODUCTION

In developing countries, water is often collected by women and children using a variety of methods (Ferguson 1986; Page 1995; Geere et al. 200a), walking an average of 6 km, and hauling an average total of 18 kg of water every day (World Vision 2020). Many communities in western Kenya do not have household or community taps available and residents must leave their household premises to collect water. According to the 2014 Kenya Demographic and Health Survey (KDHS), nearly 60% of households do not have an onsite water source, and residents of 40% of rural households have to walk more than 30 min to obtain their drinking water, carrying water most often on the head (KDHS 2014).

With a volume of 20 liter, a typical jerrycan or bucket used to carry water weighs over 20 kg when filled. The
weight of the loads and the repetitive stress placed on the spine by carrying water on the head have been shown to result in back and neck pain and radiographic changes in the spine (Levy 1968; Jumah & Nyame 1994; Jäger et al. 1997; Geere et al. 2010b). In addition, open containers or buckets can be easily contaminated if dirty hands, cups, or other items contact the water. Jerrycans, with a narrow opening, reduce this type of contamination, but are difficult to clean because they have a narrow opening.

Habitat for Humanity International (HFHI) and Greif International, an industrial packaging company (Delaware, OH), have collaborated to develop a lightweight backpack for water collection and storage called ‘PackH2O’ (https://www파트너스포어케어기도/). PackH2O is seven times lighter than a typical jerrycan, has a removable plastic liner that can be cleaned, and employs a spigot to readily dispense water stored in the backpack (Figure 1). In a preliminary pilot evaluation of the PackH2O, Greif International reported that the product eased transport and shortened water collection time over traditional water collection and storage tools (PIH ZL 2012). However, at the time of this study, there had been no independent evaluations of the PackH2O (Martinsen et al. 2019). Since 2012, over 225,000 backpacks have been distributed around the world, and as of 2018, almost 50,000 PackH2O backpacks had been deployed throughout Kenya with no published evaluations (Noland 2018). This level of investment merits justification by evaluations of use and acceptability of the backpacks as well as an assessment of stored water quality, if they are commonly used for storage.

With the assistance of HFHI, the Safe Water and AIDS Project (SWAP), a Kenyan non-governmental organization, distributed PackH2O backpacks (hereafter referred to as backpack) to rural households in western Kenya and assessed the utility and acceptability of the backpacks as a means of collecting and storing drinking water, and their effectiveness in reducing musculoskeletal pain.

**METHODS**

**Study sites**

We selected a convenience sample of eight rural villages (Kakiki, Kagoo B, Kamwanda West, Kandhere, Karabuok North, Karabouk South, Koulu B, Thim) in Kisumu County, Kenya, where a previous study suggested that the populations had to travel to collect water from their main water sources, which included Lake Victoria, rivers, earth-pans (manmade ponds), and boreholes, and store the water in their homes (KDHS 2014).

**Sample size calculation**

We calculated the approximate sample size of 200 households using the assumption that 50% of the households would use...
the backpack, with a precision of 7% and a confidence level at 95%. Assuming a loss to follow-up of 25%, we attempted to enroll a sample of approximately 250 households.

**Study design and data collection**

This study utilized an experimental, longitudinal, and quantitative design. We obtained rosters of 438 total households in 8 villages from village elders. Eligible participants for the study included female heads of household or child caretakers ≥18 years old, with at least one child <5 years old. In December 2014, enumerators visited households until the desired sample size was reached to collect baseline data, including demographic and socioeconomic characteristics; water sources; water collection, storage, and treatment practices; and musculoskeletal pain related to water carriage. Stored drinking water was also tested for the presence of free chlorine residuals (FCR) using the \( \text{N,N-diethyl 1-4 phenylenediamine sulfate (DPD) method (Hach Co., Loveland, CO, USA).} \) Enumerators obtained household coordinates using mobile devices with Geographic Positioning System (GPS) capabilities and GPS coordinates from a pre-selected random sample of 45 households to calculate a proxy for distance between home and water source. In January 2015, one backpack per household and training about proper backpack use were provided to each enrolled participant at group information sessions in each village. From January to June 2015, monthly follow-up home visits were made over a 6-month period by trained enumerators and community health workers, and the participants were asked about their backpack use and physical pain from water carriage during the same period, with the pain location categorized into a priori list of body regions (Supplemental Table 1). The English survey questionnaire was pre-translated to correspond to participants’ native language (Dholuo) and administered at baseline and follow-up by enumerators fluent in Dholuo.

