An evaluation of a Water, Sanitation, and Hygiene (WASH) Program for Rural Communities in Northern Afghanistan

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Afghanistan
**Improved**
- Piped water into dwelling
- Piped water to yard/plot
- Public tap or Standpipe
- Tubewell/borehole
- Protected dug well
- Protected Spring
- Collected rainwater

**Unimproved**
- Unprotected spring
- Unprotected dug well
- Cart with small tank/drum
- Tanker-truck
- Surface Water
- Access to Safe Drinking Water in 2010
  - Rural ≈ 42% (JMP, 2012)
  - Urban ≈ 78%

- Access to Improved Sanitation in 2010
  - Rural ≈ 30% (JMP, 2012)
  - Urban ≈ 60%
Non-governmental Organization (NGO) - WASH Program

Two-year program:
• 10 villages
• September 2009
• Baseline Survey

Interventions:
• Well drilling
• Hand-pump repair and technician training
• Introduction of biosand filters
• Classes: hygiene, safe water storage, water treatment, and handwashing with soap
Research Questions

- Post program, was access to safe drinking water improved within the study area?
- Was there an increase in WASH knowledge within the study area?
- Was there an increase in WASH practices within the study area?
- Was stored household drinking water safe for consumption?
Survey

- 4 villages
- 15 households/village
Survey

36 Questions and Observations
Water Samples

Presence/Absence of *E. coli*
Locational Information
Was there a difference in how the questions were answered before and after the NGO’s WASH program?
Survey

Was there a difference in how the questions were answered before and after the NGO’s WASH program?

Follow-up Percent - Baseline Percent = Difference
## Results – Percent Difference

### Variables with significant change between baseline and follow up surveys

<table>
<thead>
<tr>
<th>Variables</th>
<th>Village1</th>
<th>Village2</th>
<th>Village3</th>
<th>Village4</th>
<th>Mean Difference</th>
<th>Standard Deviation</th>
<th>Overall Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technology</strong></td>
<td></td>
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</tr>
<tr>
<td>Main source of drinking water for household</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Borehole</td>
<td>28.8</td>
<td>28.0</td>
<td>64.3</td>
<td>63.2</td>
<td>46.1</td>
<td>20.4</td>
<td>Increase</td>
</tr>
<tr>
<td>Narrow mouthed water storage container(s)</td>
<td>9.5</td>
<td>9.5</td>
<td>18.1</td>
<td>17.4</td>
<td>13.6</td>
<td>4.8</td>
<td>Increase</td>
</tr>
<tr>
<td><strong>Knowledge</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Named at least 3 causes of diarrhea</td>
<td>49.5</td>
<td>40.4</td>
<td>44.7</td>
<td>41.4</td>
<td>44.0</td>
<td>4.1</td>
<td>Increase</td>
</tr>
<tr>
<td>Named at least 3 ways that diarrhea can be prevented</td>
<td>28.0</td>
<td>21.4</td>
<td>44.7</td>
<td>60.0</td>
<td>38.5</td>
<td>17.4</td>
<td>Increase</td>
</tr>
<tr>
<td><strong>Practices</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Treat water in any way to make it safer for drinking</td>
<td>-22.1</td>
<td>-18.3</td>
<td>-24.0</td>
<td>-10.1</td>
<td>-18.6</td>
<td>6.2</td>
<td>Decrease</td>
</tr>
<tr>
<td>All water storage containers are covered</td>
<td>45.1</td>
<td>43.3</td>
<td>42.9</td>
<td>53.3</td>
<td>46.2</td>
<td>4.9</td>
<td>Increase</td>
</tr>
<tr>
<td>Had a specific place to wash hands after using the toilet facility</td>
<td>53.8</td>
<td>58.8</td>
<td>76.9</td>
<td>64.2</td>
<td>63.4</td>
<td>9.9</td>
<td>Increase</td>
</tr>
<tr>
<td>Recalled washing hands for at least two critical times</td>
<td>20.0</td>
<td>21.4</td>
<td>35.7</td>
<td>28.0</td>
<td>26.3</td>
<td>7.2</td>
<td>Increase</td>
</tr>
<tr>
<td>Soap was observed in handwashing area</td>
<td>26.7</td>
<td>6.7</td>
<td>23.1</td>
<td>20.0</td>
<td>19.1</td>
<td>8.7</td>
<td>Increase</td>
</tr>
</tbody>
</table>

1The percent difference is considered significant if it is more than two times the standard deviation from 0.

