



Supportive Environments for Healthy Communities

Issue 58 June 1, 2012 | Focus on WASH-Related Diseases

The World Health Organization lists more than 20 diseases that are related to water, sanitation, and hygiene (WASH) conditions. This issue focuses on three of those: cholera, diarrhea, and typhoid fever. Information and resources for each of the three diseases include fact sheets, videos, recent peer-review studies, and links to additional resources. Future issues will focus on additional WASH-related diseases.

Please let WASHplus know at any time if you have resources to share for future issues of WASHplus Weekly or if you have suggestions for future topics. An [archive](#) of past Weekly issues is available on the WASHplus website.

CHOLERA

- **Cholera Fact Sheets from CDC and WHO.** ([CDC](#), [WHO](#))
- **Cholera Statistics and Publications from WHO.** ([Link](#))
- **The Story of Cholera**, Global Health Media Project, 2011. ([Video](#))
This short animated film makes invisible cholera germs visible through the eyes of a young boy who explains how to help the sick and guides his village to prevent the spread of cholera.
- **Epidemic Cholera in a Crowded Urban Environment, Port-au-Prince, Haiti**, *Emerg Infect Dis*, Nov 2011. S Dunkle, Centers for Disease Control and Prevention. ([Full-text](#))
The authors conducted a case-control study to investigate factors associated with epidemic cholera. Water treatment and hand washing may have been protective against cholera, highlighting the need for personal hygiene in contaminated urban environments to prevent cholera. They also found a diverse diet, a possible proxy for improved nutrition, was protective against cholera.
- **Epidemic Cholera in Kakuma Refugee Camp, Kenya, 2009: The Importance**

of Sanitation and Soap, *J Infect Dev Ctries*, Mar 2012. A Mahamud, Kenya Medical Research Institute. ([Full-text](#))

A cholera outbreak with 224 cases and four deaths occurred in Kakuma Refugee Camp in Kenya from September to December 2009. The authors conducted a case-control study to characterize the epidemiology of the outbreak. In a multivariate model, washing hands with soap was protective against cholera, while the presence of dirty water storage containers was a risk factor. Provision of soap, along with education on hand hygiene and cleaning water storage containers, may be an affordable intervention to prevent cholera.

- **The Global Burden of Cholera**, *Bull World Health Organ*, Mar 2012. M Ali, International Vaccine Institute. ([Full-text](#))

The objective of this study was to estimate the global burden of cholera using population-based incidence data and reports. About 1.4 billion people are at risk for cholera in endemic countries. An estimated 2.8 million cholera cases occur annually in such countries, and an estimated 87,000 cholera cases occur in nonendemic countries. The incidence is estimated to be greatest in children under 5 years of age. The global burden of cholera, as determined through a systematic review with clearly stated assumptions, is high.
- **Knowledge, Attitudes, and Practices Related to Treatment and Prevention of Cholera, Haiti, 2010**, *Emerg Infect Dis*, Nov 2011. B De Rochars, Centers for Disease Control and Prevention. ([Full-text](#))

In response to the 2010 cholera outbreak, a public health intervention targeted high-risk communities, including resource-poor communities in Port-au-Prince, Haiti. A survey covering knowledge and practices indicated that hygiene messages were received and induced behavior change, specifically related to water treatment practices. Self-reported household water treatment increased from 30.3 percent to 73.9 percent.
- **Modelling Cholera Epidemics: The Role of Waterways, Human Mobility and Sanitation**, *J R Soc Interface*, Feb 2012. L Mari, Ecole Polytechnique Fédérale de Lausanne, Switzerland. ([Abstract](#))

This study investigated the role of human mobility as a driver for long-range spreading of cholera infections, which primarily propagate through hydrologically controlled ecological corridors. It states that long-range human movement is fundamental in quantifying otherwise unexplained inter-catchment transport of *V. cholerae*, thus playing a key role in the formation of regional patterns of cholera epidemics. It also shows quantitatively how heterogeneously distributed drinking water supplies and sanitation conditions may affect large-scale cholera transmission, and analyzes the effects of different sanitation policies.
- **Risk Factors Early in the 2010 Cholera Epidemic, Haiti**, *Emerg Infect Dis.*, Nov

2011. K O'Connor, Centers for Disease Control and Prevention. ([Full-text](#))

During the early weeks of the cholera outbreak that began in Haiti in October 2010, the authors conducted a case-control study to identify risk factors. Drinking treated water was strongly protective against illness. The results highlight the effectiveness of safe water in cholera control.

