



Issue 124 November 22, 2013 | Household Water Treatment & Safe Storage

This issue contains seventeen studies and reports from 2013 on household water treatment and safe storage (HWTS). The studies are about HWTS behavior change, health impacts, and other topics. The health studies discuss HWTS impacts or lack of impact on diarrheal diseases, HIV/AIDS, and dengue. Several studies conclude that water quality is often compromised during household storage. Technical evaluations discuss the effects of temperature and pH on reduction of bacteria, the impact of solar irradiation on cholera toxin secretion, etc. Links are also included to past issues of the Weekly on HWTS.

Please let us know if you have topic suggestions for the WASHplus Weekly. Also, please leave any comments or suggestions on how we can make the WASHplus Weekly more useful to you. Your answers will remain anonymous. Thank you. ([Survey link](#))

ADOPTION/BEHAVIOR CHANGE

Achieving Long-Term Use of Solar Water Disinfection in Zimbabwe. *Public Health, Jan 2013.* H Mosler. ([Abstract/order info](#))

The objective of this study was to use the psychological theory of behavioral change to measure and interpret the effectiveness of different promotional strategies for achieving long-term usage of an HWTS system in peri-urban Zimbabwe. Household promotion in combination with persuasion appears more effective than other approaches, especially when followed with interventions targeting the maintenance of the new behavior. With this intervention it is possible that around 65 percent of the households continue to use solar water disinfection more than two years after the initial promotion, and six months after the end of all interventions.

Evidence-Based Tailoring of Behavior-Change Campaigns: Increasing Fluoride-Free Water Consumption in Rural Ethiopia with Persuasion. *Appl Psychol Health Well Being, Nov 2013.* A Huber. ([Abstract](#))

Two hundred million people worldwide are at risk of developing dental and skeletal fluorosis due to excessive fluoride uptake from their water. Since medical treatment of the disease is difficult and mostly ineffective, preventing fluoride uptake is crucial. In the Ethiopian Rift Valley, a fluoride-removal community filter was installed. Despite having access to a fluoride filter, the community used the filter sparingly. Based on the results, two behavior-change campaigns were implemented: a traditional information intervention targeting perceived vulnerability, and an evidence-based persuasion intervention regarding perceived costs. The

campaigns were evaluated with a survey and analyzed in terms of their effectiveness in changing behavior.

Follow-Up Study to Assess the Use and Performance of Household Filters in Zambia.

Am Jnl Trop Med Hyg, Oct 2013. R Peletz. ([Abstract](#))

One year after completion of a randomized controlled study of water filters among households in Zambia with children under 2 years old and mothers who were HIV-positive, researchers conducted a follow-up study to assess the use and performance of new filters distributed at the conclusion of the study. Ninety percent of participating households met the criteria for current users, and 75 percent of participating households had stored water with lower levels of fecal contamination than source water. Microbiologically, the filters continued to perform well, removing an average of 99 percent of fecal indicator bacteria. Although this study provides some encouraging evidence about the potential to maintain high uptake and filter performance, even in the absence of regular household visits, additional research is necessary to assess whether these results can be achieved over longer periods and with larger populations.

Understanding Household Water Practices Using Ethnographic Research Methods,

2013. Water Information Network, South Africa. ([Full text](#))

This study was designed to give a visual tool to a rural community to capture, analyze, interpret, and present their household practices from their own as well as from other perspectives. The study clearly shows that the ethno-visual tool can be used in a participatory noninterventionist manner in rural communities. Apart from the film footage, other material collected was graphically and visually provided to the elders in the community, allowing for debate on a level previously unknown to them.

HEALTH IMPACTS

Considerations for Policy Development and Scaling-Up Household Water Treatment and Safe Storage with Communicable Disease Prevention Efforts,

2013. World Health Organization. ([Full text, pdf](#))

The overall consensus from the group was that existing meta-analyses, individual research reports, and WHO Guidelines provide sufficient support for scaling up HWTS. Participants thought more can and should be done to integrate HWTS into HIV, child and maternal health, dengue and vector control, and other targeted efforts.