**Data analysis**

Survey instruments were programmed on personal digital assistants (PDA) using Visual CE software version 10.0 (Syware, Cambridge, MA, USA) and analyses were performed using SAS version 9.4 (Cary, NC, USA). The associations between reported backpack use for carrying water (as a dependent variable) and selected characteristics (as independent variables) were examined using multivariable logistic regression where the unit of analysis was the household. Analyses were conducted separately for reported use in the past month and previous day. The characteristics considered in the analysis were reported pain (yes or no), age group (<24, 24–35, and >35 years), education (<primary, ≥primary), body mass index (BMI), rainy season (yes for April or May, and no), and walking time from water source to home (<10, 11–30, >30 min). BMI was calculated from reported height and weight by respondents, and then categorized into underweight (<18.5 kg/m\(^2\)), normal weight (18.5 to <25 kg/m\(^2\)), and overweight or obese (≥25 kg/m\(^2\)) to explore whether the size of each participant is a determinant of backpack use. Potential correlations from clustered data structure (repeated monthly reports < households < villages) were considered using the Generalized Estimating Equation approach. We note that reports of musculoskeletal pain (at the same period as water carriage) from carrying water were collected during rounds 1–5, but round 6 data were missing and excluded in the analysis. To examine the impact of this exclusion to the results, we also conducted a sensitivity analysis including all six rounds of data without the pain variable.

**Ethical considerations**

The Kenya Medical Research Institute Ethical Review Committee (protocol number 2788) and CDC Institutional Review Board (protocol number 6583) approved the study protocol. We obtained written informed consent from all participants.

**RESULTS AND DISCUSSION**

**Sample characteristics at baseline**

Of 438 households in village rosters (Table 1), 13 were empty during the baseline home visits, 64 could not be
found, 24 did not transport or store water, 22 had no children <5 years old, and 51 were excluded for other reasons (e.g., died, duplicate entries, separated/divorced). Of the remaining 264 households that were eligible for inclusion in the study, 13 refused to participate, which left a total of 251 enrolled in the 8 villages for the baseline survey. The median age of respondents was 26 years (interquartile range or IQR: 22–32 years), 63% finished at least primary school, and 95% had electricity at home (Table 2). The homes of 78% of respondents had an earthen floor and 81% had mud walls. For BMI categorization, 18% were underweight and 17% were overweight or obese. Thirty-six percent of households reported drinking water from an improved source (borehole, rain catchment, covered well, or piped water) and 27% used an improved water storage container (plastic jerrycan or ceramic filter). Approximately half of respondents (54%) reported treating their water, and of these, 43% said they used a chlorine product. Water treatment was confirmed in 1% of households through chlorine residual testing at baseline.

| Table 1 | The number of total households, total households with children <5 years old, and households with children <5 years old sampled at baseline, by village, Kisumu County, Kenya, 2014–2015 |
|-----------------|-----------------------------------------------------------------|
| Village      | Total households | Households with children <5yo in villages | Households with children <5yo in sample |
| Kakiki       | 171              | 67 39 42 63  |  |
| Kagoo B      | 235              | 89 38 47 53  |  |
| Kamwanda West | 125              | 52 42 33 63  |  |
| Kandhere     | 68               | 35 51 18 51  |  |
| Karabuk North| 94               | 45 48 26 58  |  |
| Karabuk South| 128              | 59 46 35 59  |  |
| Koulu B      | 216              | 56 26 35 63  |  |
| Thim         | 94               | 35 37 15 43  |  |
| Total        | 1,131            | 438 39 251 57  |  |

