Perceived Attributes of Water and Their Effects On Water Treatment in Guatemala and Pakistan

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Water Treatment as a Cluster of Related Behaviors & Diseases

- Safe Drinking Water
  - Personal Hygiene
  - Domestic Hygiene
  - Community Sanitation
  - Behavior Cluster

- Personal Sanitation
- Domestic Hygiene
- Community Sanitation

- Personal Hygiene
  - Hand Washing
  - Boiled Water
  - Chlorine Supply & Cost
  - Tap Water Quality

- Domestic Hygiene
  - Bottled Water
  - Processed Water: Tea Coffee, Soda

- Community Sanitation
  - Sewers & Latrines
  - Toilets or Latrines

- Behavior Cluster
  - Children's neighborhood drinking water
  - Travel drinking water

- Diarrhea
  - ORT and Antibiotics Availability & Cost
  - Gas Supply & Cost
  - Soap Supply & Cost

- Malnutrition
  - Skin Diseases
  - Upper Respiratory Infection
  - Upper Respiratory Infection
  - Diarrhea

- Personal Sanitation
  - Clothes Washing Water
  - Trash Removal
  - Water for Food Preparation

- Upper Respiratory Infection
  - Malnutrition
  - Skin Diseases
  - Travel Drinking Water

- Tap Water Quality
  - Gas Stove
  - Boiled Water

- Malnutrition
  - Children's neighborhood drinking water
  - Travel drinking water
Model of Communication and Hygiene Behavior

**COM**unication
- **INSTRUCTION**
- **DIRECTIVE**
  - Dissemination
  - Promotion
  - Prescription
- **NONDIRECTIVE**
  - Dialogue
  - Counseling
  - Entertainment
  - Social Networks
- **PUBLIC**
  - Services
  - Advocacy

**COM**unication
- **SKILLS & KNOWLEDGE**

**PSYCHO-SOCIAL FACTORS**
- **COGNITIVE**
  - Beliefs
  - Values
  - Perceived Risk
  - Subjective Norms
  - Self-Image
- **EMOTIONAL**
  - Emotional Response
  - Empathy
  - Self-Efficacy
- **SOCIAL**
  - Bounded Norm. Influence
  - Personal Advocacy

**ENVIRONMENT**
- Access to Water Sources & Technology, Community Sanitation & Community Organizations

**INTENTION**

**BEHAVIOR**
- Safe Drinking Water
- Household Sanitation
- Hand Washing
- Community Action

reinforcement
confirmation
enabling
A predictive model of communication & change: Influence of ideational elements on behavior

- Personal Advocacy
- Social Support & Influence
- emotions
- Self-Efficacy
- Knowledge
- Attitudes
- Self-Image
- Perceived Risk
- Norms

Implies simultaneous effect of all influences.

Implies communication can affect all influences.
**Water treatment behavior Guatemala, 2003**

Sample size = 1,500

* Includes filter w/cloth/strainer, solar disinfection and others.
Adjusted odds ratios of 6 psychosocial factors related to water treatment Guatemala, 2003

<table>
<thead>
<tr>
<th>Psychosocial Factors</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment Attitude</td>
<td>5.2</td>
</tr>
<tr>
<td>Self-Confidence</td>
<td>1.9</td>
</tr>
<tr>
<td>Discuss With Partner</td>
<td>1.4</td>
</tr>
<tr>
<td>Social Norm</td>
<td>1.2</td>
</tr>
<tr>
<td>Taste of Boiled Water</td>
<td>1.7</td>
</tr>
<tr>
<td>Boiled Water as Natural</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Controls include: Source of water, drinks bottled water, knowledge water-illness, socio-demographic factors, SES, plus other control variables.

National survey by MERTU
N= 1,446; R² = 0.19
70.6% correctly classified
Percent of water treatment by the number of ideational factors which apply
Guatemala 2003

Cumulative Number of Factors that Apply

Percent

Chi2 (5 df) = 176.8
p<.001; N = 1,500
Table 1. Regression of water treatment on psychosocial, communication, & socio-demographic control variables among Guatemalan women, 2003

