



Issue 135 February 21, 2014 | Focus on WASH-Related Diseases

This issue contains recent studies and reports on several WASH-related diseases: neglected tropical diseases (NTDs), malnutrition, cholera, diarrhea, fluorosis, and malaria. Some of the resources include: a WASH and NTDs global manual and country reports from the Sightsavers Innovation Fund; an article on the origins of the cholera outbreak in Haiti; a review of evidence linking WASH, anemia, and child growth; Cochrane Reviews on the prevention and control of malaria; and additional studies and resources.

We welcome your suggestions for future issues of the Weekly. Topics for upcoming issues include World Water Day 2014, WASH and nutrition, behavior change, community-led total sanitation, household water treatment, and menstrual hygiene management.

GENERAL/OVERVIEW

The Child Health Implications of Privatizing Africa's Urban Water Supply, 2013. K Kosec, International Food Policy Research Institute. [\(Link\)](#)

Identifying policies that can improve water sector management is critically important given the global burden of water-related disease. Can private-sector participation (PSP) in the urban piped water sector improve child health? The author uses child-level data from 39 African countries during 1986–2010 to show that introducing PSP decreases diarrhea among urban dwelling children under 5 years of age by 5.6 percentage points, or 35 percent of its mean prevalence.

Human Health and the Water Environment: Using the DPSEEA Framework to Identify the Driving Forces of Disease. *Science of the Total Environment*, 2014. J Gentry-Shields. [\(Link\)](#)

There is a growing awareness of global forces that threaten human health via the water environment. A better understanding of the dynamic between human health and the water environment would enable prediction of the significant driving forces and effective strategies for coping with or preventing them. This report details the use of the Driving Force–Pressure–State–Exposure–Effect–Action (DPSEEA) framework to explore the linkage between water-related diseases and their significant driving forces.

Seasonal Effects of Water Quality: The Hidden Costs of the Green Revolution to Infant and Child Health in India, 2013. E Brainerd. [\(Link\)](#)

This paper examines the impact of fertilizer agrichemicals in water on infant and child health

using water quality data combined with data on child health outcomes from the Demographic and Health Surveys of India. The results indicate that children exposed to higher concentrations of agrichemicals during their first month experience worse health outcomes on a variety of measures; these effects are largest among the most vulnerable groups, particularly the children of uneducated poor women living in rural India.

Water, Sanitation and Hygiene: Evidence Paper, 2013. Department for International Development. ([Link](#))

This paper aims to provide an accessible guide to existing evidence, including a conceptual framework for understanding how WASH impacts health and well-being and a description of methods used for ascertaining the health, economic, and social impacts of WASH. It also presents the available evidence on the benefits and cost-effectiveness of WASH interventions.

NEGLECTED TROPICAL DISEASES

WASH and the Neglected Tropical Diseases: A Global Manual for WASH Implementers, 2014. Sightsavers, et al. ([Link](#)) | ([Blog post](#))

These manuals are free to download and distribute. New users must create an account to download the manuals, which are divided into disease-specific chapters that describe the transmission cycle, symptoms, and disease burden of the WASH-related NTDs. Each chapter includes information about WASH activities that are most essential to the control of each disease. Maps of disease prevalence are provided to enable identification of disease-endemic communities most in need of sustainable WASH services. Country-specific versions of the manual are available so far for Brazil, Burkina Faso, Cameroon, Chad, Ethiopia, Indonesia, Kenya, Malawi, Mali, Mozambique, Nigeria, Sudan, Tanzania, and Uganda.

Integrating WASH into NTD Programs: A Desk Review, 2013. WASHplus. ([Link](#))

This desk review found that the international community recognizes that drug administration alone is insufficient to break the cycle of disease transmission. Although past programs have largely left out a WASH component, there is current renewed interest in securing WASH to any global NTD control or elimination strategy and adding WASH interventions to NTD treatment programs, which are considered essential to achieving sustained control and elimination.