| Table 2 | Baseline characteristics of participants, Kisumu in Kenya, 2014–2015, N = 251 |
|-----------------|-----------------------------------------------------------------|
| Participants, N (%) or median [IQR]                      |                              |
| Age in years, median [IQR] | 26 [22–32] |
| <24                      | 84 (33) |
| 24–35                    | 131 (52) |
| >35                      | 36 (14) |
| Education: ≥primary     | 159 (63) |
| BMI, kg/m²               |                              |
| Underweight (<18.5)     | 46 (18) |
| Normal weight (18.5 to <25) | 162 (65) |
| Overweight or obese (25+) | 43 (17) |
| Have electricity in the house | 238 (95) |
| Observed main material for floor                           |                              |
| Thatch                 | 197 (78) |
| Wood                   | 52 (21) |
| Other                  | 2 (1) |
| Observed main material for roof                            |                              |
| Thatch                 | 25 (10) |
| Iron sheet/tile/asbestos sheets                         | 225 (90) |
| Other                  | 1 (0) |
| Observed main material for wall                           |                              |
| Dung/mud               | 202 (81) |
| Metal/cement/plaster/bricks/blocks/stones                 | 48 (19) |
| Other                  | 1 (0) |
| BMI, kg/m²               |                              |
| Underweight (<18.5)     | 46 (18) |
| Normal weight (18.5 to <25) | 162 (65) |
| Overweight or obese (25+) | 43 (17) |
| Improved drinking water sourcea | 91 (56) |
| Improved drinking water containerb | 69 (27) |
| Treat drinking water? | 135 (54) |
| → If yes, what do you do to it? select all that apply      |                              |
| Chlorination            | 107 (43) |
| Filter or boil          | 27 (11) |
| Other                   | 15 (6) |
| Observed container lid  | 210 (84) |
| Observed latrine        | 131 (52) |
| Confirmed chlorination  | 3 (1) |

*aBorehole, rain catchment, covered well, or piped water.
*bPlastic jerrycan or ceramic filter.
Drinking water collection and physical pain from carrying water at baseline

At baseline, about one-third (32%) of respondents said they used plastic jerrycans and the rest used buckets (or bucket-like) containers to collect water, and 99% carried water on their heads (Table 3). The median reported time to collect water (per round trip) was 40 min (IQR: 30–60 min). Eighty percent of respondents reported collecting water every day and, of these, 85% said they collected water at least three times per day. A majority of respondents (91%) said they have had pain from carrying water at some time during their life, with the most frequently reported locations including chest (46%), head (43%), and neck (36%). These were also the most commonly reported locations for pain during the past 2 weeks. The median distance from home to water source calculated from GPS coordinate data of 44 households was 415 m (IQR: 228–688 m) (data not shown).

Backpack use and pain for water carriage at follow-up

Among 251 respondents, we distributed backpacks to a subset of 239 women in January 2015 (three refused to participate and nine were away at the time of distribution). Among 239 participants, a total of 1,334 follow-up home visits were made, with a median of 223 monthly visits ranging from 216 to 228 visits. In nearly two-thirds of these visits (62%), respondents said they collected water with the backpack in the past month and 13% said they used the backpack for water collection in the past day (Table 4). The monthly rate of reported use of the backpack for water collection during the previous month varied from 37 to 85%, and from 4 to 20% for the previous day (Figure 2). Respondents reported even storing water in the backpack over the past month during 83% of home visits, and either today or during the previous day at 64% of visits (Table 4). Water was observed in the backpack at 48% of home visits, which varied by month from 31 to 67% (Figure 2). Pain from carrying water was reported at only 9% of all home visits (Table 4). Among backpack users, reported pain ranged from 6 to 19% in the previous month and 0 to 19% in the previous day (Figure 3). Among

