



# Water, Sanitation, and Hygiene:

## Simple, Effective Solutions Save Lives

While sometimes not considered a public health priority, improvements to water supply, sanitation services, and hygiene promotion greatly reduce the incidence of diarrheal diseases, trachoma, and water-based parasitic diseases. Improvements to services are generally financed by transportation or infrastructure sectors and not part of health expenditures. However there are many steps public health policy makers can take, at low-cost, to ensure that services and benefits are optimized.

### Water Supply

Developing world residents need plentiful clean water to reap the benefits of an improved water supply. If uncontaminated water is available, reliable, and convenient to collect, more water is consumed, both for hygienic purposes and for drinking (which can improve overall health).

Great regional variation characterizes improvements in water supply. In rural Africa, a hand pump 500 meters from a home may be considered a luxury; yet, in urban Latin America, anything less than a household connection may be unacceptable. In urban Asia, a public standpost or water pump is often considered adequate, as long as water flow is reliable.

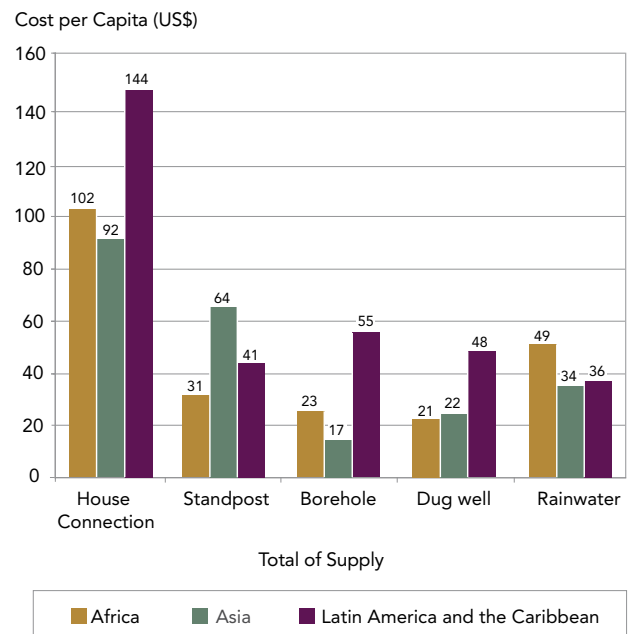
In any region, if water collection is inconvenient or too time-consuming, residents use less of it and consequently get sick more often. In order to save time, many poor and underserved households resort to paying vendors for water, rather than collecting it themselves (which can consume more than an hour a day). A more convenient water source means time and money saved, which is often the foremost benefit in the minds of consumers. In fact, the money saved by providing a more convenient water source is, in many cases, greater than the per capita cost of providing and maintaining a local or

even a household connection. And the convenience factor is so highly valued that many households are willing to finance the improvement themselves.

The cost of improving service varies by region (see Figure 1). The cheapest technologies are not always practical or possible because of hydrogeological features and the existing infrastructure.

FIGURE 1

### MEDIAN CONSTRUCTION COST OF WATER SUPPLY FACILITIES FOR AFRICA, ASIA, AND LATIN AMERICA AND THE CARIBBEAN



Source: WHO (World Health Organization) and UNICEF. 2000. *Global Water Supply and Sanitation Assessment 2000 Report*. Geneva: WHO and UNICEF.

## Water and the Disease Burden

Inadequate water supply accounts for a variety of diseases transmitted in different ways. Diarrheas, dysenteries, and typhoid are the most prevalent water-related diseases and account for over 90 percent of deaths, half of the inpatient bed nights, and a third of outpatient consultations preventable by a safe water supply. These diseases are transmitted either by ingesting contaminated water or through person-to-person contact. Children bear the brunt of the burden – most who contract water-related disease are under age 5, and most of those are under age 2.

## Quantity versus Quality

Efforts to improve water supply often focus on water quality. However, while availability of clean, uncontaminated drinking water is critical in preventing diarrheas, dysenteries, and typhoid (fecal-oral diseases), increasing water *quantity* and convenience reduce the water-related disease burden the most. Most water-related disease, including skin and eye infections, and diarrhea, is transmitted person-to-person because of a lack of water for personal hygiene. The more water available and the more convenient it is to collect, the more people will use for hand-washing and other hygienic practices. However, consumption only increases when a reliable water source is provided in a user's home, or when the old water source was more than one kilometer away.