MALNUTRITION

Water, Sanitation, and Hygiene (WASH), Environmental Enteropathy, Nutrition, and Early Child Development: Making the Links. *Annals of the New York Academy of Sciences*, Jan 2014. F Ngure. ([Link](#))

The authors review evidence linking WASH, anemia, and child growth and highlight pathways through which WASH may affect early child development, primarily through inflammation, stunting, and anemia. Environmental enteropathy, a prevalent subclinical condition of the gut, may be a key mediating pathway linking poor hygiene to developmental deficits. Current early child development research and programs lack evidence-based interventions to provide a clean play and infant feeding environment in addition to established priorities of nutrition, stimulation, and child protection.

CHOLERA

The Cholera Outbreak in Haiti: Where and How Did It Begin? *Current Topics in*

Microbiology and Immunology, 2013. D Lantagne, Tufts University. ([Link](#))

Findings indicated that the 2010 Haiti cholera outbreak was caused by bacteria introduced into Haiti as a result of human activity; more specifically by the contamination of the Meye Tributary System of the Artibonite River with a pathogenic strain of the current South Asian-type *Vibrio cholerae*. Recommendations were presented to assist in preventing the future introduction and spread of cholera in Haiti and worldwide.

Cholera Transmission Dynamic Models for Public Health Practitioners. *Emerging Themes in Epidemiology*, Jan 2014. Chun-Hai Fung. ([Link](#))

This paper provides a brief introduction to the basics of ordinary differential equation models of cholera transmission dynamics. The authors discuss a basic model adapted from Codeço (2001), and how it can be modified to incorporate different hypotheses, including the importance of asymptomatic or inapparent infections, and hyperinfectious *V. cholerae* and human-to-human transmission. The paper also highlights three important challenges of cholera models: model misspecification and parameter uncertainty, modeling the impact of WASH interventions, and model structure.

Cholera Toolkit, 2013. UNICEF. ([Link](#))

This toolkit provides guidance primarily for the health and WASH sectors; nevertheless, guidelines are presented in an integrated manner to avoid the continuation of “silo” approaches for cholera prevention, preparedness, and response. In addition, the toolkit includes specific content linked to education, nutrition, communication for development, child protection, and other relevant sectors.

Comparing Sociocultural Features of Cholera in Three Endemic African Settings.

BMC Medicine, 2013. C. Schaetti. ([Link](#))

This comprehensive review identified common and distinctive features of local understandings of cholera. Classical treatment (that is, rehydration) was highlighted as a priority for control in the three African study settings and is likely to be identified in the region beyond. Findings indicate the value of insight from community studies to guide local program planning for cholera control and elimination.

DIARRHEA

Impact of Water and Sanitation Interventions on Childhood Diarrhea: Evidence from Bangladesh 3ie Grantee Final Report, 2013. S Begum. ([Link](#))

This paper analyzes the possible relevance of water and sanitation improvements for diarrhea reduction in the context of Bangladesh. Much of the public policy thinking in the past was guided by public investment in providing improved access to water. The paper provides evidence that the relevance of water as a tool for fighting diarrhea may have changed over time.

Ending Preventable Child Deaths from Pneumonia and Diarrhoea by 2025: The Integrated Global Action Plan for Pneumonia and Diarrhoea, 2013. WHO/UNICEF. ([Link](#))

This action plan proposes a cohesive approach to ending preventable pneumonia and diarrhea deaths. It brings together critical services and interventions to create healthy environments, promotes practices known to protect children from disease, and ensures that every child has access to proven and appropriate preventive and treatment measures.

The Lancet Series on Childhood Pneumonia and Diarrhea, 2013. ([Link](#))

This series provides evidence for integrated control efforts for childhood pneumonia and diarrhea. The first paper assesses the global burden of these two illnesses, comparing and contrasting them, and includes new estimates of severe disease and updated mortality estimates for 2011. Findings from the second paper show that a set of highly cost-effective interventions can prevent most diarrhea deaths and nearly two-thirds of pneumonia deaths by 2025, if delivered at scale. The third paper presents the results of consultations with several hundred frontline workers in high-burden countries and explores the barriers and enablers they face in dealing with these two diseases and potential ways forward. The final paper represents a call to action and discusses the global and country-level remedies needed to eliminate preventable deaths from these illnesses by 2025.