DIARRHEA

- **Diarrhea Fact Sheet.** ([WHO](#))
- **Diarrhea Incidence in Low- and Middle-Income Countries in 1990 and 2010: A Systematic Review**, *BMC Public Health*, Mar 2012. C Fischer Walker, Johns Hopkins University. ([Full-text](#))
The authors conducted a systematic literature review to identify cohort studies that sought to quantify diarrhea incidence among any age group of children 0–59 months of age. They estimated that incidence has declined from 3.4 episodes/child year in 1990 to 2.9 episodes/child year in 2010. As was the case previously, incidence rates are highest among infants 6–11 months of age; 4.5 episodes/child year in 2010. Among the 139 countries reviewed, nearly 1.9 billion episodes of childhood diarrhea were recorded in 1990 and nearly 1.7 billion episodes in 2010.
- **Estimating Diarrhea Mortality among Young Children in Low and Middle Income Countries**, *PLoS ONE*, Jan 2012. C Fischer Walker, Johns Hopkins University. ([Full-text](#))
The authors identified more than 90 verbal autopsy studies from around the world to contribute data to a single-cause model. They estimated diarrhea-proportionate mortality for 84 countries in six regions and found diarrhea to account for between 10 percent of deaths in the Americas to 31.3 percent of deaths in the Southeast Asian region.
- **Fecal Contamination and Diarrheal Pathogens on Surfaces and in Soils among Tanzanian Households with and without Improved Sanitation**, *Environ Sci Technol*, May 2012. A Pickering, Stanford University. ([Abstract](#))
Little is known about the extent or pattern of environmental fecal contamination among households using low-cost, on-site sanitation facilities, or what role environmental contamination plays in the transmission of diarrheal disease. A microbial survey of fecal contamination was conducted in peri-urban Bagamoyo, Tanzania, among 20 households using private pit latrines. No significant difference in fecal indicator bacteria levels was found between households using improved pit latrines with a concrete slab versus those without a slab. These findings imply that the presence of a concrete slab does not affect the level of fecal contamination in the household environment. Human Bacteroidales, pathogenic *E. coli*, enterovirus, and rotavirus genes were detected in soil samples, suggesting that soil should be given more attention as a transmission pathway of diarrheal illness in low-income countries.

- **Global Distribution of Outbreaks of Water-Associated Infectious Diseases,**

PLoS Negl Trop Dis, Feb 2012. K Yang. ([Full-text](#))

Water plays an important role in the transmission of many infectious diseases, which pose a great burden on global public health. However, the global distribution of these water-associated infectious diseases and underlying factors remain largely unexplored. In this study, reported outbreak events associated with corresponding water-associated infectious diseases from 1991 to 2008 were extracted from the database. The analysis suggested that outbreaks of water-associated diseases are significantly correlated with socio-environmental factors. Population density is a significant risk factor for all categories; water-related diseases are associated with accumulated temperature; water-washed diseases are inversely related to surface water area; and both waterborne and water-related diseases are inversely related to average annual rainfall. Based on the model predictions, "hot spots" of risks for all categories of water-associated diseases were explored.

- **Integrated HIV Testing, Malaria, and Diarrhea Prevention Campaign in**

Kenya: Modeled Health Impact and Cost-Effectiveness, *PLoS ONE, Feb 2012.* J

Kahn. ([Full-text](#))

Efficiently delivered interventions to reduce HIV, malaria, and diarrhea are essential to accelerating global health efforts. A 2008 community-integrated prevention campaign in Western Province, Kenya, reached 47,000 individuals over seven days, providing HIV testing and counseling, water filters, insecticide-treated bed nets, condoms, and for HIV-infected individuals cotrimoxazole prophylaxis and referral for ongoing care. The study modeled the potential cost-effectiveness of a scaled-up, integrated prevention campaign.