### Table 3

| Type of water container to collect and carry home | Participants, N (%) |
|------------------------------------------------|---------------------|
| Plastic jerrycan                                | 80 (32)             |
| Buckets                                         | 171 (68)            |

| How do you carry water to home? Select all that apply | Participants, N (%) |
|------------------------------------------------------|---------------------|
| Head                                                 | 249 (99)            |
| Hands                                                | 11 (4)              |
| Back                                                 | 1 (0.4)             |

| Time to collect water (round trip), min              | Participants, N (%) |
|-----------------------------------------------------|---------------------|
| 40 [30–60]                                          |                     |

| Time from home to water source                       | Participants, N (%) |
|-----------------------------------------------------|---------------------|
| 15 [10–25]                                          |                     |

| Time from water source to home                       | Participants, N (%) |
|-----------------------------------------------------|---------------------|
| 25 [10–35]                                          |                     |

| No. of trips to collect water per week               | Participants, N (%) |
|-----------------------------------------------------|---------------------|
| Every day                                           | 200 (80)            |
| Other                                               | 51 (20)             |

| If every day, no. of trips to collect water per day  | Participants, N (%) |
|-----------------------------------------------------|---------------------|
| <3                                                  | 31 (15)             |
| ≥3                                                  | 169 (85)            |

| Any pain from carrying water in lifetime             | Participants, N (%) |
|-----------------------------------------------------|---------------------|
| Head                                                | 136 (54)            |
| Neck                                                | 90 (36)             |
| Shoulder                                            | 17 (7)              |
| Upper back                                          | 41 (16)             |
| Lower back                                          | 52 (21)             |
| Chest                                               | 115 (46)            |
| Ribs                                                | 14 (6)              |
| Knee                                                | 25 (10)             |

| Any pain from carrying water <2 week                 | Participants, N (%) |
|-----------------------------------------------------|---------------------|
| Head                                                | 69 (27)             |
| Neck                                                | 50 (20)             |
| Shoulder                                            | 11 (4)              |
| Upper back                                          | 18 (7)              |
| Lower back                                          | 32 (13)             |
| Chest                                               | 48 (19)             |
| Ribs                                                | 15 (6)              |
| Knee                                                | 17 (7)              |
backpack non-users, reported pain ranged from 1 to 33% in the past month and 5 to 22% in the past day. Respondents reported pain most frequently in the shoulder (44%), upper/lower back (44%) and neck (14%).

Preferences and challenges with backpacks

At monthly home visits, 60% of participants reported they liked the backpacks for water storage, 42% said they were comfortable for carrying water, and 14% stated that their favorite feature of the backpacks was convenience (Table 4). A few challenges were also reported as hindering backpack use, including too heavy (12%), causes pain (4%), uncomfortable to use (4%), and breakage (1%). During 84% of home visits, respondents reported cleaning the inside of backpacks; of these, 17% said they cleaned the backpack every time water was collected.

Backpack use for water carriage models

The odds of reported backpack use to carry water in the past month were higher in those who had ≥primary school education (odds ratio or OR: 1.6, 95% confidence interval or CI: 1.04–2.3) and who were in the underweight BMI category compared with normal BMI (OR: 1.7, 95% CI: 1.1–2.9) (Table 5). The odds of backpack use to carry water were lower in the rainy season than in the dry season (OR: 0.3, 95% CI: 0.2–0.3). There were no significant associations between backpack use and reported pain in the past month, respondent age group, or time from water source to home. Similar patterns were observed in the analysis of reported backpack use to carry water in the previous day, with consistently lower odds of backpack use during the rainy season than the dry season (OR: 0.3, 95% CI: 0.2–0.4). In the sensitivity analysis using all data from all six rounds and excluding missing pain data from the sixth round, the results did not change appreciably (Supplemental Table 2).

Discussion

Results of this evaluation suggested that the uptake of backpack for water collection and transport among participants in western Kenya was modest. Backpack use for water storage was more common than for water transport and increased during the rainy season, likely because the backpack fit the

