

The Safe Water System



The Safe Water System Initiative is one of the Type II partnerships that emerged from the World Summit on Sustainable Development in Johannesburg. It is an initiative that CDC helped develop, and that is now being implemented with multiple partners including WHO, CARE, USAID, and UNICEF. The Safe Water System itself is an “alternative low-cost water and sanitation solution” that has at its core “Health”, which, for CDC at least, is the most critical water issue.

Mortality and Morbidity From Unsafe Drinking Water

- Each year, 1.7 – 2.2 million persons die from waterborne diseases
- Each day, 5,000 children die from infectious diarrhea acquired from unsafe drinking water
- ~ 1 billion episodes of gastroenteritis and other infections are caused by unsafe drinking water each year



Each year, an estimated 1.7 to 2.2 million persons die from waterborne diseases. Most of these deaths are due to diarrheal diseases, and most occur in children and other vulnerable populations. More bluntly put, approximately 5,000 children die every day from diarrhea acquired from unsafe drinking water. The total burden of morbidity due to unsafe drinking water is difficult to estimate, but over 1 billion episodes of gastroenteritis and other infections annually are attributed to it each year.

Global Burden of Unsafe Water

- Over 1 billion persons have no access to improved water sources
- Hundreds of millions more drink unsafe water from “improved” sources



An estimated 1.1 billion persons worldwide have no access to improved water sources, relying on unsafe surface sources such as ponds, streams, and shallow wells like these children are using for their water needs. In addition, hundreds of millions more collect their drinking water from “improved sources”, such as the poorly functioning municipal water system this woman has accessed, that deliver un-chlorinated water contaminated with human and animal fecal waste, and with the bacteria that cause cholera, dysentery, typhoid fever, and so many other waterborne diseases. Please note that whether the source is improved or unimproved, in both photos and in hundreds of millions of families across the globe, water is collected outside and often far from the home, primarily by women and children, and that it is then carried, often in open plastic pails or buckets, back to the house where it is stored, and used for drinking, washing, cooking, and bathing until another trip to the source is required.

Post-source Water Contamination: Transport



CARE, a Safe Water System partner, provided this striking photograph of a child in Mozambique carrying water home to his family. The bucket of water is full and open, and his hands are curled into it around the top to keep it from falling. This unavoidable hand-to-water contact means that even the purest water from the best protected bore hole well will be contaminated with any disease-causing agents that are on the water-bearer's hands even before it crosses the threshold of his or her home.

Post-source Water Contamination: Storage



Inside the home, things only get worse, as illustrated by this photo taken at the height of the cholera epidemic in Peru over a decade ago. In addition to the buckets used for collecting and carrying water, other containers are often used for storing water at home, but they too tend to have wide uncovered mouths. Water is removed by dipping hands and objects in, further contaminating the stored water with the prevalent fecal flora. At the time we took this photo, and in the months that followed, CDC was assisting the Pan American Health Organization and Ministries of Health throughout the Americas in efforts to control the raging cholera epidemic. Water from many sources was the principle vehicle for cholera transmission in each country. “Boil water” orders were issued, but most persons could not afford to comply with them, and even those who could were at risk for acquiring cholera from contamination that occurred while the boiled water was stored unprotected at home. The long-term cholera fix – extending piped, treated, safe water coverage to the entire population of Latin America was projected to cost billions of dollars and take many years to complete. So the Safe Water System was initially conceived as an inexpensive, practical alternative that would enable families to protect themselves from cholera and other waterborne diseases until more definitive solutions could be implemented.

CDC Safe Water System

**Treat drinking water
at the point of use**



**Dilute sodium
hypochlorite bleach**



**Store treated
drinking water safely**



**Narrow-mouthed, lidded
vessels with spigots**



The Safe Water System is simple. It provides families with the means to treat their drinking water at the point-of-use – by adding dilute sodium hypochlorite bleach - and the means for them to store treated drinking water safely – in a narrow-mouthed, lidded vessel with a spigot that can be used to collect, transport, disinfect and store drinking water in the home. A capful of the locally-produced dilute sodium hypochlorite from the 500 ml CLARO bottle is just the right amount to treat 20 liters of water in the locally-produced CLARO storage vessel. These two items were marketed together as part of the first national Safe Water System project in Bolivia in 1996.