Effect of Household-Based Drinking Water Chlorination on Diarrhoea Among Children Under Five in Orissa, India: A Double-Blind Randomised Placebo-Controlled Trial. *PLoS Med*, Aug 2013. S Boisson. ([Full text](#))

This study was designed to overcome the shortcomings of previous double-blinded trials of household water treatment in low-income settings. The sample size was larger, the follow-up period longer, both urban and rural populations were included, and adherence and water quality were monitored extensively over time. These results provide no evidence that the intervention was protective against diarrhea. Low compliance and modest reduction in water contamination may have contributed to the lack of effect. However, findings are consistent with other blinded studies of similar interventions and raise additional questions about the actual health impact of household water treatment under these conditions.

Household Water Chlorination Reduces Incidence of Diarrhea among Under-Five Children in Rural Ethiopia: A Cluster Randomized Controlled Trial. *PLoS ONE*, Oct.

2013. B Mengisti. ([Full text](#))

The objective of the study was to assess the effectiveness of household water chlorination in reducing incidence of diarrhea among children under 5 years of age. The study compared diarrhea incidence among children who received sodium hypochlorite (liquid bleach) for household water treatment and children who did not receive the water treatment. A statistically significant reduction in incidence of diarrhea was observed in the intervention group compared to the control.

Household Water Treatment and Safe Storage: Manual for the Participant, 2013, WHO Western Pacific Region. ([Link, pdf](#))

This module provides an introduction to HWTS. The module begins by reviewing some of the leading methods for treating water at the household level and the research on their microbiological performance. It then summarizes the evidence concerning the effectiveness and cost-effectiveness of HWTS to prevent diarrheal disease. The module ends by noting the major challenges in scaling up HWTS by achieving coverage and sustained uptake among populations that might benefit most from the intervention.

Impact of Solar Irradiation on Cholera Toxin Secretion by Different Strains of *Vibrio cholera*. *S. Afr. Jnl Sci.*, 109(9-10) 2013. C Cornelius. ([Full text](#))

Solar irradiation in water reduced the integrity of DNA, inactivated the growth of *V. cholerae* and, most importantly, prevented the secretion of detectable levels of cholera toxin. This finding is encouraging for resource-poor communities that may rely on solar disinfection to alleviate the burden of cholera-related fatalities.

Quality of Piped and Stored Water in Households with Children Under Five Years of Age Enrolled in the Mali Site of the Global Enteric Multi-Center Study (GEMS). *Am Jnl Trop Med Hyg*, Aug 2013. K Baker. ([Full text](#))

Water, sanitation, and hygiene information was collected during a matched case-control study of moderate and severe diarrhea (MSD) among 4,096 children under 5 years of age in Bamako, Mali. Primary use of piped water, continuous water, fetching water, and breastfeeding significantly reduced the likelihood of MSD. Although most of Bamako's population enjoys access to an improved water source, water quality is often compromised during household storage.

Relationship Between *Aedes aegypti* Production and Occurrence of *Escherichia coli* in Domestic Water Storage Containers in Rural and Suburban Villages in Thailand and Laos. *Acta Trop*, June 2013. N Dada. ([Abstract](#))

In a cross-sectional survey in one rural and one suburban village each in Thailand and Laos the relationship between *Aedes aegypti* production and *Escherichia coli* contamination in household water storage containers was investigated. Entomological indices across all four villages were high, indicating a high risk for dengue transmission. Significantly more *Ae. aegypti* pupae were produced in containers contaminated with *E. coli* as compared to those that were not, with the odds of *Ae. aegypti* infested containers being contaminated with *E. coli* ranging from two to five. The authors conclude that *Ae. aegypti* production and presence of *E. coli* in household water storage containers suggests a causal relationship between dengue and diarrheal disease at these sites. How this relationship can be exploited for the combined and cost-effective control of dengue and diarrheal diseases requires further research.

A Stepped Wedge, Cluster-Randomized Trial of a Household UV-Disinfection and Safe Storage Drinking Water Intervention in Rural Baja California Sur, Mexico. *Am*

Jnl Trop Med Hyg, Aug 2013. J Gruber. ([Full text](#))

In collaboration with a local nonprofit organization, this study evaluated the expansion of a program that promoted and installed Mesita Azul, an ultraviolet-disinfection system designed to treat household drinking water in rural Mexico. The intervention increased the percentage of households with access to treated and safely stored drinking water (23 percent to 62 percent), and reduced the percentage of households with E. coli-contaminated drinking water. No significant reduction in diarrhea was observed. The authors concluded that household water quality improvements measured in this study justify future promotion of the Mesita Azul, and that future studies to measure its health impact would be valuable if conducted in populations with higher diarrhea prevalence.

