

Issue 102 | May 24, 2013 | Focus on WASH-Related Diseases

This issue contains recent studies and resources on several WASH-related diseases: cholera, dengue, diarrhea, leptospirosis, neglected tropical diseases, malnutrition, and typhoid. Included are a just-published UNICEF cholera toolkit, an updated review of WASH-related diseases from DfID, typhoid case studies from Bangladesh and Fiji, and other resources.

The Centers for Disease Control and Prevention suggested the topic for this issue, and we welcome other suggestions for topics. Future issues will focus on menstrual hygiene management, innovation, water point mapping, mobile applications, and WASH in schools; more than 100 past issues of the Weekly are [archived](#) on the WASHplus website.

CHOLERA

- **Cholera Toolkit**, 2013. UNICEF. ([Link](#))
As part of its effort to reduce cholera in the world, UNICEF has responded to the growing threat by launching a toolkit that will help UNICEF staff and partners prevent, prepare for, and respond to the disease. "What the toolkit does is harvest the best and most up-to-date knowledge in the field and brings it together in one location," said UNICEF Chief of Water, Sanitation and Hygiene Sanjay Wijesekera. "It looks at the evidence. It looks at practices that have produced results."
- **The Cure for Cholera—Improving Access to Safe Water and Sanitation**. *N Engl J Med*, Feb 2013. R Waldman. ([Full text](#))
The global development community has made insufficient investments to ensure access to safe water and improved sanitation and instead focused on Band-Aid solutions to a difficult problem. Because fecal-oral transmission is the predominant means by which people contract cholera, the frequency of cholera cases in the 21st century reflects the indisputable fact that the current state of development leaves more than a billion of the poorest and most marginalized people at risk of ingesting feces with their food and water.
- **Spatio-Temporal Dynamics of Cholera during the First Year of the Epidemic in Haiti**. *PLoS Negl Trop Dis* Apr 2013. J Gaudert. ([Full text](#))

In spite of chronic deprivation, Haiti had been spared cholera for a century until the vibrio was imported in October 2010, which triggered the largest national epidemic ever recorded. Environmental factors, such as rivers and rice fields, appeared to play a role in disease dynamics exclusively during the beginning of the epidemic. The dynamics of the cholera epidemic varied from place to place as time passed, following no clearly predictable scheme. Therefore, cholera control measures in Haiti should include rapid and exhaustive case tracking.

DENGUE

- **Dengue Control Strategies.** World Health Organization. ([Link](#))
Preventing or reducing dengue virus transmission depends entirely on controlling the mosquito vectors or interrupting human-vector contact. WHO promotes the strategic approach known as Integrated Vector Management to control mosquito vectors, including those of dengue.
- **Global Strategy for Dengue Prevention and Control, 2012.** World Health Organization. ([Full text](#))
Dengue is a major public health concern throughout tropical and subtropical regions of the world. It is the most rapidly spreading mosquito-borne viral disease, with a 30-fold increase in global incidence over the past 50 years. WHO estimates that 50–100 million dengue infections occur each year and that almost half the world's population lives in countries where dengue is endemic.
- **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. Mar 2013.* D Vannavon. ([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. The authors conclude that the observed relationship between Ae. aegypti production and the presence of E. coli in household water storage containers suggests a causal relationship between dengue and diarrheal disease. How this relationship can be exploited for the combined and cost-effective control of dengue and diarrheal diseases requires further research.

DIARRHEAL DISEASES

- **Diarrhoeal Disease Fact Sheet, 2013.** WHO. ([Full text](#))
Diarrheal disease is the second leading cause of death in children under 5 years old. It is both preventable and treatable. Each year diarrhea kills around 760,000 children under 5. A significant proportion of diarrheal disease can be prevented through safe drinking water and adequate sanitation and hygiene. Globally, nearly 1.7 billion cases of diarrheal disease are reported every year. Diarrhea is a leading cause of malnutrition

in children under 5.

- **Ending Preventable Child Deaths from Pneumonia and Diarrhoea by 2025: The Integrated Global Action Plan for Pneumonia and Diarrhoea (GAPPD)**, 2013. UNICEF. ([Full text](#))

The GAPPD 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 High Cost of Diarrhoeal Illness for Urban Slum Households: A Cost-Recovery Approach.** *BMJ*, Apr 2013. R Patel. ([Full text](#))

This study calculated the direct cost of medical care for having at least one person in the household sick with diarrhea to be 205 rupees (US \$3.70). Other direct costs brought total expenses to 291 rupees. Adding an average loss of 55 rupees per household from lost wages and monetizing lost productivity from homemakers gave a total loss of 409 rupees per household. During the five-week study period, a community lost an estimated 163,600 rupees or US \$3,635 due to diarrheal illness.

