

## **The Medical Anthropology of Water**

### **The Water Crisis and Health: The Role of Medical Anthropology**

Linda M. Whiteford, PhD, MPH and Cecilia Vindrola Padros, MA

University of South Florida

“When the well’s dry, we know the worth of water”

Benjamin Franklin (1746).

Two hundred and sixty-two years ago Benjamin Franklin wrote the above aphorism in *Poor Richard’s Almanac* as a way to suggest that too often there is a delay between when a crisis occurs and when its full extent is recognized. We believe that the water crisis is well recognized, and yet, few effective and sustainable solutions have been found. In this chapter we argue for greater reliance on transdisciplinary training in the search for ways to resolve the water and health crisis, and we suggest that medical anthropologists can play a critical role in that process, particularly when they link their activities in the research and teaching to the creation of effective policies.

In 2002, 1.1 billion people or 17% of the global population, lacked access to improved water sources (WHO 2004). According to the UNDP, 700 million people located in 43 countries suffer from water stress, and by the year 2025 this figure may be as high as 3 billion people suffering from inadequate and unreliable access to water (2006:14). This scarcity will be unevenly distributed and will take on different connotations according to the location of each country, as Figure 1 shows. Even with

public health and public relations campaigns to improve the provision of a clean and reliable water supply (i.e. the United Nation's International Decade for Action: Water for Life), access to potable drinking water is still difficult to achieve in many parts of the world like Asia, where approximately 675 million people consume water from inadequate sources (UNICEF et al. 2004 in Moe and Rheingans 2006:41).

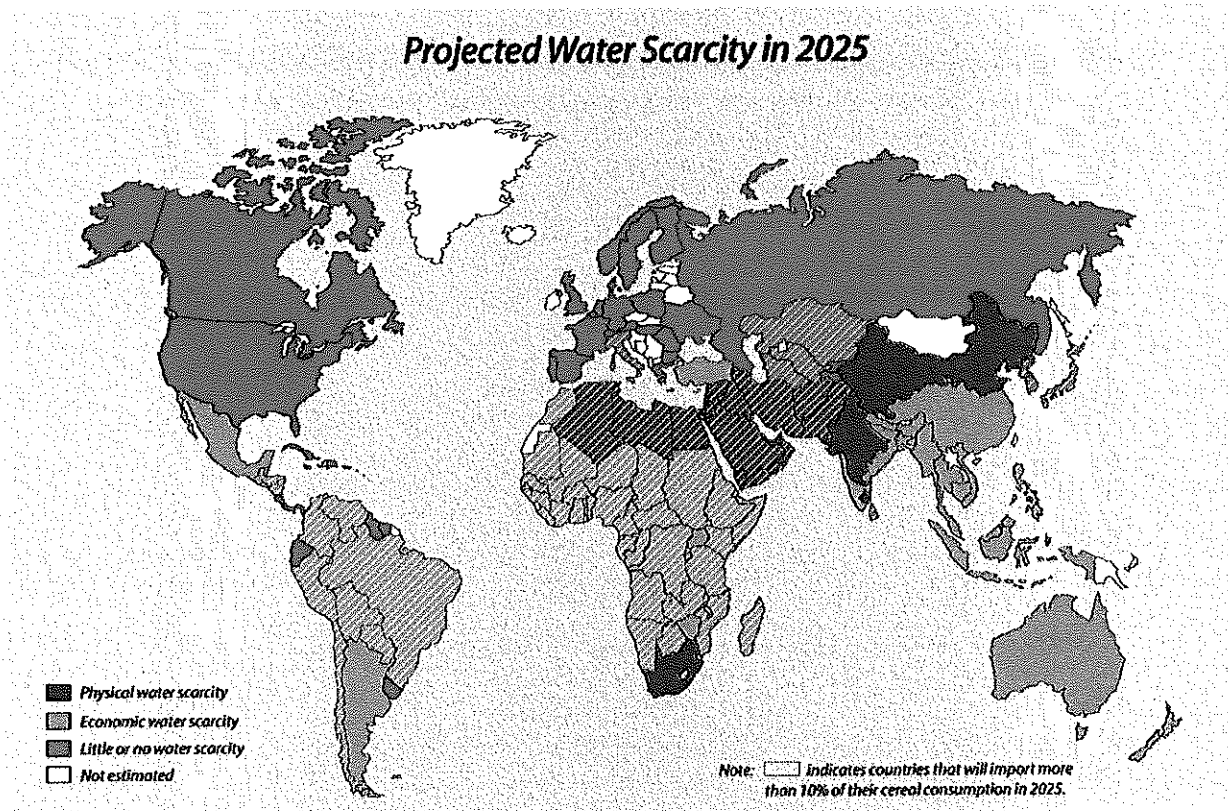


Fig. 1 Projection of water scarcity for the year 2025 made by the International Water Management Institute (IWMI 2000) (Permission pending).

In this chapter we try to connect the global water crisis and its health consequences with anthropological research and analysis. The chapter includes discussions of water and disease (the biomedical model), and anthropological social explanation models (social science epistemology), and is illuminated with examples drawn from our own research. In our conclusion we describe where we hope that the

next generation of medical anthropologists will take us in trying to resolve the water and health crisis.

Lack of access to potable water, combined with inadequate sanitation, causes or exacerbates significant, enduring and debilitating health problems (Whiteford 2005). According to the World Health Organization, 88% of all diarrheal disease is attributed to unsafe water supply, inadequate sanitation and hygiene, costing the lives of 1.8 million people every year (WHO 2004). Water-related illnesses, such as malaria kill 1.3 million each year, 90% of whom are children under 5 (WHO 2004). In many areas of the world where malaria is endemic, people are continuously infected, developing chronic anemia and experiencing episodes of acute symptoms (Wiley and Allen 2009:300). Six million people are visually impaired by trachoma, another water-related infection, this one of the eyes. It can result in blindness after repeated infections and it a disease implicated by the absence of safe water (WHO 2004). In addition to River Blindness as trachoma is called in many parts of the world, *E. coli* present in drinking water causes approximately 400 million diarrheal episodes in children under 5 with more than 700,000 needless deaths each year (Chakraborty et al. 2001; Ford 2006:61).

While a considerable range of national and international measures have been employed to reduce rates of water-related morbidity and mortality, few have produced significant and sustained improvement in health outcomes. The Millennium Project, established by the United Nations in 2002 to stimulate government and global agencies to improve the global quality of life, and to collect and maintain indicators by which to measure those changes, continues to document that failure to deliver a clean and reliable source of water to much of the world (Millennium Project 2006). Eight time-bound

targets to reduce poverty and disease on a global scale were established as part of the Millennium Development Goals (MDGs) (Millennium Project 2006). In goal number seven, which focuses on ensuring environmental sustainability, water was identified as a critical global need (Millennium Project 2006). Through this goal, the Millennium Project aims to reduce the number of people without access to safe water and sanitation by fifty per cent by the year 2015 (Montgomery and Elimelech 2007:18). Organizations like the United Nations Development Program (UNDP), the United Nations Children's Fund (UNICEF), World Health Organization (WHO) and the World Bank concentrate on addressing water shortage and scarcity, as well as the conflicts that arise as a consequence of the inadequate provision of clean water (Whiteford and Whiteford 2005:257). Local governments and non-governmental organizations also contribute in this endeavor by identifying how international programs can be adapted to suit local water and sanitation needs, in order to change the spread of disease (Whiteford and Whiteford 2005).

Anthropologists collaborated in many of these programs in different capacities and their research is instrumental in the study of the use, distribution, and sustainability of water systems. However, little research has explicitly focused on health measures as outcome matrices, thus failing to track the many ways that water leads to the increased spread of disease. In this chapter we will present some illustrations of how medical anthropology can contribute to the study of the complex and political relationships between water and health, and the need for improvement of the living conditions of those groups of people that are deprived of public services. Two examples are presented to suggest the value of anthropology to policy formation and program implementation, as

well as to shed light on how anthropologists can shape policy by working both with those who create public policy, as well as with those whose lives are influenced by those policies. The chapter ends with our vision of some future directions medical anthropology research and practice could take to inform understandings of the global nexus between water and health, especially those changes that might direct new ways to train students engaged in the resolution of this global crisis.