<table>
<thead>
<tr>
<th>Logistic regression</th>
<th>Number of obs = 1446</th>
</tr>
</thead>
<tbody>
<tr>
<td>LR chi2(25) = 362.45</td>
<td></td>
</tr>
<tr>
<td>Log likelihood = -794.56395</td>
<td></td>
</tr>
<tr>
<td>Prob &gt; chi2 = 0.0000</td>
<td></td>
</tr>
<tr>
<td>Pseudo R2 = 0.1857</td>
<td></td>
</tr>
</tbody>
</table>

| Water Treatment | Odds Ratio | Std. Err. | z   | P>|z| | 95% Conf. Interval |
|-----------------|------------|-----------|-----|------|-------------------|
| COGNITIVE-EMO   |            |           |     |      |                   |
| Attitudes       | 5.231126   | 1.289652  | 6.71| 0.000| 3.226598          |
| Self-Confid.    | 1.871891   | .3454678  | 3.40| 0.001| 1.303727          |
| Taste/Boiled    | 1.741877   | .1619398  | 5.97| 0.000| 1.451719          |
| NaturalBoiled   | 1.272286   | .1179611  | 2.60| 0.009| 1.060876          |
| Water-Disease   | 1.103860   | .0664646  | 1.64| 0.101| .9809843          |
| SOCIAL INFL     |            |           |     |      |                   |
| Talk Partner    | 1.435664   | .1828814  | 2.84| 0.005| 1.118466          |
| Social Norm     | 1.248708   | .0618986  | 4.48| 0.000| 1.133096          |
| Church Attend   | 1.066298   | .0323361  | 2.12| 0.034| 1.004767          |
| Mass Media      | 2.668498   | .7173874  | 3.65| 0.000| 1.575555          |
| HYGIENE BEHAV   |            |           |     |      |                   |
| Hand Washing    | 1.295699   | .1853092  | 1.81| 0.070| .9789629          |
| Bottle Water    | 0.124493   | .0314385  | -8.25| 0.000| .0758909          |
| River Water     | 2.193061   | .8400946  | 2.05| 0.040| 1.035098          |
| SOCIO-DEMOGR    |            |           |     |      |                   |
| SES             | 1.021658   | .0112415  | 1.95| 0.051| .9998608          |
| Age             | 1.001926   | .0062439  | 0.31| 0.758| .9897621          |
| Education       | 1.116608   | .1275622  | 0.97| 0.334| .8926041          |
| N of Children   | 0.978454   | .0250698  | -0.85| 0.395| .9305315          |
| Urban           | 1.044929   | .1599188  | 0.29| 0.774| .7741345          |
| Spanish Lang.   | 0.854877   | .139466   | -0.96| 0.336| .620923           |
| TV in Home      | 0.764067   | .118577   | -1.73| 0.083| .5636795          |
| Radio in Home   | 0.958506   | .2224302  | -0.18| 0.855| .6082274          |
| NE Region       | 2.662775   | .7091981  | 3.68| 0.000| 1.579892          |
| SW Region       | 1.563983   | .3157664  | 2.22| 0.027| 1.052871          |
| NW Region       | 1.719143   | .3850765  | 2.42| 0.016| 1.108278          |
| SE Region       | 1.467461   | .4857023  | 1.16| 0.247| .7670698          |

* Central region is the reference category for regions.

70% Correctly classified; Hosmer-Lemeshow Chi2(13)=16.97 Prob > ch2 = 0.2005
Conceptual Model of Water Treatment Behavior in Guatemala

Exogenous Factors

- Socio-Demographic Characteristics
  - Education Level
  - Language
  - Age
  - Gender
  - Marital Status
  - No. of Children
  - Socio-Econ. Status
  - Church Attendance
  - TV/Radio Ownership
  - Hand Washing Habit
  - Health Promoter

- Environmental Constraints:
  - Water Source--River & Bottled
  - Rural Residence Region

Interventions

- Exposure to Mass Media Promotional Messages

Psycho-social Factors

- Treatment Attitude
- Cognitive
  - Knows water causes diarrhea
- Emotional
  - Worried about children’s diarrhea
  - Taste of Boiled Water (rich and natural)
  - Confidence
- Social Influence
  - Perceived Norm
  - Discussion with partner and friends

Behavioral Outcome

- Water Treatment
  - 70.6% correctly classified
Summary of results from Guatemala

All else being equal, people in Guatemala who treat their water regularly are those who:

- have **positive attitudes** toward water treatment
- like the **taste of boiled** water and perceive it as **natural**
- have **self-confidence** in the water they prepare
- have **talked to their partner** about treating water
- believe that the **majority treats** their water
- wash their hands at critical times
- have been exposed to water treatment **messages in the media**
Household Perceptions, Beliefs, and Practices Regarding Safe Water in Pakistan

Dr. Mubina Agboatwalla
Maria Elena Figueroa, Faisal Sarwari, Asif Ahmed, Zahinda Khanum, Badru Nisa

Coming Soon!

