Implementing HWTS:

Issues to Consider

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Usen Family Career Development
Assistant Professor
Efficacy:
Scheme, RCT

Effectiveness:
Scalable Impact in Real-World Programs
Efficacy: Scheme, RCT

Effectiveness: Scalable Impact in Real-World Programs

Enabling Environment, Financials, & Policy

Design
Decision-making
Distribution
Use
Training
Appropriateness
Evaluation
Manufacturing
Point-of-use water treatment and diarrhoea reduction in the emergency context: an effectiveness trial in Liberia

Shannon Doocy and Gilbert Burnham

Johns Hopkins University Center for Refugee and Disaster Response, Baltimore, MD, USA

Summary

Communicable diseases are of particular concern in conflict and disaster-affected populations that reside in camp settings. In the acute emergency phase, diarrhoeal diseases have accounted for more than 40% of deaths among camp residents. Clear limitations exist in current water treatment technologies, and few products are capable of treating turbid water. We describe the findings of a 12-week effectiveness study of point-of-use water treatment with a flocculant–disinfectant among 400 households in camps for displaced populations in Monrovia, Liberia. In intervention households, point-of-use water treatment with the flocculant–disinfectant plus improved storage reduced diarrhoea incidence by 90% and prevalence by 83%, when compared with control households with improved water storage alone. Among the intervention group, residual chlorine levels met or exceeded Sphere standards in 85% (95% CI: 83.1–86.8) of observations with a 95% compliance rate.
Design

- Machine-made
- Hand-made
- $25
- $125
- Chlorine safe
- Non-chlorine safe materials
- Shippable
- Limited
- Design process not complete
Design
Design

- Design is iterative
- If treatment technology changes, RCT/Scheme not valid
Manufacturing

• Local
  – Quality control
  – Production capacity
  – Cost

• International
  – Above, plus importation
Decision-Making & Appropriateness

A - Report Dispenser Use
B - Confirmed FCR >=0.2 mg/L
C - Effective Use

Precent of Households (%)

Haiti Sustained

<table>
<thead>
<tr>
<th>Haiti</th>
<th>Sustained</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>12</td>
<td>9</td>
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### Criteria for Implementation

<table>
<thead>
<tr>
<th></th>
<th>Haiti</th>
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<tbody>
<tr>
<td>Use of point sources</td>
<td>✗</td>
</tr>
<tr>
<td>Sufficient population density to source ratio</td>
<td>✗</td>
</tr>
<tr>
<td>Source density in intervention area</td>
<td>✗</td>
</tr>
<tr>
<td>Minimum affected population</td>
<td>✓</td>
</tr>
<tr>
<td>Dispensers most appropriate option</td>
<td>✗</td>
</tr>
<tr>
<td>Minimum chlorine acceptability</td>
<td>✓</td>
</tr>
<tr>
<td>Access for evaluators</td>
<td>✓</td>
</tr>
<tr>
<td>Developing country</td>
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<tr>
<td>Diarrheal disease risk</td>
<td>✓</td>
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<thead>
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<th>Sierra Leone</th>
<th>DRC</th>
<th>Senegal</th>
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<tr>
<td>Use of point sources</td>
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Decision-Making & Appropriateness

A - Report Dispenser Use
B - Confirmed FCR >=0.2 mg/L
C - Effective Use

Percent of Households (%)

Haiti Sustained
Sierra Leone Initial
Sierra Leone Sustained
DRC Initial
DRC Sustained
Senegal Initial
Senegal Sustained

Tufts University
School of Engineering
Distribution

Commercial

Quasi-Commercial

Non-Commercial

• Direct sales
• BOP marketing
• Organized/unorganized retail
• Micro-enterprises

• Social marketing
• Microfinance institutions
• Rural sanitary marts
• Self-help groups

• Mass distribution through public sector, UN, NGOs, CBOs, etc.
## Training and Use (Haiti Filtration)

<table>
<thead>
<tr>
<th>Program type</th>
<th>Biosand</th>
<th>Biosand</th>
<th>Ceramic</th>
<th>Ceramic</th>
<th>Sawyer</th>
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<tbody>
<tr>
<td>Program type</td>
<td>Installed by NGO</td>
<td>Installed by NGO</td>
<td>Distributed for free</td>
<td>Distributed for free</td>
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<tr>
<td></td>
<td>at subsidized price,</td>
<td>at subsidized price,</td>
<td>no follow-up</td>
<td>no follow-up</td>
<td>variable follow-up</td>
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<tr>
<td></td>
<td>regular follow-up with</td>
<td>regular follow-up with</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>local Technician</td>
<td>local Technician</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geomean E. coli (untreated)</td>
<td>29.3</td>
<td>485</td>
<td>78.5</td>
<td>3.92</td>
<td>8.61</td>
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<tr>
<td>Geomean E. coli (treated)</td>
<td>1.14</td>
<td>4.12</td>
<td>16.4</td>
<td>0.33</td>
<td>0.65</td>
</tr>
<tr>
<td>Effective use (&lt;1)</td>
<td>34%</td>
<td>16%</td>
<td>0%</td>
<td>24%</td>
<td>26%</td>
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<tr>
<td>Effective use (&lt;10)</td>
<td>34%</td>
<td>45%</td>
<td>9%</td>
<td>15%</td>
<td>17%</td>
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</table>

Enabling Environment: <10 not accepted
Evaluation

- We need to measure
- Iteratively improve
- Resources for this
Example Effective Long-Term Programs

- Haiti
  - Chlorine solution

- Cambodia
  - Ceramic water filters

Evaluating the Sustained Health Impact of Household Chlorination of Drinking Water in Rural Haiti

Eric Harshfield, Daniele Lantagne, Anna Turbes, and Clair Null*
Rollins School of Public Health, Emory University, Atlanta, Georgia; Waterborne Disease Prevention Branch, Centers for Disease Control and Prevention, Atlanta, Georgia; Rollins School of Public Health/School of Medicine, Emory University, Atlanta, Georgia

Abstract. The Jolivert Safe Water for Families program has sold sodium hypochlorite solution (chlorine) and conducted household visits in rural Haiti since 2002. To assess the impact of the program on diarrheal disease, in 2010 we conducted a survey and water quality testing in 201 program participants and 425 control households selected at random. Fifty-six percent of participants (versus 10% of controls) had free chlorine residuals between 0.2 and 2.0 mg/L, indicating correct water treatment. Using intention-to-treat analysis, we found that significantly fewer participants had diarrheal disease with 59% reduced odds (odds ratio = 0.41, 95% confidence interval = 0.21–0.79). Treatment-on-treated estimates of the odds of diarrheal illness indicated larger program effects for participants who met more stringent verifications of participation. Diarrheal disease reduction in this long-term program was comparable with that seen in short-term randomized, controlled interventions, suggesting that household chlorination can be an effective long-term water treatment strategy.
Effective Use

• More than a product
  • ...that has an RCT or met Scheme requirements

• Need
  • Well-designed, quality-controlled, and consistently manufactured product
  • Distributed using an appropriate mechanism in an area where it is acceptable
  • With sufficient training and materials to use
  • Where people actually use it
  • In a program providing ongoing M&E
We cannot assume a correlation between that the most efficacious products (RCT, Scheme) are the most effective after implementation attrition.

...Implementation Matters
Thank you and I am happy to take questions.

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