CDC Safe Water System



The hypochlorite solution and the storage vessel are the “hardware” of the Safe Water System, but the more critical component is the “software”. The software is the messages and the methods used to induce and sustain healthy changes in behavior, including safe water handling, and improvements in hygiene and sanitation, such as handwashing. These printed materials are from Safe Water System programs in Bolivia, Zambia, and Ecuador, but our social marketing and implementation partners also reach people through radio and TV broadcasts, community mobilization campaigns, and interpersonal behavior change techniques such as motivational interviewing. We realized long ago that for the Safe Water System to have impact, it needed to be economically self-sustaining, and hence one function of the “software” is to get people to buy the “hardware”. Fortunately, the bleach solution costs very little to produce, and 10 to 25 cents worth will last a family an entire month. Safe storage vessels cost between 2 and 5 dollars, but are still within the means of many of those who can benefit from them. Increasingly, we’ve recognized that the “hardware” also helps to sell the software. In other words, people who purchase and bring into their homes a bottle of hypochlorite for water treatment and a safe water storage vessel are likely to be receptive to messages promoting simple hygiene measures like handwashing - which by the way, is a lot easier to do when your water is kept in a vessel with a spigot. The hardware empowers families to manage their household water and sanitation environment better, and this reinforces their willingness to adopt and maintain new behaviors.

Safe Water System Results

- **Consistently reduces diarrhea by 25-85%**

Bolivia*	1994	44% overall; 53% in infants
Uzbekistan*	1996	85% overall
Zambia*	1998	48% overall
Guatemala	2001	25% overall
Madagascar*	2001	95% against cholera
Kenya	2001	55% in children <5 years old
Madagascar	2002	63% overall
Pakistan	2002	49% overall
Uganda	2003	~30% in HIV-infected persons



*publication available



As we began field testing the Safe Water System, we quickly demonstrated that it offered protection not only against cholera, but against a wide range of waterborne bacterial infections that cause diarrhea. This table summarizes the reductions in diarrheal diseases attributable to the Safe Water System in nine studies, four of which have been published so far. In the most recent study, just completed in Uganda in 2003, the Safe Water System was associated with an approximately 30% reduction in diarrheal episodes among persons infected with the HIV-virus.

Safe Water System Results

- **Useful for emergency response**
 - Bolivia, Kenya, Malawi, Zambia, Madagascar*
- **Useful for clinics and marketplaces**
 - Guinea Bissau*, Ivory Coast*, Guatemala*
- **Cost effective and economically sustainable**
 - Bolivia*, Madagascar*, Malawi, Rwanda, Tanzania, Zambia, and India



*publication available



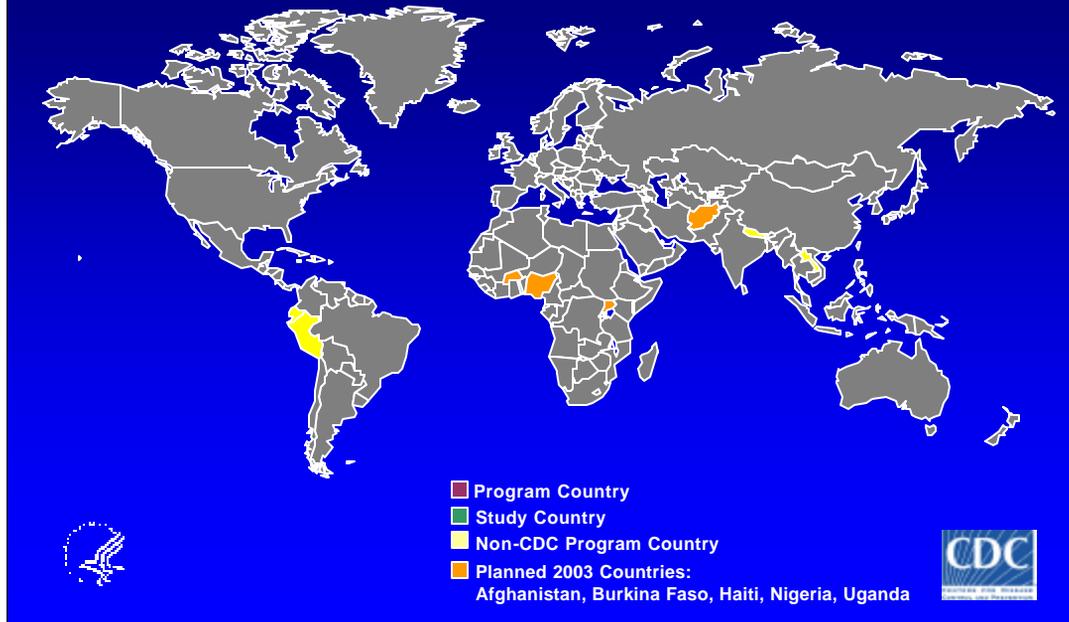
The Safe Water System has found useful applications in many places outside the home. For example, it has been used as an emergency response tool for earthquakes and flooding in Bolivia, Kenya, and Malawi, and for cholera epidemics in Zambia and Madagascar. In Guinea Bissau, the Safe Water System was used to make and dispense oral rehydration solution safely during a cholera epidemic; in Cote d'Ivoire it was given to expectant and new mothers at a maternal and child health clinic, and in Guatemala it was used by food vendors for handwashing and to make safer foods and beverages. National programs in seven countries have shown that the SWS is an extremely cost effective program that can be made economically sustainable.