HOPE: Health Oriented Preventative Education with the Safe Water Council of Pakistan
### Nine positive attitudes related to water treatment
Pakistan, 2005

<table>
<thead>
<tr>
<th>Items</th>
<th>Varimax Factor Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Water that <strong>looks</strong> clear is good for drinking (reversed)</td>
<td>-0.81</td>
</tr>
<tr>
<td>2. It is <strong>necessary</strong> to treat water even when it comes from the tap.</td>
<td>0.84</td>
</tr>
<tr>
<td>3. I am <strong>responsible</strong> for the quality of my family’s drinking water.</td>
<td>0.76</td>
</tr>
<tr>
<td>4. Without pure water children will get diarrhea and will not be able to <strong>keep</strong> the food they eat.</td>
<td>0.45</td>
</tr>
</tbody>
</table>
Nine positive attitudes related to water treatment

Items:

5. I do not have time to treat drinking water at home. (reversed)

6. I only trust water that I have treated myself.

7. If children drink untreated water elsewhere there is no reason to treat water at home.

8. I would not drink water from my usual water source without treating it myself.

9. No matter how hard I try I can not get my family’s drinking water as pure as I would like it to be.

Varimax Factor Loadings

- 0.80
0.62
0.85
0.72
0.63

Pakistan:
N = 60 Women; k = 9
Cronbach alpha = 0.89
### Five negative attitudes related to water treatment

**Items:**

1. I don’t treat **drinking** water because my children don’t like treated water.  
   - Varimax Factor Loadings: 0.51
2. I treat water when it looks **dirty**.  
   - Varimax Factor Loadings: 0.62
3. I treat water only when children **get sick**.  
   - Varimax Factor Loadings: 0.73
4. Good **health** comes from God and not from what people do to stay healthy.  
   - Varimax Factor Loadings: 0.76
5. No **matter** how careful a mother is, children may still get sick from diarrhea.  
   - Varimax Factor Loadings: 0.60

**Pakistan:**

- N = 60 Women; k = 5  
- Cronbach alpha = 0.64
Distribution of the mean positive attitude towards water treatment in Pakistan

Five Levels of Attitude (by scale-point)

Percent

K=9 items; N = 60
Percent of women who treat their water by mean attitude toward water treatment

Five Levels of Attitude (by scale-point)

Percent

Threshold Effect?

Corr. = 0.86 (vs. -0.24)
N = 60
Conclusions

• Positive attitudes are better predictors of water treatment than negative attitudes.
• Hence, water treatment strategies should be based on positive attitudes.
• Preferred attributes of water should be used to promote water treatment.
• Water treatment should be promoted as part of a cluster of health and hygiene behavior.
• Emphasize “staying healthy” rather than preventing disease, unless there is a severe threat.
Promotion Strategy for Pakistan

Safe water promoted with positive attitudes

- Healthy and well nourished children
- Take responsibility
- You can trust water you have treated yourself
- You can find the time to treat your family’s water
Another approach for Pakistan: Perceived image of water

Safe water promoted with preferred attributes:

- Sweet tasting
- Shiny and clear
  - Safe
  - Affordable
  - Easy to use
Immediate and Delayed Feedback for Sustainable Water Treatment

- Water treatment trial
- Taste, smell, ease of use
- Realized & perceived benefits; attitude change
- Science
- MM & CM

- Perceived Cost-effect. and social reinforcement
  - Habit formation
- Policy and Medical Community

If credible, promote & reinforce

Time
Measurement of the Attributes of Water in Pakistan, 2005

Attributes of Water

1. How shiny and clear is . . . . . ?
2. How safe for your health is . . ?
3. How affordable is . . . . . . . ?
4. How sweet tasting is . . . . . ?
5. How easy to use is . . . . . . ?
6. How important to you is each of these qualities?

