Ethno-etiologies of Water-borne Disease: Global Divergences and Convergences

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ABSTRACT

Using interviews conducted with 468 adults in 9 different global locations, we tested for commonalities in how people culturally understand water-disease connections. Based on consensus analysis we find evidence of shared cultural ideas about the causes and solutions to waterborne disease both within and across all locations. Causes of water-related illness with the highest salience in the different countries were comparable across sites as well, and mapped reasonably onto public health understandings. Comparison of specific items (statements) of public health and lay cultural knowledge about the causes and solutions to waterborne disease overall showed a high level of agreement. We suggest a straight-forward, cohesive approach to water-health messaging in public health campaigns could often be the most effective point of departure, and that sophisticated cultural tailoring may be less important in regard to global waterborne disease prevention efforts than might be expected.

LEADING QUESTIONS

The research study focused on three questions:

1. Can we identify cohesive ("shared") cultural models about the etiology of water-related disease *within* local communities?
2. Are there fundamental ideas about water-disease relationships that are shared *across* diverse cultural and ecological settings?
3. How do these shared ideas map onto the public health model of water-related disease causation, prevention, course, and treatment?

REFERENCES

Brown, J. 2000. Human African trypanosomiasis: ethnomedical and biomedical relationships. Nexus, 14, 11-20.

Browner, C., Ortiz de Montellano, B., and Rubel, A. 1988. A methodology for cross-cultural ethnomedical research. Current Anthropology, 29, 681-702.

Garro, L. C. 1996 Intracultural variation in causal accounts of diabetes: a comparison of three Canadian communities. Culture, Medicine, and Psychiatry, 20, 381-420.

Garro, *L.C. 1988. Explaining high blood pressure: variation in knowledge about illness. American* Ethnologist, 15, 98–119.

Green, E.C., 1998. Etiology in human and animal ethnomedicine. Agriculture and Human Values, 15, 127-131.

Helman, C. 2007. Culture, health, and illness. 5th edition. Transatlantic Publications.

Image taken from: http://ic-project-with-mr-tan-rocks.blogspot.com/

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INTRODUCTION

- Some of the most pressing global public health issues can be attributed, both indirectly and directly, to water.
- Issues with water quality (both chemical contamination and presence of pathogens), scarcity, inadequate public sanitation and personal hygiene habits are leading to a heavy disease burden worldwide.
- With the assumption that standardized public health/biomedical prevention models differ somewhat from ***ethnotheories*** (or "lay cultural models"), this research study examines cultural conceptualizations of the connections between water and disease and cultural understanding of the role that infrastructure and individual behaviors have in disease prevention.
- These cultural models are then compared to standardized public health models and thinking within the same cultural context.
- By examining divergence and convergence between ethnotheories of disease, and comparing them to public health/biomedical models, we gain a better understanding of which disease prevention strategies are likely to succeed in cross-cultural settings.
- Moreover, so as to ensure more meaningful (that is effective and inclusive) health care delivery and health education it is important to find the right balance between ethnotheories and public health/biomedical models.

METHODS

A. Approach

- Cultural consensus analysis was used to measure the internal consistency in how people respond to cultural statements in ways that can be compared across different cultures to assess convergence and divergence in world view. The most common responses comprise the shared "cultural model" of the study group.

B. The Cultural Survey Tool

- The final protocol was narrowed to 75 cultural statements about water and disease, derived from statements made by lay people (emic, or "insider", knowledge) and public health experts (etic, or "outsider", knowledge).
- The statements chosen considered the individual, the natural world, the social world, and the supernatural world (see Figures 1, 2).

C. Data Collection and Sampling

- Interviews were conducted with 468 participants in nine countries, across a range of rural and urban, as well as water-rich and water-scarce settings (see Table 1). .
- Each interview was comprised of (1) demographic questions, (2) open-ended questions, (3) a free-list section, and (4) the 75 item cultural statement survey

D. Analyses

- UCINET 6 was used to identify the most culturally "correct" answers for each cultural statement and to assess whether individual knowledge is only shared within a country or across countries.
- ANTHROPAC was used to identify how shared ideas correlate with public health models of water-related disease causation, disease progression, and treatment.