- **Effect of Recent Diarrhoeal Episodes on Risk of Pneumonia in Children Under the Age of 5 Years in Karachi, Pakistan.** *Int J Epidemiol*, Feb 2013. S Ashraf. ([Full text](#))

This study assessed the association between the duration of diarrhea and the risk of pneumonia incidence among children <5 years of age. Children had an increased risk of pneumonia for every additional day of diarrhea in the two weeks and four weeks prior to the week of pneumonia onset. The attributable risk of pneumonia cases due to recent exposure to diarrhea was 6 percent. A lower associated pneumonia risk following diarrhea was found in the control group. Children <5 years of age are at an increased risk of pneumonia following recent diarrheal illness. Public health programs that prevent diarrhea may also reduce the burden of respiratory illnesses.

- **Hands and Water as Vectors of Diarrheal Pathogens in Bagamoyo, Tanzania.** *Environ Sci Technol*, Jan 2013. M Mattioli. ([Full text](#))

Using molecular methods, this study examines the relative importance of different exposure routes by measuring enteric bacteria (pathogenic *Escherichia coli*) and viruses (rotavirus, enterovirus, adenovirus) in hand rinses, stored water, and source waters in Bagamoyo, Tanzania. Viruses were most frequently found on hands, suggesting that hands are important vectors for viral illness. The occurrence of *E. coli* virulence genes (ECVG) was equivalent across all sample types, indicating that both water and hands are important for bacterial pathogen transmission. Fecal indicator bacteria and turbidity were good predictors of ECVG, whereas turbidity and human-specific Bacteroidales were good predictors of viruses. ECVG were more likely found in

stored water of households with unimproved sanitation facilities. The results provide insights into the distribution of pathogens in Tanzanian households and offer evidence that hand washing and improved water management practices could alleviate viral and bacterial diarrhea.

- **Water, Sanitation and Hygiene Evidence Paper**, 2013. Department for International Development (DfID). ([Full text](#))

Based on suggestive evidence, WHO estimates that approximately 2.4 million deaths and 7 percent of the total disease burden could be prevented annually with safe WASH. There is good evidence that inadequate WASH contributes substantially to this mortality burden and the health impacts of WASH extend far beyond diarrhea to include many other important diseases including: acute respiratory infections, undernutrition, soil-transmitted intestinal helminth infections, schistosomiasis, Guinea worm, trachoma, and certain noninfectious diseases associated with chemical water quality. Evidence also indicates that improved hygiene can reduce the risk of acute respiratory infections an estimated 23 percent.

LEPTOSPIROSIS

- **Global Epidemiological Overview of Leptospirosis**, 2013. ([Full text](#))

Leptospirosis is an infectious disease caused by *Leptospira*. Rodents are considered to be the major reservoir of infection. *Leptospirae* are excreted in the rodents' urine. Humans are affected when they are exposed directly or indirectly to an environment contaminated by the urine of the infected animals such as soil and surface water.

- **Occupational and Environmental Risk Factors of Leptospirosis: A Case Control Study in a Tertiary Care Setting in Kerala, India**, 2013. P Rekha. ([Full text](#))

Leptospirosis is one of the most widespread zoonotic diseases in the world. In developing countries it is emerging rapidly as a significant public health problem. There are definable behavioral and environmental factors that contribute to the acquisition of leptospirosis. These risk factors are potentially correctable both at the individual and community level.

- ***Leptospira Interrogans* at the Human-Wildlife Interface in Northern Botswana: A Newly Identified Public Health Threat**. *Zoonoses Public Health*, May 2013. S Jobbins. ([Abstract](#))

Leptospirosis is the most widespread zoonosis in the world. In northern Botswana, humans live in close proximity to a diversity of wildlife and peridomestic rodents and may be exposed to a variety of zoonotic pathogens. Little is known regarding the occurrence and epidemiology of *L. interrogans* in Africa despite the recognized global importance of this disease and the threat it poses to public health. This study illustrates the need for increased focus on neglected zoonotic diseases as they present an important threat to public health.

MALNUTRITION

- **Household Environmental Conditions Are Associated with Enteropathy and Impaired Growth in Rural Bangladesh.** *Am Jnl Trp Med Hyg, Apr 2013.* A Lin. [Full text](#)

This study assessed the relationship of fecal environmental contamination and environmental enteropathy. It compared markers of environmental enteropathy, parasite burden, and growth in 119 Bangladeshi children (≤ 48 months of age) across rural Bangladesh living in different levels of household environmental cleanliness defined by objective indicators of water quality and sanitary and hand washing infrastructure. The results from this study support the hypothesis that environmental contamination, mediated through environmental enteropathy, could be a cause of growth faltering in contaminated settings.

- **Improving Child Nutrition: The Achievable Imperative for Global Progress, 2013.** UNICEF. [\(Full text\)](#)

Globally, about one in four children under 5 years old are stunted. An estimated 80 percent of the world's 165 million stunted children live in just 14 countries. Stunting and other forms of undernutrition reduce a child's chance of survival, while also hindering optimal health and growth. Stunting is associated with suboptimal brain development, which is likely to have long-lasting harmful consequences for cognitive ability, school performance, and future earnings.