### **The Anthropology of Water**

Anthropological interest in water dates back to early studies on the control of water in rural areas and the development of irrigation systems. When studying these topics, anthropologists looked at the political and social uses of water by analyzing the institutional requirements and social ties necessary to distribute water (Childe 1953; Coward 1979; Kelly 1983; Steward 1955; Wittfogel 1955, 1957). These mechanisms of water politics became the lens through which anthropologists studied social relations and power differentials (Davis-Salazar 2003, 2006; Fleuret 1985; Gelles 1990; Hunt 1988; Hunt and Hunt 1976; Lansing 1991; Lees 1986; Trawick 2001).

Contemporary studies have incorporated more complex models in order to explain the impact of power relationships on water access and use by looking at these issues from global perspectives (Treitler and Midgett 2007). Contemporary studies have focused on the conflicts that arise over who have rights over natural geophysical resources (Cortez Lara et al. 2005; Ennis-McMillan 1998, 2002; Guillet 2005; Whiteford and Quesada Aldana 2006; Whiteford and Melville 2002). Anthropologists have long been intrigued

by how power imbalances that are present in these decisions affect the livelihood of local populations.

In a study carried out in Ceceles, Ecuador, Boelens and Doornbos (2001) analyzed peasants' struggle over the right to water, finding that the struggle did not only take place at the level of the community, but also was shaped by larger frameworks where peasants negotiated the community's autonomy and authority. By using action research the authors were able to demonstrate that conflicts related to water are actually struggles over larger culturally and historically embedded decision-making processes (Boelens and Doornbos 2001).

In their 1998 volume, *Water, Culture, and Power: Local Struggles in a Global Context*, Donahue and Johnston analyzed the cultural constructions and power dimensions in the control of water by focusing on the cultural perceptions of water, and its use, its ownership and how those forces intersected with global discourses on development and sustainability. Their work ushered in a revitalized interest in the study of global connections shaping access and distribution of water. The research of Derman and Ferguson (2003) moved anthropological research on water forward with their references to the coexistence of multiple "values" of water in order to explain how actors used international, national, and local ideas about water and water access to situate themselves within Zimbabwe's water reform process.

Some authors have focused on the commoditization of water and the effects of this centralization of water management and distribution on the everyday lives of people. Aiyer (2007) for example, analyzed the Plachimada struggle against the Coca-Cola Company within the context of the agrarian crisis in India. In doing so, the study

clarified the role of transnational corporations in the centralization of capital and water on a global scale, and the effects of these processes on specific groups of people (Aiyer 2007).

All of these authors embedded their arguments in a consideration of access to a clean and adequate water supply as a universal human right. As Derman and Ferguson (2003) indicated, the human rights perspective illuminates how representations of water as a common good, faces contrasting valuations of water as an economic commodity, as a scarce resource, or as a productive utility. What is often missing from these diverse discussions is, that in the process of establishing this universal need and right for water, many (but not all) authors fail to make an explicit link between access to potable water and health outcomes (Whiteford and Cortez-Lara 2005).

### **A Medical Anthropology Perspective on Water and Health**

We believe that the two major threats to world stability are the global disparities in health, and in access to natural resources such as water. In a recent book that I co-edited, we brought together anthropologists whose primary research focused on water – its management, its distribution, and its allocation - and the policies that shape those practices, with a group of anthropologists who studied health. The aim of the book was to open a discussion linking anthropological research on water with anthropological research on health, and to demonstrate how global water management directly effects the distribution of disease, and exacerbates disparities in health outcomes (Whiteford and Whiteford 2005). In that book, the authors underlined the ways in which globalization reshapes health and environmental policies, and identified the need to look at the

interaction of culture, resources, and power as a more encompassing and global process (Whiteford and Whiteford 2005: 255-256).

In that book we applied a moral economy of health framework to contextualize water as an outcome measure, but also as a stimulus or impetus (Whiteford (2005). We employed this perspective because “a moral economy of health framework makes explicit a set of values that honor the obligation to protect common global resources, identify the underlying social and political structures of violence against disenfranchised populations, and defend health as a human right to be protected in global trade and lending agreements” (Whiteford 2005:30). This perspective identifies local and global frameworks that make specific groups of people more susceptible to disease than others, and it sheds light on the social and political factors that reify and promote those disparities among groups and their health outcomes (Whiteford 2005:30).

Water is related to health and disease in several critical ways that are important to our discussion in this chapter, in particular we focus on several variables as shaping the global water and health crisis: the level of bacteria/environment pollution of the available drinking water, the reliability of the water supply, and the accessibility of the water. All human life is dependent on water, and yet we rarely explicitly study human-water behaviors. But we do know that people become sick by pathogenic organisms in their water containing bacteria, viruses or protozoa. We know that people’s habits and behaviors are shaped by how close or far away their source of water is from where they live; and we know that people’s cultural practices reflect how and for what they use water, and we know that people often fail to connect the relationships between water and health. Water scarcity changes people’s behaviors, how often water is used, how water is



stored, and from where water is collected. Water storage patterns (open receptacles, standing water) may increase breeding grounds for larvae, snails, worms and other disease vectors. Contact with, or ingestion of, these transmitters can increase water-related disease patterns. Table 1 gives us an idea of the diversity of orally transmitted pathogens in drinking water, their health significance and their persistence in water supplies.

Table 1 Orally transmitted pathogens in drinking water			
Pathogen	Health significance	Persistence in water supplies <sup>a</sup>	Relative infective dose <sup>b</sup>
<b>BACTERIA</b>			
<i>Campylobacter jejuni, C. coli</i>	High	Moderate	Moderate
Pathogenic Escherichia coli			
<i>Salmonella typhi</i>	High	Moderate	High <sup>c</sup>
Other Salmonellae	High	Long	High
<i>Shigella spp.</i>	High	Short	Moderate
<i>Vibrio cholerae</i>	High	Short	Moderate
<i>Yersinia enterocolitica</i>	High	Long	High (?)
<i>Pseudomonas aeruginosad</i>	Moderate	May multiply	High (?)
<i>Aeromonas spp.</i>	Moderate	May multiply	High (?)
<b>VIRUSES</b>			
Adenoviruses	High	?	Low
Enteroviruses	High	Long	Low
Hepatitis A	High	?	Low
Enterically transmitted non-A, non-B hepatitis virus,			
hepatitis E	High	?	Low
Norwalk virus	High	?	Low
Rotavirus	High	?	Moderate
Small round viruses	Moderate	?	Low (?)
<b>PROTOZOA</b>			
<i>Entamoeba histolytica</i>	High	Moderate	Low
<i>Giardia intestinalis</i>	High	Moderate	Low
<i>Cryptosporidium parvum</i>	High	Long	Low
<b>HELMINTHES</b>			
<i>Dracunculus medinensis</i>	High	Moderate	Low
Source: World Health Organization (1993).			
?—Not known or unclear.			
<sup>a</sup> Detection period for infective stage in water at 20±C: short, up to 1 week; moderate, 1 week to 1 month; long, over 1 month.			
<sup>b</sup> Dose required to cause infection in 50% of healthy adult volunteers; may be as little as one infective unit for some viruses.			
<sup>c</sup> From experiments with human volunteers.			
<sup>d</sup> Main route of infection is by skin contact, but can infect immunosuppressed or cancer patients orally.			

Source: Gadgil (1998) (Permission pending).

One of the first diseases to be traced to contaminated drinking water was cholera, a waterborne bacterial disease that causes debilitating and sometimes deadly, diarrhea (Wiley and Allen 2009:301). The provision of clean water and human waste containment and removal reduces the incidence of cholera, as most outbreaks bloom in large populations of people relying on a contaminated water source, coupled with the failure to systematically separate waste water from drinking water (Wiley and Allen 2009; Yacoub and Whiteford 1994:332). Figure 2, for instance, indicates how disease is spread from sources of contamination like human and animal excreta to other humans.