Scale

Types of Water

<table>
<thead>
<tr>
<th>Types of Water</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Well (bored) Water</td>
<td></td>
</tr>
<tr>
<td>b. Tap Water</td>
<td></td>
</tr>
<tr>
<td>c. Boiled Water</td>
<td></td>
</tr>
<tr>
<td>d. DETTOL (Chlorine) Water</td>
<td></td>
</tr>
<tr>
<td>e. PuR Water</td>
<td></td>
</tr>
</tbody>
</table>

    1-5
Measurement of the Attributes of Water in Guatemala, 2003

Attributes of Water

1. How **clear** is . . . . . . . . . . . . . . . ?
2. How **safe** for your health is . . . ?
3. How **natural** is . . . . . . . . . . . . ?
4. How **tasty** is . . . . . . . . . . . . . . ?
5. How **easy to use** is . . . . . . . ?
6. How **important** to you is each of these qualities?

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<thead>
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<td></td>
</tr>
<tr>
<td>c. Boiled Water</td>
<td></td>
</tr>
<tr>
<td>d. Chlorinated Water</td>
<td></td>
</tr>
<tr>
<td>e. Bottled water</td>
<td></td>
</tr>
<tr>
<td>f. Spring water</td>
<td></td>
</tr>
<tr>
<td>g. PuR Water</td>
<td></td>
</tr>
</tbody>
</table>
Table of original mean judgments of each type of water
Scale: 0 to 4 (nothing to very much)

<table>
<thead>
<tr>
<th>Water Type</th>
<th>clear</th>
<th>good taste</th>
<th>safe</th>
<th>easy</th>
<th>natural</th>
<th>Preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>wells</td>
<td>2.49</td>
<td>2.36</td>
<td>2.08</td>
<td>2.18</td>
<td>2.8</td>
<td>1.19</td>
</tr>
<tr>
<td>tap</td>
<td>2.72</td>
<td>2.56</td>
<td>2.24</td>
<td>2.73</td>
<td>2.65</td>
<td>2.21</td>
</tr>
<tr>
<td>boiled</td>
<td>2.58</td>
<td>2.44</td>
<td>3.20</td>
<td>2.61</td>
<td>2.67</td>
<td>2.92</td>
</tr>
<tr>
<td>chlorine</td>
<td>2.49</td>
<td>1.60</td>
<td>2.52</td>
<td>2.62</td>
<td>2.05</td>
<td>0.63</td>
</tr>
<tr>
<td>bottled</td>
<td>3.18</td>
<td>2.94</td>
<td>2.88</td>
<td>2.14</td>
<td>2.4</td>
<td>1.21</td>
</tr>
<tr>
<td>spring</td>
<td>2.87</td>
<td>2.77</td>
<td>2.43</td>
<td>2.07</td>
<td>3.08</td>
<td>0.86</td>
</tr>
<tr>
<td>Pur</td>
<td>2.74</td>
<td>2.31</td>
<td>2.6</td>
<td>2.5</td>
<td>2.3</td>
<td>2.23</td>
</tr>
</tbody>
</table>

Importance 2.61 1.80 2.37 1.32 1.91 --- [4-point scale]

Mean rank of 5 attributes
Image of Seven Water Types in Guatemala

First Dimension

Second Dimension

Easy
Piped
Natural
Chlorine
Wells
Spring
Boiled
Clear
Trust
Bottle
Determinants of the Rate of Adoption of New Technology

1. Attributes of the Innovation
   - Relative advantage
   - Compatibility
   - Complexity
   - Trialability (Divisibility)
   - Observability (Comm.)

2. Locus of Decision (Adopter)

3. Nature of Social System

4. Communication Channels

5. Change Agent Promotion

Source: Rogers (1995; 1962)
Three Criticisms of Diffusion Research *

• Pro-Innovation Bias
  Source of funding and personal involvement
  Prominence of successful innovations in research

• Individual Blame → Adopter’s fault
  Accepting the sponsor’s definition of the “problem”
  System variables not amenable to change
  Individuals are the unit of observation and analysis
  Lack of alternative causal models of change

• Social Equity

* Based on 50 years of diffusion research (Rogers, 1995)
Pakistan: Measuring water attitudes, image, and treatment

Exploratory Survey:

- Household survey in February, 2005
- Sindh Province
- 60 households and female respondents
- Self-reported answers and observation
  * boiled water, chlorine solution, filter
  * household hygiene

HOPE: Health Oriented Preventative Education
Water treatment behavior in Pakistan, 2004

Treatment Method

- Not treating: 56.7%
- Boiling: 23.3%
- Cloth Filter: 8.3%
- PUR: 10%
- Alum: 1.7%

Sample size = 60