Safe Water System Projects



This is a simple picture of the actual water treatment solution bottles that are sold under different brand names in 7 countries: (left to right) Bolivia, Peru, Zambia, Uganda (in yellow), Kenya, India, and Madagascar.

Safe Water System, 1992 - 2003



This map illustrates the countries where we have active Safe Water System programs, in red, and countries where we have studied applications of the Safe Water System, in green. Countries in yellow are those where Safe Water System programs have been initiated by local groups with only long-distance technical support from CDC and materials such as our Safe Water System Handbook, now available in English, French, and Spanish, and soon to be available in Arabic. As of late 2003, Safe Water System programs have been or will be launched in the five new countries shown in orange: Afghanistan, Burkina Faso, Haiti, Uganda, and Nigeria. The Gates Foundation has funded the project in Afghanistan, while core partners, UNICEF, PSI, and CDC will fund projects in the three other countries.

Safe Water System Partners

- Funding: USAID, WHO, UNICEF, Rotary International, JICA, Procter, and Gamble Fund
- Production: Local private sector companies
- Implementation: CARE, PSI, other NGOs
- Human resources: Ministries of Health, NGOs, PSI, private sector (retailers, wholesalers)
- Political support: Ministries of Health, Ministries of Water, municipal governments
- Monitoring and evaluation: CDC, universities



Many key partnerships have made these Safe Water System programs possible, and this slide lists some of the institutions that have played key roles in various aspects of the program development, implementation, and evaluation. I want to point out the important role played by private sector partners ranging from multi-national producers of bleach and plastic vessels, to national wholesalers and retailers, and on down to the level of door-to-door salesman and the owners of small roadside kiosks. Rather than creating the solid infrastructure needed to extract, process and deliver safe water to people's homes, the Safe Water System relies on the existing commercial infrastructure to deliver inexpensive water treatment and storage products, and key hygiene and sanitation messages to people wherever they live and work.

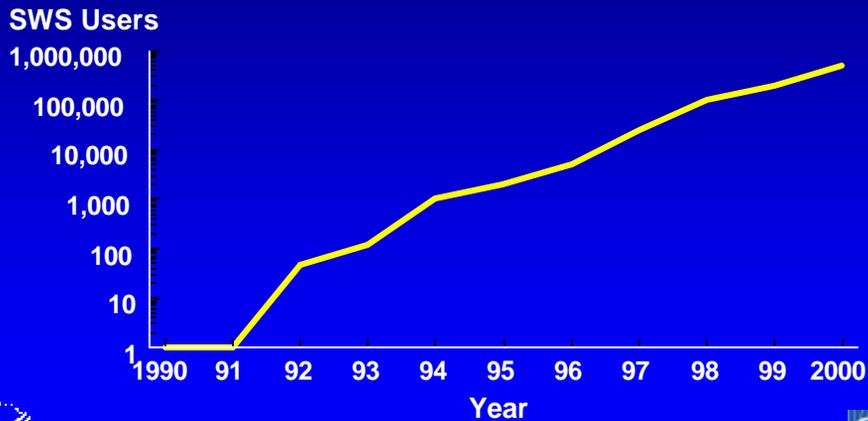
Experience on Three Continents

- Safe Water System Programs
 - Can be rapidly implemented
 - Promote local entrepreneurship
 - Reduce diarrhea in families by ~50%
 - Are the most cost effective water intervention worldwide, costing <1/10 cent per liter of water
 - » World Health Report, 2002



The experience of nearly a decade in 15 countries on 3 continents has demonstrated that Safe Water System programs can be rapidly implemented; that they promote local entrepreneurship and can be economically self-sustaining, and that they consistently reduce episodes of diarrhea in families by approximately 50%. In its World Health Report, 2002, WHO recognized point of use treatment programs like the Safe Water System as the most cost effective water intervention worldwide, costing less than a tenth of a cent per liter of treated water.