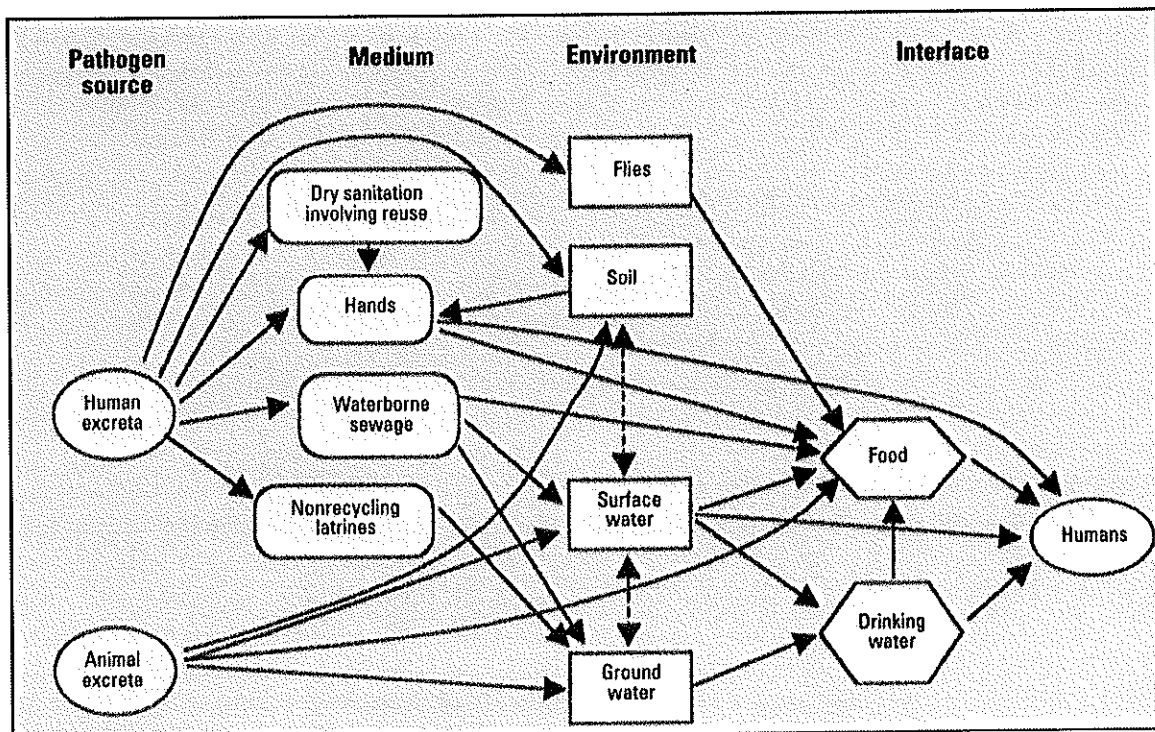


Figure 2. Transmission pathways of fecal-oral disease (Pruss et al. 2002) (Reproduced with permission from the authors).

Parasites can be transferred to humans as they come in contact with water contaminated with snails that have schistosomiasis or guinea worms (MacCormack 1985:15). They can become infected when bathing, swimming; washing clothing or drinking contaminated water (Whiteford and Whiteford 2005:10). The spread of this

disease is due to the presence of large bodies of still water, the lack of access to indoor plumbing, and the inability to separate waste water from the water used for consumption, bathing, irrigation of crops, and washing of clothes (Wiley and Allen 2009:306-307).

The spread of diseases like cholera and schistosomiasis, where the deposition of schistosome eggs by worms through small cuts in people's feet or hands moves into the blood vessels surrounding the bladder or intestines (WHO 2009), is exacerbated by changing the environment in which the disease vector (the parasite) and the human host intersect. This may happen when dams to generate hydroelectricity or control water for irrigation are built by damming up rivers, creating still ponds of waters that become ideal breeding grounds for parasites in places where previously the water was free flowing and rapid, thus not ideal breeding areas (Wiley and Allen 2009:304). The Three Gorges dams in China and the Aswan dam in Egypt tragically exemplify this expansion of disease affiliated with development. As humans continue to use the water they are forced into exposures with the snails carrying the parasites that previous could not live in the flowing water.

Insect vectors also rely on water as a breeding ground as, for instance, when female mosquitoes deposit their larvae in water. Mosquitoes are implicated in the spread of several well-known diseases such as dengue, malaria, West Nile virus, filariasis (disease characterized by the lodging of parasitic filarial worms in the lymphatic system which causes elephantiasis and genital damage) (WHO 2000), and yellow fever (Whiteford and Whiteford 2005:10). Community water deposits or those surrounding households can become important sources of disease propagation, just as agricultural practices that necessitate clearing large areas of land for farming and irrigation or the

flooding of land for the cultivation of crops like rice, also contribute to the spread of these diseases, especially malaria (Holtz and Kachur 2004:138, McElroy and Townsend 2004:369).

Patterns of water-related diseases are shaped not only by changing the environment, but also by water scarcity, as families reduce the amount of hand washing, bathing, and use of soap or other disinfectants for the washing of fruits and vegetables (Arar 1998:288; Whiteford and Whiteford 2005:9). It is difficult to fully comprehend our constant and pervasive dependence on water, particularly for those of us who live where we have easy and reliable access to clean water. Some research even suggests having a water supply available within reasonable distance is more important for good health than the quality of the water (Gorter et al. 1991). According to Gorter et al. (1991), cleanliness and reliability of the water supply may be less important to users, than the distance which they must travel to secure it.

Even when potable water is supplied, if the system is not locally sustainable, it often will become bowdlerized and fail to protect the health of the users. In our research in highland Ecuador we found examples of community-based piped water systems, in which the community was responsible for their maintenance. The community water council was in charge of collecting a 'water fee' and the monies were to be used to purchase the disinfectant for the water tank that supplied the water for the community.

However, in poor rural communities, collecting the tax was an unpopular job that no community member wanted. No one wanted to ask his or her neighbors to pay from what little they had for disinfectant, especially when they could not see what it was supposed to do. As long as the water continued to be piped into their homes, they saw no

need to pay a tax for disinfectant. The result was that, indeed, the money was never collected, the disinfectant was not purchased, and water, while still piped, was no longer clean (Whiteford 1997). As a result, the community was exposed to a variety of water related diseases that could have been avoided.

Clearly, what people believe about water (and about health) is culturally created, but it is also shaped by global economic and political forces, as well as environmental factors. For those reasons, we believe that medical anthropology can significantly contribute to the better understanding of the complex interplay between water and health. We offer two brief cases from our own research to show how medical anthropology was used to identify the causes of the continued reemergence of cholera in rural highland Ecuador communities in our first example, and in the second case, how the analysis of culturally appropriate gender roles unlocked the question of why water tanks were exposed in the Dominican Republic.

### **The Case of Cholera - A Water-borne Epidemic**

One of the most devastating cholera epidemics to hit South America took place between 1991 and 1993 (Guthmann 1995). It began in Peru, causing over 9,000 deaths, and spread rapidly to Ecuador where it would affect different regions of the country, particularly the communities in the coast and Andean regions (Izurieta et al. 2000). The immediate response of the government and international health authorities was to control the outbreak in the urban areas of the country through campaigns promoting proper waste disposal and hand-washing. However, the rural, indigenous communities of the Andes

did not receive these services and continued to get infected (Whiteford 2000; forthcoming).

During the period of 1994-1995, one of us (Whiteford) worked on a USAID, World Bank funded, bilateral cholera intervention project with an Ecuadorian epidemiologist/physician and a community educator in order to carry out research on why cholera persisted in two Andean provinces in Ecuador: Chimborazo and Cotopaxi. Together with the province of Imbabura, Chimborazo and Cotopaxi were among the poorest; they had the largest concentration of indigenous people in Ecuador, and the highest rates of cholera at the time (Whiteford 2005).

As part of this project, I worked with a team from Ecuador to develop what came to be called the Community-Based Participatory Intervention (CPI) project. The project trained community members to identify adult behaviors that could lead to the spread of cholera. The interdisciplinary team was instrumental in the ethnography of the communities, the training of the adult teams in the communities, and the collaborative assessment of causes, and the design and implementation of an intervention. The epidemiology and medical anthropology shaped the project by focusing attention on collecting data on environmental and domestic health behaviors, and developing community-based interventions to change high-risk behaviors. Community education was instrumental in developing reciprocal educational processes with local people, resulting in enhanced local leadership, improved knowledge about disease transmission, and the design of a locally appropriate and sustainable intervention (Whiteford et al. 1996).

