

Household Water Treatment (HWT)

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Water Needs and Risks

Progress made

- 2.3 billion people gained access to drinking water
- Child mortality dropped from 1.5 million to 600,000

Progress needed

- Annually, 600,000 children are dying as a result of ingesting contaminated water
- 748 million people lack access to improved drinking water
- 1.8 billion people use fecal-contaminated water

Urban crisis

- Urban areas will experience a fourfold increase in population size by 2050
- Exacerbate challenges of providing safe drinking water

Intermittent Water Supply

- Go-to when treatment facilities are too small to serve population
- Yields poor, unreliable water quality

Making the Case

Recontamination

- Intermittent water delivery and poor infrastructure can cause water to become re-contaminated
 - Freetown, Sierra Leone
 - Population of 1.5 million is served water for a few hours every 3 to 4 days
 - Tests for E. Coli over 6 months were positive 57% of the time

U.S. vs. low and middle-income countries

- Public sector vs. Private sector
 - US drinking water standards
 - Responsibility on individuals in low and middle-income countries

Distribution of HWT through income brackets

- 1/3 of total population in low and middle-income countries use HWT
- 20% of lowest income bracket use HWT
- 36% of highest income bracket use HWT

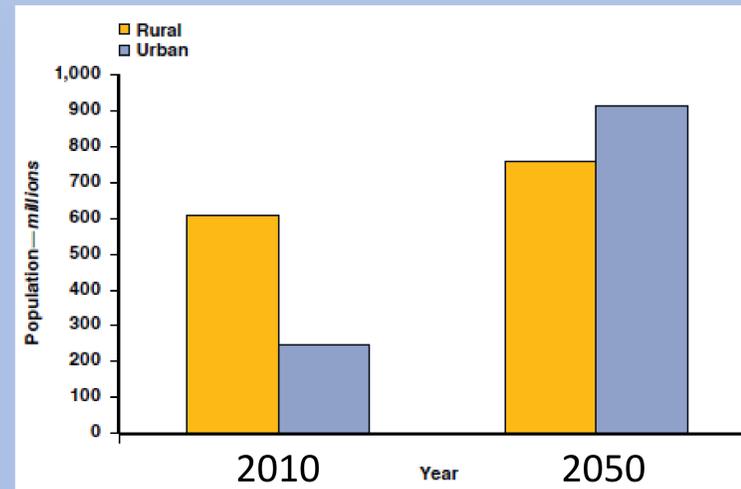


Figure 1: Rural and urban population projections for least-developed countries



Figure 2: Storage Tanks of water in a city

Alternative HWT

Filtering/Straining

- Can have varying effectiveness in microbial treatments
- Usually requires another form of treatment

Biosand/Ceramic Filters

- Less expensive than normal filters, but comes with a recommendation for further disinfection
- Low production rates (1.5-2.5 L/h)

Solar Disinfection

- Virtually free water disinfection
- Raised temperatures and UV rays disinfect the water over a 6 hour period
- Planning ahead and weather inconsistencies make this less common

Chlorine Tablets

- \$18/year for 20 L of clean water a day
- Lack of education and an unfavorable taste limit this use

Boiling

- 600 million people regularly boil their water
- Extremely inefficient-10,000 times more energy than solar disinfection

HWT Certification and Standards

“Black Box” nature

- Many HWT methods and products
- People cannot observe the workings behind treatments such as microfiltration or UV disinfection so they are skeptical of how well they work
- One reason boiling water remains a primary water treatment in low income countries because they are taught this method and are familiar with it and can see it working

Safe Drinking Water Act (SDWA 1996)

- United States public water utilities governed by SDWA
- Because of concerns that people may not understand water treatment and will not reliably operate and maintain their HWT devices

World Health Organization (WHO)

- Concluded that HWT plays an important role in protecting public health.
- Published health performance targets to inform the development of new HWT methods
- Related performance specifications to health based outcomes

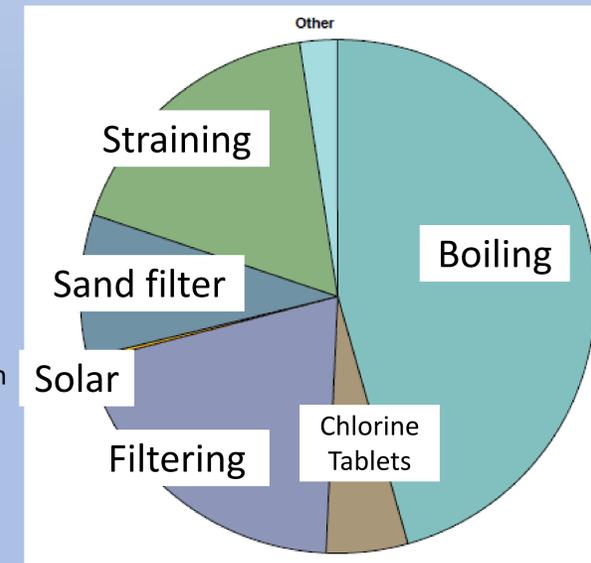


Figure 3: Household water treatment methods in low- and middle-income countries by Rosa and Clasen (2010)



Figure 4: Boiling water over charcoal cookstoves

References

Berg, P. The World's Need for Household Water Treatment. J. AWWA. 2015, 107(10), 36-44.
Rosa, G.; Clasen, T. Estimating the scope of household water treatment in low- and medium-income countries, Amer. J. Tropical Medicine and Hygiene, 2010, 82(2), 289.

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