- **Water, Sanitation and Hygiene (WASH) Play a Fundamental Role in Improving Nutritional Outcomes, 2013.** WaterAid; SHARE. [\(Full text\)](#)

A successful global effort to tackle undernutrition must include WASH. What are the links between undernutrition and WASH? Direct links: WHO estimates that 50 percent of malnutrition is associated with repeated diarrhea or intestinal worm infections as a result of unsafe water, inadequate sanitation, or insufficient hygiene. Parasitic infections, such as soil-transmitted helminths caused by a lack of sanitation and hygiene, infect around 2 billion people globally while an estimated 4.5 billion people are at risk of infection. A lack of sufficient, safe water close to home has many indirect effects on nutrition. People are often left with no choice but to drink unsafe water from unprotected sources. Where safe water is available to purchase from vendors, a limited quantity leaves little for good hygiene practices. The time wasted collecting water or suffering from water-related illnesses prevents young people from getting an education, which has a significant impact on their health, well-being, and economic status.

NEGLECTED TROPICAL DISEASES

- **WASH: The Silent Weapon Against NTDs, 2012.** WaterAid. [\(Full text\)](#)

WASH is crucial but all too often underplayed part of the prevention and control of Neglected Tropical Diseases (NTDs). Diseases including trachoma, soil-transmitted

helminths, and schistosomiasis all demand practical WASH interventions so that their prevention, treatment, and ultimately their elimination can be achieved by the international community as soon as possible. This publication outlines, in order of significance, the clear linkages between WASH and NTDs in terms of their transmission, control, and prevention.

- **15 Thoughts on Eliminating Neglected Tropical Diseases.** *Guardian Professional*, May 2013. A Scott. ([Blog post](#))

This is a summary of the points made by a panel of experts on how the global health community can work toward eliminating NTDs.

TYPHOID

- **Comparative Study of Four Time Series Methods in Forecasting Typhoid Fever Incidence in China.** *PLoS One*, May 2013. X Zhang. ([Full text](#))

Accurate incidence forecasting of infectious disease is critical for early prevention and for better government strategic planning. In this paper, the authors present a comprehensive study of different forecasting methods based on the monthly incidence of typhoid fever.

- **Spatiotemporal Transmission and Determinants of Typhoid and Paratyphoid Fever in Hongta District, Yunnan Province, China.** *PLoS Negl Trop Dis*, Mar 2013. J Wang. ([Full text](#))

Typhoid and paratyphoid fever are endemic in Hongta District and their prevalence, at 113 per 100,000 individuals, remains the highest in China. Results showed that disease prevalence was spatially clustered, with clusters decreasing with increasing distance from markets and discharge canals. More than half of the spatial variance could be explained by a combination of economic conditions and availability of health facilities. Temporal prevalence fluctuations were positively associated with monthly precipitation. Disease transmission was exacerbated by the fact that rain water canals were being used for disposal of polluted waste from hospitals and residential areas. Social factors and their interactions also played a significant role in disease transmission.

- **Typhoid Fever: Hurdles to Adequate Hand Washing for Disease Prevention Among the Population of a Peri-Urban Informal Settlement in Fiji,** 2013. J Greenwell. ([Full text](#))

The Pacific island nation of Fiji Islands has high rates of endemic typhoid fever, which is difficult to diagnose and often goes underreported. However, the majority of cases are preventable through use of safe water; adequate sanitation; vaccination; and, most sustainable of all, simple hygienic behavior, such as hand washing with soap. Despite many attempts by public health authorities, little progress has been made in the area of environmental adaptation and behavior change. Perceptions of typhoid fever suggest confusion about risk factors, symptoms, and communicability. Environmental barriers

for hand washing were related to water and soap access.

- **Typhoid Fever and Its Association with Environmental Factors in the Dhaka Metropolitan Area of Bangladesh: A Spatial and Time-Series Approach.** *PLoS Negl Trop Dis*, Jan 2013. A Dewan. ([Full text](#))

This research studies the spatial and temporal distribution of typhoid infections in the Dhaka metropolitan area of Bangladesh in the period 2005 to 2009. Data from hospital admission records were analyzed together with a range of demographic, environmental, and climatic data, in what is believed to be the first study of this nature; clear periodicity was found in the timing of case occurrences, with most cases occurring in the monsoon season. Men and very young children appear to be at greatest risk of contracting the disease. Closeness to rivers was also found to be a contributor to increased typhoid risk. While a difference in rates between urban and rural locations suggested by other studies was not found, distinct clustering of the disease was uncovered.

Each WASHplus Weekly highlights 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, creates supportive environments for healthy households and communities by delivering high-impact interventions in water, sanitation, hygiene (WASH) and indoor air pollution (IAP). WASHplus uses proven, at-scale interventions 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.

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