The community based investigation implicated a series of behaviors associated with the continual re-emergence of the disease in the community. Those behaviors were:

defecation in fields or areas close to living and eating activities, lack of potable water , the consumption of street food, and close contact with family members who were labor migrants returning from coastal areas (where sporadic outbreaks of cholera existed) . The research also showed that because water was difficult to obtain, many hygiene practices like hand-washing were severely reduced, or abandoned. Furthermore, much of drinking water was transported in open air cannels and had been contaminated by human, animal, and, in the case of one community, hospital waste.

In the 1990s, most Latin American countries adopted neoliberal economic reforms where many of the services previously provided by the central government, like provision of water, sanitation and public health facilities, were transformed into responsibilities of the individual local communities or were in the hands of private enterprises (Armada et al. 2001; Assies 2003; Iriart et al. 2001; Lloyd-Sherlock 2004; Peabody 1996). This generalized privatization transformed access to water into a luxury that only a few rural communities could afford (Whiteford 2005). In addition, in Ecuador the harsh economic conditions experienced during this period were particularly severe in the rural areas of the country, leading to the loss of agricultural jobs. This caused significant financial difficulties in already poor communities as scarce resources dried up. In these communities, this resulted in an increase in the number of men who migrated to the large coastal cities like Guayaquil or Esmeraldas in search of jobs. In coastal areas of Ecuador cholera is endemic, so when men returned to their highland home communities for yearly festivals, they often returned carrying the cholera vibrio which was shared as families and friends partook of common pot meals or street food where the vibrio could be easily transmitted.

The suggestions made by the research team resulted in a series of changes, some small like the provision of a convenient and hygienic container to store and serve water, and some larger, changes like leadership training for women and students – two groups traditionally excluded from leadership in these communities. Large or small, these changes were associated with radical and sustained drops in the rates of cholera in these communities. There were several key elements to the success of the CIP projects: the incorporation of the community in all aspects of the project, the slow pace of the project (12 months) and its follow-up assessment, and the interdisciplinary composition of the team. The anthropological contributions that appeared to have had the most lasting effects were the valuation of local beliefs and practices, the commitment to the local community, and the embedding our understanding of the local in the larger, global context.

### **The Case of Dengue Fever: a Vector –Borne Outbreak.**

Our second case also emphasizes the role played by medical anthropology in shaping the research outcomes in a project designed to change peoples' water handling practices to reduce the spread of dengue fever. From 1989 to 1990, a team of medical anthropologists (Coreil et al. 1997; Salazar 1993; Whiteford and Coreil 1991) carried out a nine month investigation in a neighborhood in Santo Domingo in the Dominican Republic called Villa Francisca (Whiteford 1997). The research used an ecological model to identify local beliefs about the causation and prevention of Dengue Fever. Ecology is a framework where the relationship between human beings and their environment is mutually reinforcing and must be studied as a dynamic and fluid process (Fowler 2000;



Posey et al. 1984). We were also concerned with the local indigenous perceptions and linguistic categories of descriptions of particular bio-cultural environments, especially at the intersection between water handling and knowledge of disease transmission (Coreil et al. 1997). We combined this model with a historical and political analysis of the region in order to identify how residents of a particular neighborhood perceived and explained threats of infection of dengue fever and which measures were being taken to protect the population from dengue fever and other forms of water related vector-borne diseases.

Dengue epidemics increased in Latin America and the Caribbean during the 1970s, and between the 1980 and 1990 it spread rapidly due to the introduction of new virus strains and the presence of multiple serotypes (Gubler 1998:481). As Figure 3 shows, there are still many countries at risk of dengue transmission. Dengue fever symptoms are similar to those of the flu. They include fever, severe headache, muscular and joint pain, and rashes (WHO 2008). In severe cases, people may be unable to get out of bed due to the severity of their bone pain. In addition, dengue hemorrhagic fever, another serotype spread by the *Aedes Egypti* mosquito, can be deadly. Dengue viruses spread from human to human through the biting of infected female *Aedes* mosquitoes (WHO 2008). Once the virus enters the bloodstream, it circulates the body from two to seven days and during this time mosquitoes can acquire the virus while feeding on these individuals (WHO 2008).

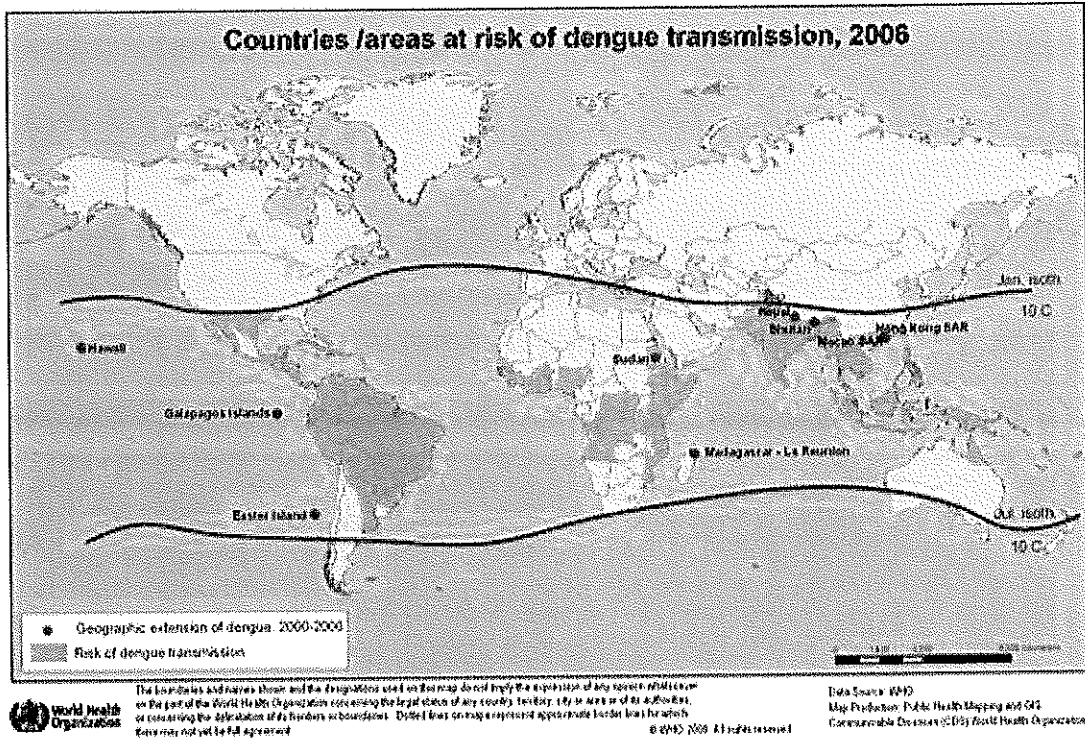


Figure 3. Countries and geographical areas at risk of dengue transmission in 2006 (WHO 2006) (Permission pending).

In the case of the Dominican Republic, increases in the population, uncontrolled urbanization and the demand of resources, like land and water for the building of hotels for the burgeoning tourist industry, resulted in the creation of densely populated neighborhoods without piped water systems or latrines (Whiteford 1997; Yamashiro et al. 2004). Furthermore, since most of the water pumps in neighborhoods like Villa Francisca used electrical current, the common loss of electricity equated the loss of water supply. As a consequence, most people relied heavily on the storage of water in various kinds and sizes of containers in anticipation of such outages. Small water containers were used for drinking and cooking, while water for other (non-drinking) household use was stored in 55 gallon drums outside the house. Those outside containers were rarely covered, and thus provided excellent breeding ground for *Aedes aegypti*, the vector for dengue fever transmission.

We found that the main cause for dengue transmission was not the failure of public health workers to communicate appropriate public health information. Community members in Villa Francisca employed a combination of ethnomedical and biomedical knowledge in order to explain the reproduction and transmission of *Aedes aegypti*, and they were knowledgeable about the relationships between the mosquito and dengue fever. We did identify that one of the difficulties was that many of the Dominican public health programs geared towards dengue prevention were targeted exclusively at women. The assumption apparently was that since women used water for cooking and household chores, therefore they should be expected to be responsible for the control and protection of the water storage devices.