- **Where Science Meets Policy: Comparing Longitudinal and Cross-Sectional Designs to Address Diarrhoeal Disease Burden in the Developing World,** *Int. J. Epidemiol, Jan 2012.* A Markovitz, University of Michigan.

([Full-text](#))

The authors conducted a diarrheal disease surveillance of 5,616 individuals within 19 Ecuadorian villages. In their study, cross-sectional designs yielded more consistent evaluations of diarrheal disease risk factors when those factors varied more between villages than over time. Cross-sectional studies can provide information that is representative across large geographic regions and therefore can provide insight for local, regional, and national policy decisions. The value of the cross-sectional study should be reconsidered in the public health community.

TYPHOID FEVER

- **Typhoid Fever Fact Sheets.** ([CDC](#), [WHO](#))

- **Cost of Illness Due to Typhoid Fever in Five Asian Countries,** *Trop Med Int'l Health, Mar 2011.* C Poulos, Research Triangle Institute. ([Full-text](#))

The objective of this study was to generate community-based estimates of the public (paid by the government) and private (paid by households) costs of blood culture-confirmed typhoid fever in Hechi, China; North Jakarta, Indonesia; Kolkata, India; Karachi, Pakistan; and Hue, Vietnam. The costs of hospitalized cases ranged from \$129 U.S. in Kolkata to \$432 in North Jakarta (hospitalization rates varied from 2 percent in Kolkata to 40 percent in Hechi), and the costs of nonhospitalized cases ranged from \$13 in Kolkata to \$67 in Hechi. Where costs were highest (Hechi, North Jakarta, and Karachi), the bulk of the costs of hospitalized cases was borne by families, comprising up to 15 percent of annual household income.

- **Risk Factors Associated with Typhoid Fever in Children Aged 2–16 Years in Karachi, Pakistan**, *Epidemiol Infect.*, Apr 2012. M Khan, International Vaccine Institute. ([Abstract](#))

This study analyzed the data from the control group in a typhoid vaccine trial in Karachi to assess the differences in individual-, household- and cluster-level characteristics for developing typhoid fever. After adjustment, the risk of typhoid was lower with increasing age, higher with an increase in population density, and lower in the households using a safe drinking-water source. Typhoid fever affects younger children living in areas of high population density that lack access to safe water in Pakistan.

- **A First Step in Bringing Typhoid Fever Out of the Closet**, *Lancet*, Feb 2012. J Maurice. ([Full-text](#))

The main problem with typhoid fever is that it has dropped out of the minds of the international health community and, sadly, also of the many health officials of the developing countries where the disease is rife. "The disease," says Chris Nelson, head of the Coalition against Typhoid Secretariat at the Sabin Vaccine Institute in Washington, DC, "has become so omnipresent in the developing world as to be invisible."

- **Personal Hygiene and Household Habits Relation to Typhoid Outbreak in Rural Sharkia Governorate**, *Egyptian Journal of Community Medicine*, Apr 2011. H Wali, Benha University. ([Full-text](#))

This study showed that socio-economic status seemed to be irrelevant in the case of typhoid fever but that the hygienic habits of the population were of importance. Public health awareness should be modified to include skills building of proper hygienic habits (oral-fecal cycle).

- **Multidrug-Resistant Typhoid Fever: A Review**, *J Infec Dec Ctries*, May 2011. L Tilak, Municipal Medical College and General Hospital, India. ([Full-text](#))

Multidrug-resistant typhoid fever (MDRTF) is defined as typhoid fever caused by S. Typhi strains that are resistant to the first-line recommended drugs for treatment. Since the mid-1980s, MDRTF has caused outbreaks in several countries in the

developing world, resulting in increased morbidity and mortality, especially in affected children below 5 years of age who are malnourished. Mass immunization in endemic areas, rational use of antibiotics, improvement in public sanitation facilities, availability of clean drinking water, promotion of safe food handling practices, and public health education are vital in the prevention of MDRTF.

ADDITIONAL RESOURCES

- **Centers for Disease Control and Prevention**—Global WASH-related diseases and contaminants fact sheets. ([Link](#))
- **World Health Organization**—Information sheets on water-related diseases ([Link](#))
- **World Health Organization**—WASH maps, statistics, and country reports ([Link](#))

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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