Heavy Rainfall Events and Diarrhea Incidence: The Role of Social and Environmental Factors. *Am J Epidemiol.* Feb. 2014. E Carlton. ([Abstract/order info](#))

The impact of heavy rainfall events on waterborne diarrheal diseases is uncertain. The authors conducted weekly, active surveillance for diarrhea in 19 villages in Ecuador from February 2004 to April 2007 to evaluate whether biophysical and social factors modify vulnerability to heavy rainfall events. Heavy rainfall events were associated with increased diarrhea incidence following dry periods and decreased diarrhea incidence following wet periods. Drinking water treatment reduced the deleterious impacts of heavy rainfall events following dry periods. Sanitation, hygiene, and social cohesion did not modify the relationship between heavy rainfall events and diarrhea.

FLUOROSIS

Fluorosis Factsheet, n.d. World Health Organization. ([Link](#))

Ingestion of excess fluoride, most commonly in drinking water, can cause fluorosis, which affects the teeth and bones. Moderate amounts lead to dental effects, but long-term ingestion of large amounts can lead to potentially severe skeletal problems. Paradoxically, low levels of fluoride intake help to prevent dental caries. The control of drinking-water quality is therefore critical in preventing fluorosis.

Health Based targets and Integrated Fluorosis Mitigation: Findings from Madhya Pradesh, India, 2013. S Godfrey, UNICEF. ([Presentation](#))

This presentation gives an introduction to fluorosis, its health impacts, and mitigation methods.

De-Fluoridation, n.d. Akvopedia. ([Link](#))

Treatment at the household level has several advantages over treatment at the community level. Costs are lower, as defluoridation can be restricted to the demand for cooking and drinking, which is usually less than the total water demand. This treatment option may be feasible in less developed countries especially in rural areas, where settlements are scattered.

MALARIA

For Sustainable Control of Malaria in Sudan: No More Broken Water Pipes and Water Containers! *Malaria World,* Jan 2014. B Knols. ([Link](#))

Leakages of broken water pipes are becoming a major resource for the main malaria vector in Sudan. Reporting and /or treating of these pipes and water containers by community members, through affordable rational choice of larvicides, and by using citizen reporting tools,

can have effective results that might support the sustainability of the tremendous malaria control efforts on the part of health observers.

Larvivorous Fish for Preventing Malaria Transmission. *Cochrane Library Review*, Dec 2013. D Walshe. ([Link](#))

Research evidence is insufficient to show whether introduction of larvivorous fish reduces the number of Anopheles larvae and pupae in water sources (nine studies, unpooled data, very low quality evidence). However, larvivorous fish may reduce the number of water sources with Anopheles mosquito larvae and pupae (five studies). None of the included studies examined the effects of introducing larvivorous fish on other native species present, but these studies were not designed to do this. Before much is invested in this intervention, better research is needed to determine the effect of introducing larvivorous fish on adult Anopheles populations and on the number of people infected with malaria. Researchers need to use robust controlled designs with an adequate number of sites. Also, researchers should explore whether introducing these fish affects native fish and other non-target species.

Mosquito Larval Source Management for Controlling Malaria. *Cochrane Summaries*, Aug 2013. L Tusting. ([Abstract/order info](#))

Larval source management (LSM) aims to reduce malaria and targets immature mosquitoes, which are found in standing water, before they develop into flying adults. This is done by permanently removing standing water, for example by draining or filling land; making temporary changes to mosquito habitats to disrupt breeding, for example by clearing drains to make the water flow; or by adding chemicals, biological larvicides, or natural predators to standing water to kill larvae. Where larval habitats are not too extensive and a sufficient proportion of these habitats can be targeted, LSM probably reduces the number of people that will develop malaria, and probably reduces the proportion of the population infected with the malaria parasite at any one time. LSM was shown to be effective in Sri Lanka, India, the Philippines, Greece, Kenya, and Tanzania, where interventions included adding larvicide to abandoned mine pits, streams, irrigation ditches and rice paddies where mosquitos breed, and building dams, flushing streams, and removing water containers from around people's homes.

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.