Our analysis, however, uncovered a contradiction we believed helped explain the cultural reasons for the failure of families in Villa Francisca to successfully translate the public health messages into effective behaviors. Our research indicated that even though women controlled the water containers found inside the house, men were in charge of the large water containers found outside the homes. Men were not targeted by the public health messages and therefore lacked information why clean standing water, like that in the 55 gallon tanks, provided perfect breeding places for the mosquito that transmitted dengue when they were left uncovered. Failing to have that information, the men saw no reason to cover the tanks after their frequent use (Whiteford 1997). Had we not employed an anthropological gendered analysis, the gender role differences in expectations and actions as they related to inside/outside might not have been uncovered.

An anthropological perspective that included a political/historical analysis allowed us to further understand why the Dominican public health campaign had failed.

While the Dominican government and the Ministry of Health focused their activities on neighborhood responses to common problems with mosquito control (and hence, dengue control), residents refused to accept the responsibility for removing mosquito breeding grounds. They argued that should be the responsibility of the government, not the residents. Careful ethnographic and participatory research uncovered what the residents referred to as the 'mala union' between the government and themselves. The people of Villa Francisca distrusted government programs and policies because they had not benefited from them in the past, and they saw health campaigns as empty political manipulations - used to win votes but once the election was over, nothing more. As a consequence, most members of the neighborhood refused to participate in public health projects. People said they did not see the value of participating in the cleaning or covering of the water tanks when they did not have access to public services like running water, reliable electricity, sewers and drainage systems (Whiteford 1992). The results of this kind of medical anthropology – especially in the domain of the current water crisis – can be used to more effectively construct public health campaigns and to understand the historical reasons for their failures.

### **Anthropology and Water Policy**

We see medical anthropology as the quintessential tool – both methodological and theoretical - to understand the complex and often opaque relationship between the cultural habits of belief and practice, and the biological responses to disease transmission, be they cultural practices that lead to the increased incidence of cholera in highland Ecuador, or the 'inevitability' of suffering from 'bonebreak fever' if you live in Villa

Francisca. We also believe that policy is a critical application of anthropological research. However, the relationship between anthropology and policy has been neither inevitable nor linear (Shore and Wright 1997; Whiteford 2008). On the contrary, it has been a complex relationship filled with tensions, failed attempts, and limited successes. Tensions are produced when anthropologists interact with professionals from other disciplines, especially those in charge of making policies. As Hackenberg indicated, problems in the past arose due to the fact that “the donor groups, led by economists who were allied with the policy makers, sought refuge in the obscure macroeconomics of structural adjustment, while anthropologists, submerged beneath postmodern discourse, became equally unintelligible to outsiders” (2002:290). Collaboration cannot take place when each side maintains its own language and neither is willing to listen or adapt their approach.

In spite of these difficulties, there are currently many anthropologists working in different areas of the government and many of them have become decision and policy makers. As Castro and Singer (2004) pointed out, anthropologists have collaborated with policy makers and worked with policies in many different ways. The most common form of participation of anthropologists in policy-making has consisted in the provision of research findings, and in some cases, the proposal of recommendations for the elaboration of policies (Singer and Castro 2004: xiii). Anthropologists have analyzed existing policies and searched for ways to make them more effective as well as looked at the effects policies have on the everyday lives of people (Singer and Castro 2004; Wedel et al. 2005). In fewer cases, they have even participated as policy makers.

In sum, there are great opportunities for anthropologists interested in contributing to policy-making and implementation (Fiske 2006, 2008; Wulff and Fiske 1987). In this section of the chapter we introduce some ideas about the relationship between anthropology and policy by asking two questions: what are some contributions anthropological research can make to policy, and secondly, what can anthropologists learn from looking at policies and working with policy-makers.

As the examples presented earlier suggest, anthropological research and analysis can provide important contributions to the understanding of the consequences of the failure to provide something as supposedly simple as access of clean water. Much of anthropological research contextualizes analysis with history, embeds it in a discussion of power, and grounds it in cultural understandings. When it is done well, anthropological research makes the marginalized the center of focus, the invisible clearly identified, and moves from description to theory. Policy, we believe, is a way to insert practice into the movement toward theory because, while policy is theoretical, it is also translated into practice and becomes both observable and quantifiable. In our Dominican example, by identifying the invisible water handlers (men who were responsible for the outside water containers), they become an opportunity to shape policy to include them and their roles and practices. The other policy lesson from the Dominican example is the culturally rational response of the Villa Franciscans to the ‘mala union’ of failed promises, and the clarity of a demonstrated reciprocal relationship between the government and the stakeholders

Contextualization allows anthropologists to identify the conditions in which policies, once they are designed, will operate. In the case of Ecuador, recommendations

for policies to control the spread of cholera needed to be framed within the political and economic context of rural highland provinces like Chimborazo and Cotopaxi, and to take into consideration the effects of the neoliberal policies on the provision of public services to already marginalized indigenous communities such as those (Whiteford 2005).

Anthropological research can also look at the historical relationship between policies and specific groups identifying the reasons why policies might not be effective. In other words, it can look at the people for whom policies are directed, as well as the policy makers themselves. As Wedel, Shore, Feldman and Lathrop described: “from an anthropological perspective, what happens in the executive boardroom, the cabinet meeting, or the shareholders’ annual general meeting is no less important than that which occurs at the level of the factory floor or locality” (2005:34). By analyzing who makes policies and how they make them, anthropologists show that policies are not neutral, but rather reflect and represent the concepts and ideas of the groups that have the power to make them (Shore and Wright 1997; Wedel et al. 2005).

Anthropological research uses a variety of methodological tools that can provide information from a local as well as a global perspective (Van Willigen 1984). This bifocal view can inform policy about local realities in the context of larger political arenas. And in many cases, anthropology tries to bring individuals and their communities together to inform policy formation (Treitler and Midgett 2007:141). Ethnographic research is useful in this endeavor because it sheds light on the everyday lives of individuals. “Ethnography is a mode of knowing that privileges experience –often going into realms of the social that are not easily discernible within the more formal protocols used by many other disciplines” (Das and Poole 1991:14). When focused on the

formation and operation of policy, ethnography can point to the social relations created through policies, their adaptation to local contexts, and the contradictions that arise when differing interpretations of the same policies interact (Castells 1996; Mosse 2006).

In other words, anthropological research highlights the local, nuanced, and fine-grained characteristics of social problems that are all too frequently lost in policies. Furthermore, by favoring the perspective of the people in the study, it is more oriented towards increasing the participation of the population of interest in the research process, design of policies, and their actual implementation.

In our cholera example, the medical anthropological analysis identified how traditional decision-making processes and rules of exclusion removed both women and young people from being able to effect water reforms because they were being excluded from access to power. By bringing women and young people into leadership roles in the research process, new avenues for water use and means to interrupt the disease transmission routes were made possible. The spread of cholera was then attacked at multiple levels: introduction of soap and chlorine, the storage of water in closed, spigotted containers, the reduction of consumption of street food, and an understanding of sources of reintroduction of the disease. Furthermore, by enhancing the active participation of all community members, many of these previously excluded groups assumed leadership roles promoting sanitation measures and the consumption of potable water inside their communities and they became advocates for the improvement of the living conditions of the region (Whiteford 1997).



## **Conclusion**

This chapter was co-authored by a senior medical anthropologist (Whiteford), and a doctoral student in applied medical anthropology (Vindrola Padros). We have used our research and readings to shape this chapter, as they shape the questions we ask and our epistemologies. And, as we complete this chapter, we conclude with our vision of some possible future directions in the medical anthropology of water and health. The literature reviewed and fieldwork experiences described in this chapter suggest that if medical anthropologists are to be effective in providing viable solutions to the reduction of diseases transmitted through and by water, they need to receive transdisciplinary training. By transdisciplinary we do not mean participating in teams composed of professionals from different academic disciplines (usually referred to as multidisciplinary or interdisciplinary). We mean that medical anthropology training needs to include instruction not only in anthropology, but also in other areas such as engineering, public health, medicine, and chemistry, among others.

In the fall of 2000, the Department of Anthropology at the University of South Florida moved in the direction to enhance transdisciplinary training with the inauguration of its anthropology and public health dual degree program, allowing students to cross train at both the MA and PhD levels in applied anthropology and public health. This very effective program allows students to take either M.A./Ph.D. in applied anthropology and in one of eight research areas of public health: Environmental Health, Epidemiology, Global Communicable Disease, Healthcare Organizations and Management, Health Policy and Programs, Maternal and Child Health, Public Health Education, and Global Health.