Water consumption is up to three times higher when there is connection within the household than with a public source. Consequently, household connections can reduce diarrheal disease incidence by up to 63 percent compared with households that use shared public water sources. Evidence suggests that household connections and improved hygiene produce a substantial reduction in trachoma by encouraging hand and face washing. Household connections also discourage human contact with fresh-water rivers and lakes and thus reduce exposure to the parasites that transmit schistosomiasis.

## Water and Hygiene Promotion

Hygiene promotion can be a cost-effective way to encourage and educate consumers to maximize the benefits of available water and reduce the water-related disease burden. Studies have shown that promotional activities do not need to be continuous because behavior change, and subsequent

reductions in morbidity and mortality, may last for as many as five years after the intervention takes place. Interventions eventually need to be repeated, but not frequently.

Promoting hand-washing with soap is particularly cost-effective. The intervention is both very affordable (approximately US\$1 per capita or US\$3.35 per DALY gained)\* and can generate excellent results – up to a 43 percent reduction in diarrhea morbidity and a 48 percent reduction in life-threatening cases of diarrhea. Oral-rehydration therapy, the principal other measure to prevent diarrhea mortality, costs an estimated US\$23 per DALY gained. The intervention is most effective when it is the sole behavior change promoted – combining with other interventions can dilute the message and make recipients less compliant.

## Water and the Health Sector

The yearly per capita investment in water supply and sanitation, including national investment and external aid, is US\$2.25 in Asia, US\$7.53 in Africa, and US\$8.87 in Latin America and the Caribbean.

An additional 1 percent of this investment (US\$0.02 to US\$0.09 per capita) contributed to public health advocacy and regulation related to the water supply would greatly enhance water service. Reducing household connection charges, for example, is a cost-effective strategy to increase household coverage and thus reduce the water-related disease burden. The lost revenue could be recovered from consumer-paid monthly water tariffs.

Mexico provides a good example of the critical role the health sector can play in improving water service. After a cholera outbreak in 1991, the Ministry of Health intervened. It required chlorination of drinking water and prohibited sewage irrigation of fruits and vegetables. The results were dramatic – diarrheal incidence in children under age 5 fell from 4.5 to 2.2 episodes per year and the corresponding mortality rate declined from 101.6 to 62.9 deaths per 100,000 children.

## Sanitation Services

Many technologies are available for improving sanitation services (defined here as excreta disposal), most of which are equally effective in preventing disease if used consistently and maintained correctly. The *Global Water Supply and Sanitation*

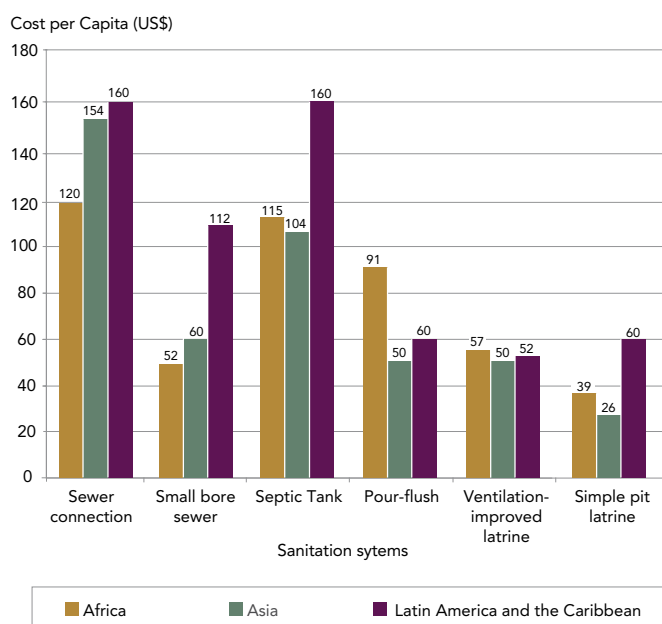
*Assessment 2000 Report* (WHO with UNICEF, 2000) determined that the following technologies are acceptable:

- Sewerage systems;
- Septic tanks with drainage beds;
- Pour-flush latrines; and
- Pit latrines.