RESULTS

- The free-list data revealed that people identify common causes of both infectious and non-infectious contamination of water consistent with public health understandings (see Table 2).
- There is consistent concern with both environmental and infectious contaminants of water as a cause of disease (see Table 3).
- Using consensus analysis of the cultural survey statements, local samples demonstrated a shared understanding (shared cultural models) of the water-disease relationship.
- The Tanzanian sample had the highest average within-group competency score (.67), while Fiji had the lowest (.49) (see Table 4). Overall, there was poorer correspondence between the global model and separating the country sites, with the Guatemala and the U.S. model having the lowest correspondence and the Fijian model having the highest.
- Combining all 486 participants in a "global" sample also reflected a shared cultural water-disease model, with agreement averaging over 50%.

Country	Sample Size (N)	Percentage of deaths that are WSH-related (A)	Percent of DALYs attributable to WSH-related disease (A)	Percentage of total country population served with Improved Water (B)	Percentage of total country population served with Improved Sanitation (B)	Percentage of sample with any water insecurity in last 12 months
Higher waterborne disease load						
Tanzania	50	13.1	14.6	54	24	100
Bangladesh	30	9.9	11.0	80	53	90
Guatemala	24	9.9	9.4	94	81	61.5
Moderate waterborne disease load						
China	68	2.2	4.3	89	55	26.2
Fiji	92	3.4	3.6	0*	0*	36.2
Paraguay	39	3.6	4.0	86	70	47.4
Lower waterborne disease load						
New Zealand	69	0.0	NA [negligible]	100	0*	10
USA	30	0.4	0.4	99	100	10.3
UK	66	0.1	NA [negligible]	100	100	6.2

A. DALY – Disability-adjusted life year; WSH – water supply, sanitation, and hygiene. Source: Pruss-Usten et al. (2008)

B. Source: World Health Organization and UNICEF 2010. Progress of Sanitation and Drinking Water: 2010 Update. "Improved Water" = piped water, public tap, protected well, protected spring, or rainwater. "Improved Sanitation" = flush or pour-flush toilet to sewer, septic, or pit system, pit latrine with slab, composting toilet.

Table 1. Study Site Characteristics and Sample Sizes

Rank	Global	NZ, UK, US (Negligible diarrheal disease)	China, Fiji, Paraguay (Noticeable Diarrheal Disease)	Bangladesh, Tanzania, Guatemala (Substantial Diarrheal Disease)
Common Causes of Diarrhea				
1	Dirty Water (0.220)	Bacteria (0.329)	Not Boiling Water (0.191)	Dirty Water (0.369)
2	Bacteria (0.172)	Giardia (0.188)	Dirty Water (0.174)	Cholera (0.186)
3	Not Boiling Water (0.126)	Dirty Water (0.148)	Bacteria (0.132)	Not Boiling Water (0.183)
4	Contaminated Water (0.106)	Contaminated Water (0.111)	Contaminated Water (0.129)	Poor Human Hygiene Behaviors (0.145)
5	Pollution (0.068)	Septic or Sewage Contamination (0.091)	Floods (0.111)	Food Poisoning (0.138)
Common Causes of Contaminant Pollution				
1	Rubbish (0.190)	Chemicals (0.173)	Rubbish (0.231)	Rubbish (0.279)
2	Chemicals (0.113)	Sewage (0.149)	Bacteria (0.145)	Dust (0.165)
3	Animals (0.084)	Industrial Pollution (0.127)	Chemicals (0.105)	Animals (0.163)
4	Industrial Pollution (0.073)	Feces in Water; Animals(0.106)	Animals (0.070)	Insects (0.155)
5	Bacteria (0.073)	Petroleum (0.096)	Industrial Pollution (0.066)	Frogs (0.123)

Table 2: Free-list results based on Smith's Salience Test (shown in parentheses), based on respondent open-ended to responses to being asked to name causes of waterborne illness, for sets of countries based on diarrheal disease profile

Figure 2. Main domains used to identify and classify cultural statements

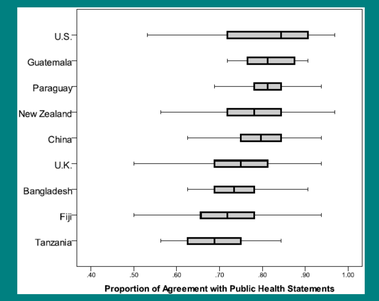

Figure 3: Mean proportion of public health items to which people responded correctly, by country sample. The middle line in the box indicates the median, and the middle of the box indicates the mean.