In the spring of 2009, USF moved into a new experiment in transdisciplinary education with the initiation of a graduate certificate program in *Water, Health, and Sustainability* jointly offered by the College of Arts and Sciences (Departments of Anthropology and Geography), College of Engineering (Departments of Civil and Environmental Engineering and Chemical Engineering), and the College of Public Health (Department of Global Health and Environmental and Occupational Health). This program is directed at graduate students interested in research on the nexus between water and health, and for public health professionals, anthropologists, humanitarian aid providers, engineers, and others interested in addressing health problems associated with inadequate and unclean water. The study program draws from collaborating departments and provides students with transdisciplinary education and training on topics such as the social and cultural dimensions of local and global health, the treatment, testing, and management of water supplies; the role of water as a sustainable resource, the role of water in health and disease, and the engineered environment of water and sanitation.

The certificate is designed to provide students with transdisciplinary training in medical anthropology, epidemiology, global information systems, civil, environmental, and chemical engineering, and geography. While the program was approved during the writing of this chapter, already students are working on projects such as how to design solar latrines in culturally appropriate and sustainable ways, investigating how cultural conceptions of water shape behavior and sanitation practices, researching how to raise the temperature on waste composting to level sufficient to kill ascaris in sustainable and culturally acceptable forms, experimenting with locally growing plants to extract a

substance to filter out dangerous bacteria from water, and developing sustainable water systems for impoverished rural and periurban areas of Latin America.

Both of the authors of this chapter participated in the process of creating this graduate certificate program in *Water, Health and Sustainability* in different ways and capacities, one as a principal investigator and the other as a graduate student. However, our experiences are similar in that we both shared the difficulties of transdisciplinary inquiry and dialogue, while at the same time we recognize and applaud its value. We both believe that medical anthropology is a critical component to any research on water and health, but we also believe that the subject is both so complex and so urgent that medical anthropology alone cannot reduce the number of what Paul Farmer calls 'stupid deaths,' deaths that need not to happen (Farmer 2003). To stop or at least slow down the rate of these stupid water-related deaths, we need to know much more than we can just from anthropology. We conclude this chapter with a brief story from each of us about our 'transdisciplinary experience. in the belief that stories are more memorable ways to communicate the necessity to approach the water/health crisis in a transdisciplinary frame.

My story (Whiteford): While I knew that transdisciplinary teaching and research can be immensely productive, I also knew from experience that it often is equally challenging. Even with that knowledge, I was constantly and consistently surprised by what I, even as the senior anthropologist on the team, failed to anticipate. As this story shows, my experience in our transdisciplinary seminar - as with any fieldwork - was humbling as well as exciting. As we began our water, health and sustainability cross-college seminar, we anticipated paradigmatic, methodological, and terminological

barriers. We counted on our common passion and commitment to the subject area to help us work through these obstacles, and so set up a portion of each seminar meeting for members of the group to present a detailed review of some article that represented significant discipline-specific insights that were felt to be important for the other members of the seminar to be exposed to. In part, we wanted to establish some groundings in the sea of unknown vocabularies, models, and methods, and even a sense of what was really important to share. The first presentation was on semi-permeable membranes and their relative width, densities and chemical compositions and their ability to filter particular wastes. Another presentation focused on the various ways to increase temperature using solar capabilities to a level to kill ascaris parasites and the relative importance of pH, temperature, moisture, biogas digesters, and other things unintelligible to many medical anthropologists.

One of the first reviews the anthropology group presented was focused on participatory research (PAR) methods which we felt was not part of the tool kit of the engineers and others in the seminar. The presentation went well with the anthropologists providing great detail on what PAR was, why it was important, and how it was conducted. At the end of the presentation, we offered an anthropological example of how PAR was used to develop community-based support for a water system. When the presentation was over, there was silence in the seminar room. The engineering and public health students and faculty had listened, but the presentation had not generated any discussion or questions from them. And then one of the engineering faculty raised her hand and she asked what kind of water system had been put in, was it a pump, tank, in ground, gravity based, and was the source a generator, battery, or hand turned? None of

knew the answers to the crucial technical questions she asked, nor had we even thought about them!

Her questions focused on the technical response of the project, and the anthropologists did not know the answer; even the article failed to explain the actual water system. Her question was central to understanding the case and none of us could answer it. It certainly provided an unforgettable example that what different partners in the seminar thought was important and significant questions to ask were not even thought of by the others. Clearly, our narrow disciplinary expertise blinded many of us to think of a whole array of questions. The seminar in transdisciplinary research once again showed us not only the value of understanding multiple approaches to common problems, but also the hidden obstacles to their resolution. Clearly, expanding our realm of what information was important for all of us.

My story (Vindrola Padros): During my first semester at U.S.F., Linda invited me to participate in the water, health and sustainability cross-college seminar. In one of our meetings, a representative from a group of engineering students (Engineers Without Borders) was asked to come in and make a presentation on a project they were designing to provide water to a small community. The representative indicated that they needed collaboration from students and faculty from disciplines outside of engineering, especially anthropologists. I became interested in the project and attended one of their meetings. It was surprising to me how the group had already decided which water system to install in the community without having visited it for an extended period of time and without carrying out an in site investigation of what the community members wanted. I expressed this concern indicating many other things that I thought needed to be taken into

consideration like power relationships, gender roles, and government policies. The group of engineers listened patiently to my arguments; however, to them the water system appeared to operate separately from the things I mentioned. I knew this was not the case, but since I had no idea about the operating mechanisms of the water system I could not provide them with specific examples on how the installation and maintenance of the system would be affected if the community did not participate actively in the decision-making process. I did not understand their language and I could not translate my anthropological language into terms they could understand. As a result, I failed to demonstrate the value of adding an anthropological perspective to the project and some of my proposals were dismissed because they appeared too complex to be carried out in the short time available for the implementation of the water system. Even though in the following meetings our communication improved, the group incorporated social research methodology, and received some suggestions from professors in the Anthropology Department, that experience made me think of the many things that were lost in attempting to translate concepts to a methodological/technical language I did not understand.

Medical anthropologists have called our attention to the need to look at the relationship between water and health, and to propose viable solutions to interrupt the spread of infectious diseases. In this chapter we suggest that the relationship between anthropology, water, and policy will represent a valuable factor in this process. Furthermore, anthropologists that have received transdisciplinary training will be well-equipped to participate in the design and implementation of policies and programs that look at the relationship between water and health from multiple perspectives. As we

conclude this chapter we offer our own experiences in one new way to approach the remediation of the water and health crisis. We know there are many other forms and perspectives critical to this discussion, and we look forward to improved health as clean water becomes more equitably distributed across the globe.

## References

Aiyer, Ananthkrishnan

2007 The Allure of the Transnational: Notes on Some Aspects of the Political Economy of Water in India. *Cultural Anthropology* 22(4):640-658.

Arar, Nedal Hamdi

1998 Cultural Responses to Water Shortage among Palestinians in Jordan: The Water Crisis and Its Impact on Child Health. *Human Organization* 57(3):284-291.

Armada, Francisco, Carles Muntaner, and Vicente Navarro

2001 Health and Social Security Reforms in Latina America: The Convergence of the World Health Organization, the World Bank, and Transnational Corporations. *International Journal of Health Services* 31(4):729-768.

Assies, Willem

2003 David versus Goliath in Cochabamba: Water Rights, Neoliberalism, and the Revival of Social Protest in Bolivia. *Latin American Perspectives* 30(3):14-36.

Boelens, Rutgerd and Bernita Doornbos

2001 The Battlefield of Water Rights: Rule Making Amidst Conflicting Normative Frameworks in the Ecuadorian Highlands. *Human Organization* 60(4):343-355.

Castells, M.

1996 *The Rise of Network Society*. Oxford: Blackwell.

Castro, A. and Merrill Singer, eds.

2004 *Unhealthy Health Policy: A Critical Anthropological Examination*. Lanham, MD: Altamira Press.

Chakraborty, S., J.S. Deokule, P. Garg, S.K. Bhattacharya, R.K.Nandy, G.B. Nair, S. Yamasaki, Y. Takeda, and T.Ramamurthy

2001 Concomitant Infection of Enterotoxigenic Escherichia coli in an Outbreak of Cholera Caused by Vibrio cholera 01 and 0139 in Ahmedabad, India. *Journal of Clinical Microbiology* 39:3241-3246.