Table 4 | Monthly reports for backpack (BP) use and pain from carrying water during follow-up home visits, Kisumu in Kenya, 2014-2015, N = 1,334 visits

| Visits, N/total (%) |
|---------------------|
| Water collection    |
| Collect water with BP in the past month 753/1,205 (62) |
| Did you collect with BP yesterday? 160/1,205 (21) |
| How often use BP to collect water Everyday 58/1,333 (4) |
| Water storage       |
| Ever store water in BP 1,104/1,334 (83) |
| → Stored water in BP today or yesterday 701/1,103 (64) |
| → How often use BP to store water Everyday 354/1,104 (32) |
| Pain from carrying water |
| Any pain in the past month from carrying water 101/1,109 (9) |
| → If yes, location of pain Head 8/101 (8) |
| Neck 14/101 (14) |
| Shoulder 44/101 (44) |
| Upper back 17/101 (17) |
| Lower back 27/101 (27) |
| Chest 33/101 (33) |
| Ribs 2/101 (2) |
| Knee 2/101 (2) |
| What do you like most about the BP? Select all Good for water storage 796/1,334 (60) |
| More comfortable to carry 558/1,334 (42) |
| Convenient to use 188/1,334 (14) |
| What do you like least about the BP? Select all Too heavy 164/1,334 (12) |
| Causes pain 52/1,334 (4) |
| Uncomfortable 48/1,334 (4) |
| It broke 12/1,334 (1) |
| Maintenance of BP  |
| Do you clean inside of BP? 1,124/1,334 (84) |
| If yes, how often? Everyday I collect water 186/1,124 (17) |
| Other 938/1,124 (83) |
Figure 2 | Monthly reported backpack use to collect water past month or previous day (left) and to store water today/previous day and observed water in the backpack (BP) (right).

Figure 3 | Monthly reported pain from carrying water by backpack (BP) use past month (left) and previous day (right).

Table 5 | The odds ratios (OR) of reported backpack use in past month or previous day to carry water, Kisumu in Kenya, 2014–2015

| Pain from carrying water past month | Past month OR (95% CI) | P-value | Previous day OR (95% CI) | P-value |
|-----------------------------------|------------------------|---------|--------------------------|---------|
| Age group, years                  |                        |         |                          |         |
| <24                               | Ref                    | –       | Ref                      | –       |
| 24–35                             | 0.8 (0.5, 1.3)         | 0.438   | 0.7 (0.4, 1.1)           | 0.083   |
| >35                               | 1.1 (0.6, 1.9)         | 0.826   | 1.0 (0.5, 1.9)           | 0.910   |
| Education level attained          |                        |         |                          |         |
| <Primary                          | Ref                    | –       | Ref                      | –       |
| ≥Primary                          | 1.6 (1.04, 2.3)        | 0.030   | 1.5 (0.9, 2.3)           | 0.112   |
| BMI, kg/m²                        |                        |         |                          |         |
| Normal weight                     | Ref                    | –       | Ref                      | –       |
| Underweight                       | 1.7 (1.1, 2.9)         | 0.030   | 1.5 (0.7, 2.3)           | 0.407   |
| Overweight or obese               | 1.1 (0.6, 2.0)         | 0.658   | 1.1 (0.6, 2.0)           | 0.765   |
| Rainy season*                     |                        |         |                          |         |
| No                                | Ref                    | –       | Ref                      | –       |
| Yes                               | 0.3 (0.2, 0.3)         | <0.001  | 0.3 (0.2, 0.4)           | <0.001  |
| Time from water source to home, min |                        |         |                          |         |
| ≤10                               | Ref                    | –       | Ref                      | –       |
| 11–30                             | 1.0 (0.6, 1.6)         | 0.929   | 1.0 (0.6, 1.8)           | 0.945   |
| >30                               | 1.0 (0.6, 1.7)         | 0.935   | 1.0 (0.5, 1.8)           | 0.903   |

*April or May.
local water storage strategy of filling as many containers as possible when it rains. The finding of low use for water transport was consistent with a recent evaluation of the same backpack conducted in rural Haiti which showed the overall modest acceptance of backpack with decreasing use over a 6-month period (Martinsen et al. 2019).

