

World Spotlight: The Safe Water System -- A Household-Based Water Quality Intervention Program for the Developing World

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In 2002, just 12 years after the end of the United Nations-declared International Drinking Water and Sanitation Decade, the lack of access to safe water remains a problem for over a billion people worldwide, and inadequate sanitation services affect at least 2.4 billion people, according to the Global Water Supply & Sanitation Assessment 2000 Report.(9)

Diarrheal diseases, which are frequently transmitted by contaminated water, continue to be a leading cause of morbidity and mortality among children under 5 years of age in developing countries. Estimates of annual total mortality from diarrheal diseases range from 2.5 million to 3.5 million. More than 80 percent of cases are among children under age 5.2 Total morbidity is estimated at 4 billion episodes per year, of which 30 percent are, according to one estimate, related to contaminated water. Thus, there are roughly 1.2 billion episodes of water-related diarrheal diseases annually.(2) The water quality crisis is highlighted by the continuing 7th cholera pandemic that started in Latin America in Peru in 1991 and swept across the region causing more than 1.2 million cases and more than 12,000 deaths.(3)

There are a number of reasons for the persistence of these problems, in spite of the investment of billions of dollars in water and sanitation services by donor agencies and governments. Population growth and shifts from rural to urban areas have stressed existing water and sanitary infrastructure and exceeded the capacity of many countries to keep up with demand for services. In many rural areas, water and sanitary infrastructure are inadequate or non-existent because of dispersed populations and poor transportation infrastructure. Large population dislocations caused by armed conflict and natural disasters have created enormous logistical problems in providing water and sanitation services. Finally, inadequate maintenance of water and sanitation infrastructure has, in some instances, led to failures of technology.

The Safe Water System

In response to the need for inexpensive, alternative means of water treatment and storage in the short to medium term, the U.S. Centers for Disease Control and Prevention (CDC) and the Pan American Health Organization/World Health Organization (PAHO/WHO) developed the Safe Water System,¹ a household-based water quality intervention (see www.cdc.gov/safewater/). The intervention has three main components -- point-of-use (POU) treatment, safe storage and behavior change techniques.

POU water treatment is promoted through the use of sodium hypochlorite solution as a disinfectant that's produced in the community from water and salt using an electrolytic cell or manufactured by a private company. Treatment with sodium hypochlorite is effective, safe, inexpensive and provides a residual effect against recontamination. In Ecuador, the Ministry of Health created a national program for the local production of sodium hypochlorite solution for POU water disinfection (see Figure 1).

Safe water storage prevents recontamination of treated water and can be accomplished through the use of containers with a narrow mouth, tight-fitting lid and a spigot for removing water. If such a storage container is used, people are less likely to introduce dirty hands or cups into the water. Street vendors in Guatemala City used safe storage containers to make and store beverages free from contamination (see Figure 2).

Behavior change techniques help ensure proper use of the intervention by the target population. Techniques that have been field-tested include social marketing, community mobilization, and motivational interviewing. These methods serve to increase awareness of the link between contaminated water and disease and the benefits of consuming safe water. The goal of these methods is to motivate the target population to purchase and properly use safe water storage vessels and disinfectant. In Bolivia, the Safe Water System was socially marketed under the brand name "CLARO" (see Figure 3).

Conclusion

The need for safe water in Latin America and throughout the developing world is great, and children continue to be at risk for illness and death due to diarrheal diseases. The Safe Water System has been shown to reduce the risk of diarrheal diseases by 44-to-85 percent in field trials performed in South America, Africa and Central Asia.^{5,6,7} The Safe Water System is inexpensive, simple to use, adaptable to different conditions and can be implemented in a relatively short period of time. In developing country communities with poor water quality, successful implementation of the Safe Water System can improve water quality and health. Further work is needed to explore innovative approaches -- such as private sector partnerships and cost recovery mechanisms -- to facilitate the expansion of the Safe Water System to other countries. Finally, further research on behavior change strategies is needed to determine the most effective approaches to motivating target populations to use the Safe Water System.

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Figure 1: Sodium Hypochlorite Production in Ecuador

In Ecuador, PAHO initiated a project in response to flooding from El Niño. Twenty-four hypochlorite production centers were established in five provinces using existing, but under-utilized, hypochlorite generators. A production and distribution network was created with approximately 210 distribution centers in Ministry of Health facilities or houses of health promoters or community health volunteers. The project has benefited approximately 200,000 persons and has been incorporated into regular activities of the Provincial Health Directorates and a newly created National Program of Water Disinfection at the Household Level.

Figure 2: Street Vendors in Guatemala

Consumption of street-vended foods and beverages is common in metropolitan centers of the developing world. Street vendors are often the only affordable source of ready-made meals for urban workers near their place of employment. Street vendors typically do not have a continuous supply of potable, running water for

drinking, cleaning, cooking and preparing beverages. Therefore, they have to store water, often in wide-mouth storage containers that facilitate contamination of the stored water. In 1996, the CDC tested the Safe Water System among food vendors in municipal marketplaces in Guatemala City, Guatemala.⁸ Participating in the study were 41 vendors who received the intervention and 42 control vendors. When compared with samples from control vendors, a significant decrease in total coliform and fecal coliform bacteria in samples of stored water and beverages sold by intervention vendors was observed over the course of the study. This study showed that the Safe Water System, which was well accepted by vendors, could reduce contamination of street-vended beverages.

Figure 3: CLARO in Bolivia

In Bolivia, the safe water storage containers and sodium hypochlorite solution were marketed under the brand name "CLARO" with the slogan "Mas CLARO, mejor agua" (more clear, better water). Videotape, pamphlets and flip charts were produced to teach about the association between water and diarrhea and demonstrate how CLARO could be used to prevent diarrhea. Promotional CLARO T-shirts and baseball caps were made to give to health personnel, public figures and consumers. A rally with local and national leaders and the general public, with extensive media coverage, was held to launch the product. A radio and television advertising campaign was launched. A field team consisting of a social communicator, a salesman and a driver began a series of visits to urban and rural communities carrying the special vessels, disinfectant, and promotional material in a truck and trailer painted with the CLARO brand name and logo. In the evenings, the field team projected the video on a 2-by-3 meter screen, gave project demonstrations, and sold the special vessels and disinfectant to individuals and stores. An evaluation of the social marketing campaign compared an intervention group of households using CLARO water vessels and disinfectant solution with a control group of households using traditional water treatment and storage methods. Three months after the launch of the CLARO social marketing campaign, in the intervention communities 50 percent of households reported using the CLARO water vessel, 34 percent said that they were using CLARO disinfectant, and 19 percent had detectable levels of chlorine in their stored water. Within intervention communities, households that reported using the CLARO vessel or CLARO disinfectant had significantly lower fecal coliform counts than households that reported not using these products.⁴ Children less than 5 years old in intervention villages had a significantly lower risk of diarrhea than children in control communities.

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