Childe. V.G.

1953 *New Light on the Most Ancient Near East*. New York: Praeger.

Coreil, Jeannine, Linda Whiteford and Diego Salazar

1997 The Household Ecology of Disease Transmission: Dengue Fever in the Dominican Republic. *In The Anthropology of Infectious Disease: International Health Perspectives*, Marcia Claire Inhorn and Peter J. Brown, eds. Pp. 145- 171. London and New York: Routledge.

Cortez Lara, Alfonso, Scott Whiteford, and Manuel Chavez Marquez, eds.

2005 *Seguridad, Agua y Desarrollo: El Futuro de la Frontera México-Estados Unidos*. Tijuana: Colegio de la Frontera Norte.

Coward, E. Walter, Jr.

1979 Principles of Social Organization in an Indigenous Irrigation System. *Human Organization* 38:28-36.



Das, Veena and Deborah Poole

2004 State and Its Margins: Comparative Ethnographies. *In Anthropology in the Margins of the State*, Veena Das and Deborah Poole, eds. Pp. 3-33. Santa Fe: School of American Research Press.

Davis-Salazar, Karla

2003 Late Classic Maya Water Management and Community Organization at Copan, Honduras. *Latin American Antiquity* 14(3):275-299.

2006 Late Classic Maya Drainage and Flood Control at Copan, Honduras. *Ancient Mesoamerica* 17:125-138.

Derman, Bill and Anne Ferguson

2003 Value of Water: Political Ecology and Water Reform in Southern Africa. *Human Organization* 62(3):277-288.

Donahue, John and Barbara Rose Johnston, eds.

1998 *Water, Culture, and Power: Local Struggles in a Global Context*. Washington, D.C.: Island Press.

Ennis-McMillan, Michael C.

1998 Drinking Water Politics in Rural Mexico: Negotiating Power, Justice, and Social Suffering. Thesis Ph.D. Michigan State University Department of Anthropology.

2002 A Paradoxical Privatization: Challenges to Community-Managed Drinking Water Systems in the Valley of Mexico. *In* Protecting a Sacred Gift: Water and Social Change in Mexico, Scott Whiteford and Roberto Melville, eds. Boulder: Lynne Rienner Publishers.

Farmer, Paul

2003 *Pathologies of Power: Health, Human Rights, and the New War on the Poor*. Berkeley: University of California Press.

Fiske, Shirley

2006 Anthropology in Pursuit of Public Policy and Practical Knowledge. *National Association for the Practice of Anthropology (NAPA) Bulletin* 26:82-107.

2008 Working for the Federal Government: Anthropology Careers. *National Association for the Practice of Anthropology (NAPA) Bulletin* 29(1):110-130.

Fleuret, Patrick

1985 The Social Organization of Water Control in the Taita Hills, Kenya. *American Ethnologist* 12(1):103-118.

Ford, Tim

2006 Emerging Issues in Water and Health Research. *Journal of Water and Health* 4(Suppl 1):59-65.

Fowler, Catherine

2000 Ethnoecology: An Introduction. *In Ethnobotany: A Reader*, Paul E. Minnis, ed. Pp. 13-16. Oklahoma: University of Oklahoma Press.

Franklin, Benjamin

1900 Poor Richard's Almanac. New York: Caldwell.

Gadgil, Ashok

1998 Drinking Water in Developing Countries. *Annual Review of Energy and the Environment* 23:253-286.

Gelles, Paul H.

1990 *Channels of Power, Fields of Contention: The Politics and Ideology of Irrigation in an Andean Peasant Community*. Ph.D. dissertation, Harvard University. University Microfilms, Ann Arbor, Michigan.

Gorter, A., Sandford, P., Davey Smith, G. and Pauw, J.

1991 Water Supply and Sanitation and Diarrhoeal Disease in Nicaragua: Results from a Case Control Study. *International Journal of Epidemiology* 20(2):527-533.

Gubler, Duane J.

1998 Dengue and Dengue Hemorrhagic Fever. *Clinical Microbiology Reviews* 11(3):480-496.

Guillet, David

2005 Water Management Reforms, Farmer-Managed Irrigation Systems, and Food Security: The Spanish Experience. *In Globalization, Water, and Health:*

Resource Management in Times of Scarcity, Linda Whiteford and Scott Whiteford, eds. Pp. 185-208 Santa Fe: School of American Research Press.

Guthmann, J.

1995 Epidemic Cholera in Latin America: Spread and Routes of Transmission. *Journal of Tropical Medicine and Hygiene* 98(6):419-427.

Hackenberg, Robert A.

2002 Closing the Gap between Anthropology and Public Policy: The Route Through Cultural Heritage Development. *Human Organization* 61(3):288-298.

Holtz, Timothy and Patrick Kachur

2004 The Reglobalization of Malaria. *In* *Sickness and Wealth: the Corporate Assault on Global Health*, Meredith Fort, Mary Ann Mercer, and Oscar Gish, eds. Pp. 131-143. Cambridge, MA: South End Press.

Hunt, Robert C.

1988 Size and the Structure of Authority in Canal Irrigation Systems. *Journal of Anthropological Research* 44:335-355.

Hunt, Robert C. and Eva Hunt

1976 Canal Irrigation and Local Social Organization. *Current Anthropology* 17:389-410.

International Water Management Institute

2002 Water-A Scarce Resource? Electronic document,

<http://www.lk.iwmi.org/Press/press4.htm#Water-%20A%20Scarce%20Resource?>,

accessed January 5<sup>th</sup>, 2009.

Iriart, Celia, Emerson Elias Merhy, and Howard Waitzkin

2001 Managed Care in Latin America: The New Common Sense in Health Policy

Reform. *Social Science and Medicine* 52(8):1243-1253.

Izurieta, Ricardo, Tatiana Ochoa, Alberto Narváez, José Racines, Arturo Castro,

Verónica Villegas, and José Álvarez

2000 Cólera en los Andes Ecuatorianos: Factores Ambientales y Etnoculturales de su Transmisión. Electronic document, <http://ris.bvsalud.org/finals/EQU-1367.pdf>,

accessed November 14th, 2008.

Kelly, William W.

1983 Concepts in the Anthropological Study of Irrigation. *American Anthropologist*

85(4):880-886.

Lansing, J. Stephen

1991 *Priests and Programmers: Technologies of Power in the Engineered*

*Landscape of Bali*. Princeton University Press, Princeton, New Jersey.

Lees, Susan H.

1986 Coping with Bureaucracy: Survival Strategies in Irrigated Agriculture.

*American Anthropologist* 88(3):610-622.

Lloyd-Sherlock, Peter

2004 Health Sector Reform in Argentina: A Cautionary Tale. *Social Science and*

*Medicine* 60:1893-1903.

MacCormack, Carol

1985 Anthropology and the Control of Tropical Disease. *Anthropology Today* 1(3):14-16.

McElroy, Ann and Patricia Townsend

2004 *Medical Anthropology in Ecological Perspective*. Cambridge, MA: Westview Press.

Millennium Project

2006 UN Millennium Project. Electronic document, <http://www.unmillenniumproject.org/>, accessed on December 12<sup>th</sup>, 2008.

Moe, Christine L. and Richard Rheingans

2006 Global Challenges in Water, Sanitation and Health. *Journal of Water and Health* 4:41-57.

Montgomery, Maggie A. and Menachem Eimelech

2007 Water and Sanitation in Developing Countries: Including Health in the Equation. *Environmental Science and Technology* 41:16-24.

Mosse, David

2006 Anti-social Anthropology? Objectivity, Objection, and the Ethnography of Public Policy and Professional Communities. *Journal of the Royal Anthropological Institute* 12:935-956.

Peabody, John W.

1996 Economic Reform and Health Sector Policy: Lessons from Structural Adjustment Programs. *Social Science and Medicine* 43(5):823-835.

Posey, Darrell, John Frenchione, John Eddins, Luiz Francelino Da Silva, Debbie Myers, Diane Case, and Peter Macbeath

1984 Ethnoecology as Applied Anthropology in Amazonian Development. *Human Organization* 43(2):95-107.

Pruss, Annette, and David Kay, Lorna Fewtrell, and Jamie Bartram

2002 Estimating the Burden of Disease from Water, Sanitation, and Hygiene at a Global Level. *Environmental Health Perspectives* 110(5):537-542.

