

Policy Brief:

Effect of Water, Sanitation, and Hygiene on Soil-transmitted Helminthiasis

Summary: More than a billion people are infected with soil-transmitted helminthiasis (STH), a disease caused by parasitic worms that live in the intestine.¹ Symptoms include chronic diarrhea, anemia, stunting, and severe malnutrition.² Current control programs provide deworming medication to children in schools, which safely kills most of the worms and helps prevent serious symptoms from developing. However, without changes to the environment, re-infection usually occurs quickly because worm eggs can contaminate soil for years.³ A long-term strategy requires improvements in water, sanitation, and hygiene (WASH), so we reviewed available research to explore the effect of WASH on STH. We found that improvements in WASH were linked to much lower chances of STH infection. WASH access and practices were generally associated with 33% to 70% lower odds of infection. For example, people who washed their hands after defecating were less than half as likely to be infected as those who did not. Overall, these results confirm the importance of WASH for STH control.

Background: STH is caused by three main types of worm—roundworm, hookworm, and whipworm—which lay microscopic eggs in human feces. Without safe water and basic sanitation infrastructure, these eggs contaminate soil and the surrounding environment. People are infected when they ingest the eggs (often on produce or their hands) or walk barefoot on soil, where hookworms can penetrate their feet.⁴ Because STH is transmitted through the environment, WASH has been identified as an important potential tool for disease control.



Credit: WHO

Methods: We screened over 40,000 studies and found 95 with relevant information. We organized the studies based on the type of WASH improvement measured and the STH worm studied. We then performed a series of meta-analyses (a statistical technique for analyzing results from multiple studies) on available information.

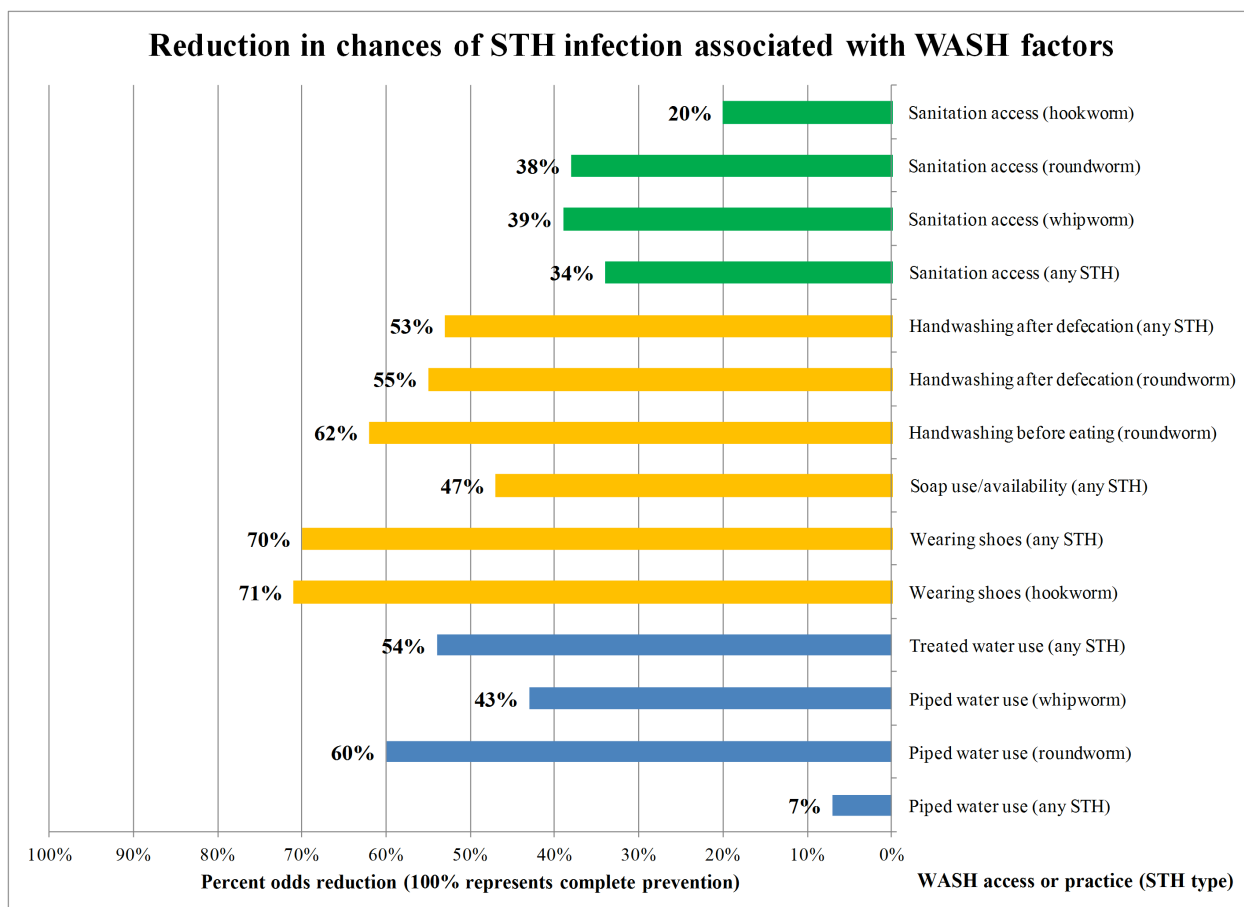
Results: Individual WASH access or practices were generally associated with 33% to 70% lower chances of infection. Sanitation access (i.e., availability or use of a latrine), handwashing, wearing shoes, and using piped water all emerged as potentially valuable tools for STH control. The chart below shows results from each meta-analysis, with bigger bars representing a stronger, more beneficial relationship.