Safe Water System Usage, Global Estimates, 1990-2000



This slide shows on a logarithmic scale the estimated number of people using the Safe Water System each year from 1990 through 2000, when we estimated that we reached our first million users.

Safe Water System Usage, Global Estimates, 2001-2003

- Over 1 million bottles of Clorin sold in Zambia each year in 2001 and 2002
- Over 850,000 bottles of Sur'Eau expected to be sold in Madagascar in 2003
- Through 2002, an estimated 1 million families have been reached with SWS projects



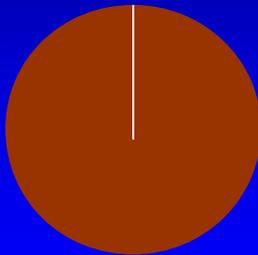
With introduction of national programs in several countries since 2000, usage has continued to rise dramatically. PSI sold over 1 million bottles of Clorin in Zambia each year in 2001 and 2002. And nearly 1 million bottles of Sur'Eau are expected to be sold in Madagascar in 2003. With the new program countries coming on line, we expect to reach approximately 1 million families, or about 5 million persons, with the Safe Water System by the end of 2003.

Global burden of unsafe water

>1.1 billion persons

Safe Water System: 2003

5 million users



Unsafe Water



But as good as that makes us feel, when we leave our logarithmic scales behind and examine our progress on a pie chart representing the billion plus persons without safe water, we see immediately how much more needs to be done. So how are we going to capitalize on the tremendous opportunity that this situation presents us with? Several exciting new prospects have recently emerged ...

Safe Water System Opportunities

- Expansion to national scale programs in 20 countries (63 million users) proposed by UNICEF, PSI, CDC at 3rd World Water Forum
- International Network to Promote Safe Household Water Treatment & Storage, Washington, June 5
- G-8 Leaders' Summit Meeting in Evian, France statement: "Encourage the use of adapted technologies at the household level ... including point of use water treatment"



At the Third World Water Forum in Kyoto in March 2003, a proposal to reach 20 countries with national Safe Water System programs was presented by UNICEF, PSI, and CDC that would extend this intervention to 63 million new users in just 2 years. If this proposal finds support within the donor community, we could be well on our way. In addition, on World Environment Day, June 5th, WHO convened the second meeting of the recently created International Network to Promote Household Water Treatment and Safe Storage in Washington DC. This group of public and private sector partners aims to promote awareness, research, and support for a variety of related technologies, including solar water disinfection, filtration, and flocculation and coagulation, that can all be applied to make water safer at the household level. Some of these technologies offer advantages over hypochlorite in their ability to neutralize parasitic and viral pathogens, and chemical contaminants, and in some situations they may cost less or be more widely accepted than hypochlorite treatment. Lastly, in June 2003, the G-8 Leaders' Summit Meeting in Evian, France made the following statement to: "...Encourage the use of adapted technologies at the household level on a self sustaining basis for the provision of basic sanitation and safe drinking water, including point of use water treatment..." We can only hope that these statements will open the doors to many new opportunities and greatly expanded support for program implementation.

Millennium Development Goal

- Reduce by 50% the proportion of people without access to safe water by 2015
- Requires that 125,000 people a day get access to safe water

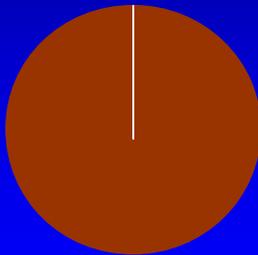


The Millennium Development Goal, re-endorsed at the World Summit for Sustainable Development in Johannesburg, is to reduce by 50% the proportion of people without access to safe water by the year 2015. A conservative calculation, assuming no population growth, converts that into 125,000 people each day who will need to get access to safe water for the next 12 and a half years if this goal is to be met. And remember, that still leaves over half a billion people without access to safe water.

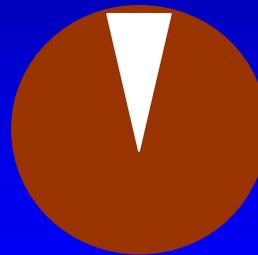
Global burden of unsafe water

>1.1 billion persons

Safe Water System: 2003
5 million users



Safe Water System: 2007
100 million users



 Unsafe Water

Proposed 20 country expansion



We believe that the Safe Water System can help us reach the goal, and have projected a figure of 100 million regular users by 2007, if we can find the resources to support our proposed 20 country expansion.

Reducing diarrheal disease 10%



Could save the lives of 500 children
every day



If this effort succeeds in reducing waterborne diarrheal disease worldwide by only 10%, we could be saving the lives of 500 children every day.