Pure Home Water, Tamale, Ghana
Lessons from 4 Mass Distributions of Household-Scale Ceramic Pot Filters
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Pure Home Water, Tamale, Ghana
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Pure Home Water

- Pure Home Water (PHW): a social enterprise with two goals:

1. Reach people most in need of safe drinking water, sanitation and hygiene (WASH) in Ghana, especially in northern Ghana, the poorest part of the country
2. Become financially and locally self-sustaining
Pure Home Water was founded in 2005. Influenced by the HWTS Network, we began with the aim of demonstrating and selling a wide variety of HWTS. Seven products were selected, based on local availability in Ghana.
Unfortunately, because unimproved surface waters (such as the picture on the left) is a typical drinking water supply for many of our target customers, very few of the HWTS products that had worked elsewhere worked in Ghana! Only the ceramic pot filter gave consistently good results.
A Brief History of Pure Home Water

2005 - 2009

2010 - 2012

2013
AfriClay Filter – How it is Made?

• AfriClay ceramic pot filters are made of a mixture of local clay and rice husk.
• When this mixture is fired in a brick kiln, the organic material combests, leaving behind many small pores in a wide range of sizes (0.6 to 500 microns).
• The ceramic filter element sets into a translucent plastic bucket which serves as a safe water storage container
• Clean water is dispensed through the tap at the bottom
AfriClay Filter – How Does it Work?

• When dirty water is poured into the ceramic filter element bacteria, protozoa, particles and other contaminants are removed as the dirty water passes through the filter.

• Contaminants are removed by physical screening, by adsorption, (i.e. the binding of particles to surfaces in the ceramic pores spaces) and by inactivation of microbes via silver nanoparticles.
Advantage of the AfriClay Hemisphere Filter

<table>
<thead>
<tr>
<th></th>
<th>Flower Pot Filters</th>
<th>Hemisphere Filters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow (Liters/Hr)</td>
<td>1.5 – 3</td>
<td>2 – 7</td>
</tr>
<tr>
<td>Coliform Removal (%)</td>
<td>90-99%</td>
<td>90-99%</td>
</tr>
</tbody>
</table>

Same performance at much higher flow rate !!!
Pure Home Water Filter Sales
(2005 – 2013)

7,800 Flood Distribution

4,000 Guinea Worm Programme

1,224 Sold at Various Prices

1,224 Free (& Emergency)

962 Factory Construction

962 1,100 MLGRD/UNICEF

962 1,250 Rotary

500 World Vision

333 Guinea Worm Programme

902 1,100 MLGRD/UNICEF

589 FY1 (05-06)

1,224 FY2 (06-07)

333 FY3 (07-08)

902 FY4 (08-09)

962 FY5 (09-10)

4,000 FY6 (2011)

500 FY7 (2012)

450 FY8 (2013)
The 3 “C”s

• Correct: achieves X% correct responses on a correct use follow-up survey
• Consistent: filter is used daily
• Continuous: filter is used throughout the entire year, both during the rainy and dry seasons
Proper Cleaning & Maintenance

1. Place funnel in cloth, boiled water
2. Gently wash cup with fresh and soft water & 2% Alkaline
3. Wash tap with Aquafine water
4. Fill a cup with filtered water
5. Wash inside with soft brush
6. Assemble filter
7. Collect water
8. Let settle for at least 1 hour
9. Wash outside with soft brush
10. Drink

Stop

- Do not lift pot when full
- Place filter on stable, high base
- Do not overfill filter
- Do not touch outside part of pot
- Always keep lid on filter
- Always keep a clean drinking cup on top of filter
Behavior Change - to develop good habits around household water treatment and management
Lessons from M&E of Filters
Peletz & Johnson (2006-07)

Direct Sales Monitoring
Other Findings

• 93% still use filter after 6-12 months (Peletz 2006)

• 99.7% *e. coli* removal

• 92% turbidity reduction

• Urban (modern) households with filters have **88% less risk** of having diarrheal illness (Peletz 2006)

• Rural (traditional) households with filters have **69% less risk** of having diarrheal illness (Johnson 2007)
Flood Distribution (2008)

UNICEF, Oxfam, CLIP
2008 Flood Distribution

• 7,800 filters sold by PHW to UNICEF, Oxfam, and CLIP in Nov. 2007

• 2000 Distributed to end user by PHW, remainder by NGO or Government (Jan. – April, 2008)

• PHW monitored > 1,000 filters in households (June – Aug, 2008)