2Cell values are the difference in percent between baseline and follow-up surveys. Follow-up percent - Baseline percent = percent difference
Results

Diarrhea Incidence

Percentage of children 5 years old or younger in surveyed households that had diarrhea in the previous two weeks.
Results of *E. coli* Tests - Boreholes

- **Village 1**
  - Counts: 4 (Presence)
- **Village 2**
  - Counts: 2 (Absence)
- **Village 3**
  - Counts: 1 (Presence)
- **Village 4**
  - Counts: 4 (Absence)

Legend:
- Red: Presence
- Blue: Absence
Results

Results of *E. coli* Tests – Stored Water

![Bar chart showing the presence and absence of *E. coli* in stored water from different villages.](image)

- Village 1: Presence = 6, Absence = 5
- Village 2: Presence = 12, Absence = 1
- Village 3: Presence = 11, Absence = 2
- Village 4: Presence = 8, Absence = 4
Results

Water Quality Tests - Biosand Filters

- Absence
- Presence
Results
Post program, was access to safe drinking water improved within the study area?

- World Health Organization standard:
  - No access = More than 1000 meters or 30 minutes collection time
  - Basic Access = 100-1000 meters or 5-30 minutes collection time
  - Optimal Access = Water supplied through multiple taps continuously

- Improved sources were not necessarily providing safe water
Piped Water System in Village 2
Was there an increase in WASH knowledge within the study area?

- Two knowledge variables seemed to have a significant increase between baseline and follow-up:
  - Causes and Preventions of Diarrhea

- The open-ended question revealed many pieces of information from the WASH classes that were not captured in the survey:
  - Pump water is cleaner than surface water
  - Toilets can make well water dirty
  - Washing hands with soap is important
Was there an increase in WASH practices within the study area?

- Storing Water Safely
- Washing Hands with Soap at Critical Times
- Treating Water at Point of Use – Effectively and Regularly
• At the time of the survey, not all biosand filters were being used effectively
Was stored household drinking water safe for consumption?

- 74% of household water samples showed a presence of *E. coli*
Limitations

- Water Testing (repeated, degree of contamination)
- Survey Questions (Why don’t you treat your water?)
- Sampling Design (households with children 5 years and under)
Conclusions

• Several goals were met
• Longer programs with follow-up
• Longer-term funding
Acknowledgements

- The Hosting NGO, Survey Participants
- Gray Family Foundation, 3M
- Advisor – Dr. Michael Campana
- Committee Members – Dr. Julia Jones, Dr. Anna Harding, Dr. John Bliss
- Friends and Family!!

Thank You!
Table 4.8: Comparison of survey variables for households with water samples testing free of *E. coli*.

### Counts of Households

<table>
<thead>
<tr>
<th></th>
<th>Water was Available All Days in the Last Week</th>
<th>Narrow Mouthed Container Covered</th>
<th>Treat Water Effectively &amp; Regularly</th>
<th>Use Biosand Filter</th>
<th>Named Diarrhea Causes</th>
<th>Named Diarrhea Preventions</th>
<th>Soap Present</th>
<th>Recalled Washing at 2+ critical times</th>
<th>Improved Toilet</th>
<th>Fecal Matter Absent Inside of Latrine</th>
<th>Practice Safe Disposal of Child Feces in Last Two Weeks</th>
<th>Had a Specific Place for Hand Washing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Village 1</strong></td>
<td>6</td>
<td>6</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td><strong>Village 2</strong></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Village 3</strong></td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Village 4</strong></td>
<td>5</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>14</td>
<td>14</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>7</td>
<td>5</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>
Contaminated Well Buffered to 1000 Meters
Village 3

Legend
- Other Wells
- NGO Wells
- 250
- 500
- 750
- 1000
- Village Outline

Datum: WGS Projection: UTM 42N Source: Denise Costello May 9, 2013 Denise Costello
Water Testing

Idexx’s Colilert
3M™’s Petrifilm™ E. coli/Coliform Count Plates