Water, Sanitation, and Hygiene Interventions to Improve Health Among People Living with HIV/AIDS: A Systematic Review. *AIDS, Oct 2013.* R Peletz. ([Abstract](#))

People living with HIV/AIDS (PLHIV) are at increased risk of diarrheal disease and enteric infection. This review assesses the effectiveness of WASH interventions to prevent disease among PLHIV. Ten studies met the eligibility criteria and are included in the review, of which nine involved water quality interventions and one involved promotion of hand washing. Among eight studies that reported on diarrhea, water quality and the hand washing intervention were shown to be protective. One study reported that household water treatment combined with insecticide treated bednets slowed the progression of HIV/AIDS. The validity of most studies is potentially compromised by methodological shortcomings.

OTHER STUDIES/REPORTS

Effects of Temperature and pH on Reduction of Bacteria in a Point-of-Use Drinking Water Treatment Product for Emergency Relief. *Appl. Environ. Microbiol., Mar 2013.* J Marois-Fiset. ([Full text](#))

The effects of temperature and pH on the water treatment performance of a point-of-use coagulant/disinfectant product were evaluated. Cold temperatures (~5°C) reduced the bactericidal efficiency of the product with regard to E. coli.

Removal of Waterborne Bacteria from Surface Water and Groundwater by Cost-Effective Household Water Treatment Systems (HWTS): A Sustainable Solution for Improving Water Quality in Rural Communities of Africa. *Water SA, 39(4) 2013.* J. Mwabi. ([Full text](#))

In this study five HWTS were constructed using inexpensive local materials (sand, gravel, zeolites, and clays). They included the silver-impregnated porous pot filter (SIPP), the ceramic candle filter, the conventional biosand filter, a modified biosand filter with zeolites, and a bucket filter. Based on the findings of this study, the SIPP can be recommended for use by rural communities as it consistently produced high-quality water that complied with the turbidity and microbiological limits for drinking water.

Retention and Transport of Silver Nanoparticles in a Ceramic Porous Medium Used for Point-of-Use Water Treatment. *Env Sci Tech, Mar 2013.* D Ren. ([Full text](#))

The retention and transport of silver nanoparticles particles through a ceramic porous medium used for point-of-use drinking water purification is investigated. Two general types of experiments were performed. The results of this investigation suggest that the fire-in method may be a new and significant improvement to ceramic filter design.

PREVIOUS WASHPLUS WEEKLIES

- Feb 15, 2013 - [Focus on Household Water Treatment & Safe Storage](#)
- Sept 14, 2012 - [Focus on Household Water Treatment & Safe Storage](#)
- Feb 3, 2012 - [Focus on Household Water Treatment & Safe Storage](#)
- July 1, 2011 - [Focus on Household Water Treatment & Safe Storage](#)
- Apr 15, 2011 - [Focus on Household Water Treatment & Safe Storage](#)

WEBSITE LINKS

- WHO Household Water Treatment and Safe Storage - [\(Link\)](#)
- Water Institute - Communications Portal for the WHO HWTS Network - [\(Link\)](#)
- WASHplus Household Drinking Water Quality Updates - [\(Link\)](#)

WASHplus Weeklies will highlight topics such as Urban WASH, Indoor Air Pollution, Innovation, Household Water Treatment and Storage, Hand Washing, Integration, and more. If you would like to feature your organization's materials in upcoming issues, please send them to Dan Campbell, WASHplus Knowledge Resources Specialist, at dacampbell@fhi360.org.



About WASHplus - WASHplus, a five-year project funded through USAID's Bureau for Global Health, supports healthy households and communities by creating and delivering interventions that lead to improvements in access, practice and health outcomes related to water, sanitation, hygiene (WASH) and indoor air pollution (IAP). WASHplus uses at-scale, targeted as well as integrated approaches to reduce diarrheal diseases and acute respiratory infections, the two top killers of children under five years of age globally. For information, visit www.washplus.org or email: contact@washplus.org.