¹ Rachel L Pullan et al., “Global Numbers of Infection and Disease Burden of Soil Transmitted Helminth Infections in 2010,” *Parasites & Vectors* 7, no. 1 (2014): 37, doi:10.1186/1756-3305-7-37.

² Simon Brooker, “Estimating the Global Distribution and Disease Burden of Intestinal Nematode Infections: Adding up the Numbers – A Review,” *International Journal for Parasitology* 40, no. 10 (August 15, 2010): 1137–44, doi:10.1016/j.ijpara.2010.04.004.

³ Tie-Wu Jia et al., “Soil-Transmitted Helminth Reinfection after Drug Treatment: A Systematic Review and Meta-Analysis,” *PLoS Neglected Tropical Diseases* 6, no. 5 (May 8, 2012), doi:10.1371/journal.pntd.0001621.

⁴ Jeffrey Bethony et al., “Soil-Transmitted Helminth Infections: Ascariasis, Trichuriasis, and Hookworm,” *The Lancet* 367, no. 9521 (2006): 1521–32, doi:10.1016/S0140-6736(06)68653-4.



Limitations: Most studies were cross-sectional and did not follow populations over time. These studies can only identify associations, not causal relationships. However, four randomized controlled trials—which provide the strongest causal evidence—also supported the results from the meta-analyses. While this analysis broadly highlights the importance of WASH, we still do not know which intervention combinations work best in different environments. More research is needed to determine best strategies.

Key messages for STH-endemic communities:

These findings confirm that WASH improvements could provide an effective control measure for STH. Evidence suggests that a closer integration between drug treatment and WASH improvements can effectively break the cycle of helminth re-infection. Specifically, it appears that behavior change related to handwashing and latrine use could strongly impact changes to helminths infection

Policy brief by Eric Strunz. Original manuscript available at [dx.plos.org/10.1371/journal.pmed.1001605](https://doi.org/10.1371/journal.pmed.1001605). Research funded in part by UK aid from the Department of International Development (DfID) as part of SHARE. The views expressed do not necessarily reflect the Department's official policies. For more information, contact Children Without Worms at CWW@taskforce.org or +1 (404) 687-5618.



EMORY
UNIVERSITY

Center for
Global Safe Water