Q: What are you more concerned about as a cause of illness in your water?	Bacterial Disease	Contaminants	Both Equally
Bangladesh	48.1%	48.1%	3.7%
China	28.6%	63.3%	8.2%
Fiji	46.2%	41.0%	12.8%
Guatemala	46.2%	30.8%	23.1%
New Zealand	33.8%	63.1%	3.1%
Paraguay	23.5%	29.4%	47.1%
Tanzania	50.0%	50.0%	.0%
UK	39.5%	48.8%	11.6%
US	47.1%	52.9%	.0%
All combined	39.6%	49.5%	10.9%

Table 3: Respondent relative concern over bacterial versus pollutant contaminants in water by country (% is percentage of respondents in that country sample)

	N	Ratio Between the 1st to 2nd Eigenvalue	Mean Competence Score	SD Competence Score	QAP Correlation Statistic (p-value)
Bangladesh	30	11.23	0.654	0.076	0.984 (p=0.000)
Guatemala	24	6.98	0.645	0.102	0.994 (p=0.000)
Paraguay	39	10.77	0.577	0.106	0.988 (p=0.000)
Tanzania	50	8.10	0.670	0.112	0.913 (p=0.000)
China	68	19.49	0.655	0.118	0.965 (p=0.000)
Fiji	92	6.41	0.491	0.136	0.907 (p=0.000)
U.S.	30	10.30	0.651	0.145	0.990 (p=0.000)
New Zealand	69	9.88	0.596	0.163	0.975 (p=0.000)
U.K.	66	11.82	0.541	0.21	0.962 (p=0.000)
All Combined	468	6.75	0.525	0.155	--

Table 4: Results of the cultural consensus analysis by country and for the combined ("global") sample, comparison between country scores and the global answer key, and QAP correlations

- Of the 32 "public health" statements tested, 30 (94%) of the answers in the "culturally correct" global model were the same as public health model (see Figure 3).
- Within local samples, the highest percent of "culturally correct" was in the U.S. (82%) and the lowest in Tanzania (68%).
- Although the lowest scores were in three of the least developed countries, London had the lowest scoring sample.
- Rural Guatemala had the second highest score, showing that there is no significant relationship between level of economic development or local disease prevalence and individuals with public health understandings.
- Multiple regression was used to determine the relationship between demographic variables and people's public health statement scores. Overall, the number of correct answers was higher with educational level and age. While gender, water shortage, nor economic standing in a community were not significant.

SUMMARY AND CONCLUSION

- Overall, there is strong evidence of cohesive local, shared cultural models of how people classify and understand waterborne disease in each country, as well as agreement across study sites. There was strong overlap between global shared knowledge and public health knowledge regarding waterborne disease cause and prevention. In particular there was strong emphasis on the personal and environmental conditions.
- Where there are disagreements between biomedical and lay statements made, the lack of knowledge can be attributed to the lack of discourse between public health experts and the local community.
- In the case of this comparative cross-cultural study, evidence of global shared understandings of the relationship between water and disease suggest that more straight-forward and cohesive, rather than culturally-specific, public health campaigns may be the most effective.
- While education and age had an affect on individual knowledge level, personal socioeconomic and ecological factors did not. Thus, the "us" and "them" approach to global water-disease education is not recommendable.
- The convergence in ethnotheories of water-disease cross culturally with public health models can be explain by two possible theories: (1) global public health education related to water and illness prevention may be effective, and (2) this shared water-disease knowledge may be so crucial to health and well-being worldwide due to the similar circumstances that people are facing.

Elicitation Question	Correct "global" answer	Public Health items, correct response
Are there invisible organisms in water that can make you sick?	Yes	Yes
Can swimming in fresh water make you sick?	No	Yes
Can environmental contaminants in water kill you?	Yes	Yes
Do environmental contaminants in water affect pregnant women more than other women?	Yes	Yes
Can you tell water is safe based on its original source?	No	No
Is rainwater always safe to drink?	No	No
Can you tell that water will make you sick just by looking at it?	No	No
Is it healthy to drink water that has been stored in your home for a long time?	No	No
Is it healthy to drink water that is cloudy?	No	No
Does having farming nearby make water unsafe to drink?	Yes	
Are people more likely to get sick in the winter?	Yes	
Is salty water more likely to make you sick?	Yes	
Is illness more likely at certain times of the year?	Yes	
Can sorcery or witchcraft make water supplies safe?	No	

Figure 1. Elicitation Statements, Culturally Correct Answers as Suggested by Consensus Analysis, and Comparison to "Correct" Public Health Statements