**Water transport**

Devising a container for carrying water on the back reflects an interest that has been raised in recent years (WHO 2007, 2017). Despite the apparent musculoskeletal stress of water carriage and scientific evidence of chronic health problems from this practice (Levy 1968; Jumah & Nyame 1994; Jäger et al. 1997; Geere et al. 2010b), no large-scale epidemiological studies were found which had used a scientifically appropriate study design to analyze the association between water carrying and objective indicators of effects on physical health (Evans et al. 2013). A few studies have compared several types of containers that reduce physical pain, but no designs have been widely disseminated (Geere et al. 2010b; Martinsen et al. 2019). In a study conducted on Xhosa women of South Africa, the participants reported they can carry greater loads on the back than on the head and said that back-loading was generally more comfortable (Lloyd et al. 2010). Conversely, several studies have reported that back-loading led to more areas of pain and discomfort than head-loading using buckets and jerry-cans (Noland 2018; Martinsen et al. 2019). Although fewer women had complaints (heady, difficult to use straps, pain, difficulty cleaning) than positive comments (storage, comfort, convenience) about the backpack in this study, the duration of data collection may have been insufficient, the distance to water sources not far enough (<500 m on average), and the use of backpacks too limited to meaningfully evaluate acute and chronic pain associated with backpack use. Furthermore, because the backpacks were neither fitted to the women nor ergonomically designed, it is possible that musculoskeletal problems could have developed over time (Geere et al. 2018). An additional possibility is that the use of the head for carrying water was an ingrained habit that served as a barrier to changing this longstanding practice. This possible explanation is consistent with a study by Schilling et al. that found that poverty, low educational levels, and ingrained habits were a barrier for rural residents to adapt to new health interventions (Schilling et al. 2013). Behavior change interventions that employ social norms can help overcome barriers to change and sustain new behaviors (Yamin et al. 2019), particularly if the new behaviors have advantages that facilitate diffusion of innovative practices or technologies into populations (Rogers 1985).

**Water storage**

Although the results of this study did not clearly answer the question of the acceptability of the backpack for water carriage in western Kenya, many study participants appeared to have little motivation to use the backpack for water transport during the rainy season because they preferred its use for rainwater collection. The highest level of reported use of the backpacks for water storage in the previous day occurred during the rainy season. Participants indicated that, by providing an additional water storage container with the added advantages of a wide opening for rain capture and easy cleaning, as well as a spigot for water removal, the backpack serves the household need for water storage.

The unexpected preference for storage over transport of water raised several questions regarding the utility of the backpack. Acceptable water containers are accessible in western Kenya and have been tested for their ability to maintain water quality (Ogutu et al. 2001; Murphy et al. 2016). Unless the backpacks offered advantages in storage over effective, less expensive alternatives, it would be difficult to justify using scarce resources to make them widely available if they were not commonly used for their original purpose of water transport.

Evaluating the relative hygienic advantages and durability of the plastic liner would be important because of its role in maintaining water quality (Mellor et al. 2015). During this study, a majority of participants did report during home visits that they cleaned the inside of the backpacks (84%) and, at the end of the study, nearly all participants (93%) reported cleaning the plastic liners. Whether these hygienic practices were accompanied by treatment of water from potentially contaminated sources would be an important evaluation question.
Limitations

This study was subject to several limitations. First, because we selected a convenience sample of eight rural villages in one district, our study findings may not be generalizable to the Kenyan population. Second, the 6-month study follow-up period was relatively short and limited our ability to assess further attrition in use through discomfort or breakage. Although the backpacks did appear to be durable with only two reports of breakage, a follow-up at 1 year would enhance the assessment of durability, as well as continued acceptability of the backpacks. Third, courtesy bias may have inflated apparent backpack use: reported water storage in the backpack today/previous day was reported to be 64% compared with a confirmed rate of 48% (observed water in backpack) during home visits (Glick 2009).

Conclusions and recommendations

In conclusion, we observed that the acceptability of backpack use was modest for water collection and transport but somewhat higher for water storage. Participants increasingly reported physical pain over the study period, but its link to backpack use remains unclear. At this time, we do not recommend dissemination of the backpacks because of their modest use for water transport. Further evaluation of promotion, use, and effectiveness of alternative water transport interventions to minimize the potential health effects of head-loading is needed because water fetching is a practice that will continue, of necessity, for some time.

COMPETING INTERESTS

The authors declare no conflicts of interest.

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DATA AVAILABILITY STATEMENT

Data cannot be made publicly available; readers should contact the corresponding author for details.

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