(Credit: M.Stevenson)
Flood Distribution – Lessons Learned

- Overall 63% sustained use after 6-12 months
- Targeted beneficiaries vs. blanket coverage
- Interactive small group training vs. large group training
- Seasonal or other factors impact sustained use
- Follow-up impacts sustainability
Guinea Worm Outbreak Distribution (2009)

UNICEF/EU I-WASH Funded,
Implementation under MLGRD, DAs
"When you have a guinea worm outbreak it is critical to move with speed to stop further transmission. The best way to do this is to provide clean water for the community, but unfortunately in most cases this cannot be done quickly or in each household. Using ceramic filters helped us to do both. They were especially helpful in areas where there was limited or no groundwater. We used them with great success in the guinea worm eradication effort in Ghana."

- Jim Niquette, Director, Carter Center-Ghana, Guinea Worm Eradication Campaign 2005 - 2011
6 Month M&E

• 90 to 97% still using the filter (varied by community)
• Correct usage was lower – 70 to 80%
  – Unhygienic condition of storage vessel
  – Unhygienic condition of cup or calabash used to consume filtered water
36 month M&E

- Assessment by Community Development Workers to determine how many filters were still in use
- Approximately 25% still in use
- Most not in use due to breakage over time
Chanshegu (2012)

Independent NGO Distribution 2012
Chanshegu Lessons Learned

• Extremely high breakage rate (80% after 6 months)
• Filters generally not on stable bases
• Training by donor NGO poor
UNICEF- MLGRD Distribution 2012
Yipeligu, Northern Ghana
Results & Lessons Learned
### UNICEF Yipelgu Overall Filter M&E Results (N = 85 households)

#### Table 1: Geometric means of total coliform, *E. coli*, and turbidity

<table>
<thead>
<tr>
<th>Water Quality Parameter</th>
<th>Stored Sample</th>
<th>Filtered Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total coliform (MPN/ 100 mL)</td>
<td>12,905 (9,162-18,197) ($N = 81$)</td>
<td>141 (78.7-253.5) ($N = 83$)</td>
</tr>
<tr>
<td><em>E. coli</em> (MPN/100 mL)</td>
<td>202 (133-308) ($N = 76$)</td>
<td>4 (3-5) ($N = 85$)</td>
</tr>
<tr>
<td>Turbidity (NTU)</td>
<td>157 (122-201) ($N = 85$)</td>
<td>40 (31-51) ($N = 85$)</td>
</tr>
</tbody>
</table>

| % Total coliform reductions$^a$ | -- | 99% |
| % *E. coli* reductions$^a$ | -- | 98% |
| % NTU reductions$^a$ | -- | 80% |

$^a$ Calculated as $\log_{10}$ reduction = $\log_{10}$ influent – $\log_{10}$ effluent and subsequently the $\log_{10}$ reductions were transformed into percentages.
Overall Filter Performance

E. coli Log Removal Value Summary

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
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<tbody>
<tr>
<td>Minimum (n = 76)</td>
<td>-0.50</td>
</tr>
<tr>
<td>Maximum (n = 76)</td>
<td>4.28</td>
</tr>
<tr>
<td>Median (n = 76)</td>
<td>1.90</td>
</tr>
<tr>
<td>Arithmetic mean (n = 76)</td>
<td>1.74</td>
</tr>
<tr>
<td>Geometric mean (n = 70)</td>
<td>1.73</td>
</tr>
<tr>
<td>Standard deviation (n = 76)</td>
<td>0.91</td>
</tr>
</tbody>
</table>
UNICEF Distribution (2012-2013)  
Yipelgu - Lessons Learned

- Usage 99%
- Increased reliability (breakage or problems 2.5%)
- Filters not being left on stable base after we leave
- Taps being removed at each cleaning
- Unclear information in training sessions
Overall Lessons Learned

• Correlation between filter performance and correct use surveys can provide suggestions to:
  – Implementation Design
  – Training manual
  – Training sessions
  – Factory production variables/quality control procedures
Thanks to our Partners

unicef

Department of Civil & Environmental Engineering
Massachusetts Institute of Technology

Gerard Health Foundation
21 Eliot Street #10
Natick, MA 01760-8085

ARCH
ARCH is now part of Lonza

Rotary International
The Rotary Foundation

World Vision
More on “Pure Home Water”

http://web.mit.edu/watsan/meng_ghana.html

http://www.purehomewater.org

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YouTube video: Pure Home Water Ghana

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