Salazar, Diego

1993 Folk Models and Household Ecology of Dengue Fever in an Urban Community of the Dominican Republic. Doctoral Dissertation, University of South Florida.

Shore, Cris and Susan Wright

1997 *Anthropology of Public Policy: Critical Perspectives on Governance and Power*. London: Routledge.

Singer, Merrill and Arachu Castro

2004 Introduction: Anthropology and Health Policy: A Critical Perspective. In *Unhealthy Health Policy: A Critical Anthropological Examination*, Arachu Castro and Merrill Singer, eds. Pp. xi-xix. Lanham, MD: Altamira Press.

Steward, Julian, ed.

1955 *Irrigation Systems: A Comparative Study*. Washington, D.C.; Pan American Union Social Science Monographs.

Trawick, Paul

2001 The Moral Economy of Water: Equity and Antiquity in the Andean Commons. *American Anthropologist* 103(2):361-379.

Treitler, Inga and Douglas Midgett

2007 It's About Water: Anthropological Perspectives on Water and Policy. *Human Organization* 66(2):140-149.

United Nations Development Program (UNDP)

2006 Human Development Report. New York: United Nations Development Program.

van Willigen, John

1984 Truth and Effectiveness: An Essay on the Relationships between Information, Policy and Action in Applied Anthropology. *Human Organization* 43(3):277-282.

Wedel, Janine, Cris Shore, Gregory Feldman and Stacy Lathrop

2005 Toward an Anthropology of Public Policy. *Annals of the American Academy of Political and Social Science* 600:30-51.

Whiteford, Linda

1997 The Ethnoecology of Dengue Fever. *Medical Anthropology Quarterly* 11(2):202-223. 1992 Contemporary Health Care and the Colonial and Neo-Colonial Experience: The Case of the Dominican Republic. *Social Science and Medicine* 35(10):1215-1223.

2005 Casualties in the Globalization of Water: a Moral Economy of Health Perspective. *In Globalization, Water, and Health: Resource Management in Times*



of Scarcity, Linda Whiteford and Scott Whiteford, eds. Pp. 25-44 Santa Fe: School of American Research Press.

2008 The Political Economy of Policy: The Dengue Complex. Keynote Presentation at the International Conference on Dengue Fever, Phuket, Thailand. October 15-17.

Forthcoming Approaches to Policy. *In* Social and Behavioral Foundations of Public Health, Jeannine Coreil, ed. SAGE Publications.

Whiteford, Linda with C. Laspina and M. Torres

1996 Cholera Prevention in Ecuador: Community-Based Approaches for Behavior Change. Activity Report No. 19. Arlington, VA: Environmental Health Project.

Whiteford, Linda and Jeannine Coreil

1991 Household Ecology of *Aedes aegypti* Control in the Dominican Republic. Unpublished project report.

Whiteford, Linda and Scott Whiteford

2005 Paradigm Change. *In* Globalization, Water, and Health: Resource Management in Times of Scarcity, Linda Whiteford and Scott Whiteford, eds. Pp. 3-15 Santa Fe: School of American Research Press.

Whiteford, Scott and Roberto Melville, eds.

2002 *Protecting a Sacred Gift: Water and Social Change in Mexico*. Boulder: Lynne Rienner Publishers.

Whiteford, Scott and Sergio Quesada Aldana

2006 *La Ecología Política en la Cultura del Agua en Queretaro*. Queretaro:  
Universidad Autónoma de Queretaro.

Whiteford, Scott and Antonio Cortez-Lara

2005 Good to the Last Drop: the Political Ecology of Water and Health on the  
Border. *In* Globalization, Water, and Health: Resource Management in Times of  
Scarcity, Linda Whiteford and Scott Whiteford, eds. Pp. 231-254 Santa Fe:  
School of American Research Press.

Wittfogel, Karl

1955 Development Aspects of Hydraulic Civilization. *In* Irrigation Systems: A  
Comparative Study, Julian Steward, ed. Washington, D.C.: Pan American Union  
Social Science Monographs.

1957 *Oriental Despotism: A Comparative Study of Total Power*. New Haven, CT:  
Yale University Press.

World Health Organization (WHO)

2000 Lymphatic Filariasis. Fact Sheet No. 102. Electronic document,  
<http://www.who.int/mediacentre/factsheets/fs102/en/print.html>, accessed January  
7<sup>th</sup>, 2009.

2004 Water, Sanitation and Hygiene Links to Health: Facts and Figures, Updated  
November 2004. Electronic document,  
[http://www.who.int/water\\_sanitation\\_health/publications/facts2004/en/](http://www.who.int/water_sanitation_health/publications/facts2004/en/), accessed  
November 14<sup>th</sup>, 2008.

2006 Countries/areas at risk of dengue transmission. Map Production Public  
Health Imaging.

2008 Dengue and Dengue Haemorrhagic Fever. Fact Sheet No. 117. Electronic document, <http://www.who.int/mediacentre/factsheets/fs117/en/>, accessed November 14<sup>th</sup>, 2007.

2009 Schistosomiasis. Epidemiological Situation. Electronic document, <http://www.who.int/schistosomiasis/epidemiology/en/>, accessed November 14<sup>th</sup>, 2008.

Wiley, Andrea S. and John S. Allen

2009 *Medical Anthropology: a Biocultural Approach*. New York: Oxford University Press.

Wulff, Robert and Shirley Fiske

1987 *Anthropological Praxis: Translating Knowledge into Action*. Boulder: Westview Press.

Yacoob, May and Linda M. Whiteford

1994 Behavior in Water Supply and Sanitation. *Human Organization* 53(4):330-335.

Yamashiro, Tetsu, Mildre Disla, Angela Petit, Delfis Taveras, Mercedes Castro-Bello, Miguel Lora-Orste, Sonia Vardez, Ana Julia Cesin, Barbara Garcia, and Akira Nishizono

2004 Seroprevalence of IgG Specific for Dengue Virus Among Adults and Children in Santo Domingo, Dominican Republic. *American Journal of Tropical Medicine and Hygiene* 71(2):138-143.

## Biostatements of the authors

**Linda M. Whiteford:** PhD, MPH is a professor of anthropology at the University of South Florida where she is currently holds two positions as Associate Vice President for Global Strategies, Office of the President, and Associate Vice President for Academic Affairs and Strategic Initiatives, Office of the Provost. She is a Past President of the Society for Applied Anthropology. Her research focuses on translating anthropological research into global health policies and practices, particularly concerning infectious and contagious water-related diseases. Her current National Science Foundation funded research (with Co-PIs Graham Tobin, Arthur Murphy, and Eric Jones) centers on social networks and recovery from chronic hazards such as active volcanoes. In 2008 she co-authored two books: Primary Health Care in Cuba: The Other Revolution, with Laurence Branch, Rowman and Littlefield Press, Lanham, Maryland, and Anthropological Ethics for Research and Practice, with Robert T. Trotter, II, Waveland Press. Long Grove, Ill. And in 2005 co-edited Globalization, Water and Health: Resources in Times of Scarcity, with Scott Whiteford, published by the School of Advanced Research Press. She hopes that Global Health in Times of Violence, (co-edited with Barbara Rylko-Bauer, Linda Whiteford, and Paul Farmer), and published by School for Advanced Research Press, Santa Fe, New Mexico will be available in 2009.

**Cecilia Vindrola Padros:** Cecilia originally obtained her B.A. in Cultural Anthropology from the Universidad de las Americas, Puebla in Mexico. She is currently carrying out a Ph.D. in Bio-cultural Medical Anthropology at the University of South Florida thanks to

the financial support provided by the Fulbright-Garcia Robles Grant, AAUW International Fellowship, CONACYT Complementary Doctoral Scholarship, and USF. Her previous research has focused on different health related issues (HIV/AIDS, Cancer treatment, health impacts of domestic violence) with particular interest on the services provided to children within public healthcare facilities in Latin America. For her Ph.D. dissertation, Cecilia will analyze the strategies used by pediatric oncology patients and their parents to overcome the delays and obstacles in the diagnosis and treatment of cancer within the public health system in Argentina.