Bucket latrines and open-pit latrines of any kind are not considered “improved.” Public latrines are also not acceptable if they are the only sanitation service available. They are seldom maintained adequately, difficult to access at night, and not accessible by the elderly or disabled or by children. User fees, which are commonplace for public toilets, further restrict access and are thus not effective in stopping public defecation.

Like water supply technology, the cost of sanitation services also varies regionally (see Figure 2). Low-cost options are often not used because builders may not know about them or opt to specialize in more expensive technologies to increase their profit margins.

**FIGURE 2**  
**MEDIAN CONSTRUCTION COST OF SANITATION TECHNOLOGIES IN AFRICA, ASIA, AND LATIN AMERICA AND THE CARIBBEAN**



Source: WHO and UNICEF, 2000. *Global Water Supply and Sanitation Assessment 2000 Report*. Geneva: WHO and UNICEF.

## Sanitation and the Disease Burden

Improvements in sanitation can also have a major affect on diarrheal disease incidence, particularly in urban areas where public defecation leads to fecal pollution throughout densely populated neighborhoods. In rural areas, where public defecation sites are generally farther from homes, latrines (while still important) are likely to have less affect on disease.

It is difficult to directly measure the effect excreta removal has on diarrheal disease because households and communities with adequate sanitation tend to be more hygienic in all aspects of their lives. However, there is little doubt that improving sanitation services can greatly reduce the incidence of diarrhea. In urban northeast Brazil, for example, diarrheal incidence of children in homes with a toilet was one-half that in homes without one. The incidence of diarrhea in young children in communities with a sewage system was one-third of that in communities without one

By reducing public defecation, improved sanitation also helps to protect residents from infestation with intestinal worm parasites (including hookworm and ascariasis). Latrines help prevent fecal pollution of household surroundings (including children’s play areas) which reduces the incidence of ascariasis by a median of 28 percent and hookworm infection by a median of 4 percent. Excreta removal is especially effective in preventing trachoma. Flies that spread trachoma prefer to breed in scattered human feces. Latrines, if widely available and used consistently, can eliminate their breeding sites.

## Interventions

While subsidies to increase latrine construction may seem like an obvious intervention, government subsidies often encourage providers to market and construct expensive designs that only the well-off can afford – excluding the poor. National and local regulations are better approaches for increasing sanitation coverage without significantly increasing cost or public expenditure. In Bobo Dioulasso, Burkina Faso, for example, the local administration withdrew land tenure rights from owners who did not build a latrine on their plot within a specified time. As a result, 90 percent of households now have their own latrine. Another effective regulation requires landlords to provide latrines for their tenants.

Most urban and rural households, even very poor ones, are willing to pay for their own latrine, as long as a fair credit system helps them to finance it. Thus, government promotion and social marketing of latrines is a very cost-effective intervention to raise awareness and help facilitate new construction (US\$11.15 per DALY gained). The following actions aimed at the construction and consistent use of latrines are cost-effective and should be considered:

- Advertising and other forms of promotion;
- Facilitate building regulation approval;
- Assist potential purchasers find and contact providers;
- Conduct training in low-cost construction techniques;
- Provide pit-emptying and desludging services; and

- Promote improved hygienic practices including appropriate use and maintenance of sanitation facilities.

### For more information

Sandy Cairncross and Vivian Valdmanis. 2006. "Water, Sanitation, and Hygiene Promotion." In *Disease Control Priorities in Developing Countries*, 2nd ed., D.T. Jamison, J.G. Breman, A.R. Measham, G. Alleyne, M. Claeson, D.B. Evans, P. Jha, A. Mills, and P. Musgrove, 771-92. New York: Oxford University Press.

---

\* DALY (disability-adjusted life year) is a composite measure that combines the number of years lived with a disability and the number of years lost to premature death.