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The Effects of Water Insecurity and Emotional Distress on Civic Action for Improved Water Infrastructure in Rural South Africa

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Abstract

The South African constitution ratifies water as a human right. Yet millions of citizens remain disconnected from the national water infrastructure. Drawing on data collected in 2013–2014 from women in northern South Africa, this study explores "water citizenship"—individual civic engagement related to improving water service provision. Literature indicates that water insecurity is associated with emotional distress and that water-related emotional distress influences citizen engagement. I extend these lines of research by assessing the connection that water insecurity and emotional distress may collectively have with civic engagement to improve access to water infrastructure.

Keywords

citizenship; emotional distress; rural poor; South Africa; water insecurity

Introduction

The global demand for water has increased six-fold in the past century (UNFPA 1999). If current trends persist, by 2025 two-thirds of the world's population will be living with serious water shortages or almost no water at all (UNEP 2007). Given the increasingly limited supply of water, a consequence of inappropriate water management, climate change, increasing populations, industry demands, pollution, and privatization, governments will feel further pressure to ensure that citizens have an ample supply of safe water. Furthermore, governments will have to address the drivers of water insecurity, namely inequitable distribution of water rights, economic resources, and resource availability (Whiteford and Whiteford 2005).

Disparities in the availability of safe drinking water constitute one of the primary underlying determinants of global health inequities. Recent estimates indicate that half a million people die every year from preventable cases of diarrhea caused by inadequate drinking water (Pruss-Ustun et al. 2014). More than half of the cases of diarrhea in middle and low-income countries are attributable to inadequate drinking water, inadequate sanitation, and poor hand-washing hygiene (Pruss-Ustun et al. 2014). In sub-Saharan Africa, treating diarrhea consumes 12% of the health budget (WSSCC 2013). It is estimated that nearly 10% of the global disease burden could be reduced through improved water supply, hygiene, sanitation, and water resource management (UN Water 2009). Reviews evaluating the effect of water supply and sanitation interventions in resource-limited settings note that while focusing

improvements on water quality and/or quantity reduces diarrhea rates and other water-related health conditions, the effects are not as great as predicted (Arnold and Colford 2007; Clasen et al. 2007; Fewtrell et al. 2005). Authors attribute this lack of effect in part to lack of community engagement. Few studies have examined the determinants that might predict individual citizen action to improve water services.

In South Africa, citizens have been granted extensive *de jure* socioeconomic rights, including the right to water (Bill of Rights 1996). The translation of these rights into *de facto* socioeconomic empowerment has proven both complicated and slow. Many new civil society organizations have emerged around issues of housing provisions (e.g., the South African Homeless People's Federation), state evictions, and disconnections of services (e.g., Western Cape Anti-Eviction Campaign and Soweto Electricity Crisis Committee) (Millstein et al. 2003; Ngwane 2003; Oldfield and Stokke 2002). In this article, I focus on the impact of water service provisions on women in a rural area of South Africa to provide an example of distinct political structures and social norms that produce a unique configuration of water insecurity, emotional distress, and civic action. The data draw on 10 years of collaborative work conducted in the region by the University of Virginia (UVA) and the University of Venda (UNIVEN), work that has closely examined and made efforts to address water insecurity in local communities.

Background

Drawing on an approach that has proven useful in research on food insecurity, scholars have developed scales to measure water insecurity, "the insufficient and uncertain access to adequate water for an active and healthy lifestyle" (see FAO 2004; Hadley and Wutich 2009:451; Stevenson et al. 2012). Scholars develop these scales from the ground up, beginning with qualitative research on water use in specific cultural contexts. This approach develops experience-based measures of water insecurity, reflecting local idioms of stress and suffering (Ennis-McMillan 2001).

Amber Wutich (2006) pioneered this approach, showing how ethnographic evidence on water insecurity could be used to develop locally grounded scales of water insecurity through a series of studies in urban squatter settlements in Bolivia. Wutich demonstrated that households with greater water insecurity (related to water access and not limited to quantity of water used) was significantly associated with scores on a measure of emotional distress (including symptoms of anger, bother, fear, and worry) (Hadley and Wutich 2009; Wutich and Ragsdale 2008). Taken together with ethnographic evidence (Wutich 2009), these findings suggested that water insecurity is determined not only by physical access and adequacy of supply quantity, but also by the stresses inherent in negotiating with inequitable systems of water regulation. Stevenson and colleagues (2012) further demonstrated the relationship between water insecurity and psychosocial distress among women in Ethiopia.

Scholars have indicated that understanding the social dimension of water insecurity is "useful for informing and evaluating interventions to improve water supplies" (Stevenson et al. 2012:392). How might the relationship between water insecurity and emotional distress influence how individuals engage in improving their access to water, particularly in contexts

where the state has declared itself responsible for the provision of safe drinking water? In an examination of two South African communities, Jacqueline Goldin (2010) found that emotional distress, not simply water insecurity, influenced engagement in citizenship. Negotiations for improved water infrastructure and services appeared directly related to emotional states, specifically feelings of shame. Communities and individuals disconnected from state systems of education, politics, and economics, partially visualized through lack of infrastructure, felt greater shame and consequently were more reluctant to participate in civic engagement to improve their water situations (Goldin 2010). This has been supported by other scholars examining the situation in post-apartheid South Africa, who recognize the value of infrastructural connections in defining citizenship in South Africa (Robins 2013a, 2013b; Von Schnitzler 2008).

Contradicting Goldin's view, that lack of connection with national systems perpetuates citizen inaction, Nikhil Anand (2011) points to situations in Mumbai, India, where residents circumvent the state completely, illegally tapping into existing lines and operating outside the state infrastructure networks. Anand argues that excessive bureaucratic restrictions and corruption prevent residents from legally exercising their claims to services as citizens. A similar movement of operating outside the national infrastructure exists in South Africa where urban township residents employ "moonlight plumbers" to connect households illegally to the state water supply. In addition, individuals in upper- and middle-income communities in South Africa are increasingly electing to distance themselves from the state, though more as "responsible citizens" through legal means of boreholes, wells, and septic systems (Von Schnitzler 2013).

Contradicting the assessment that an excessive bureaucratic and corrupt system motivates South African citizens to act without the state (through illegal or legal means), Lyla Mehta (2006) argued that the human rights framework granting the right to potable water fails because of a lack of clear process by which to make claims against the state. Examining vulnerable communities throughout South Africa in the early 2000s, Mehta (2005, 2006; Mehta and Ntshona 2004) noted that most individuals were unaware of their right to water. Mehta argued that this lack of awareness contributed to a lack of significant progress to improve water infrastructure in the most remote regions of the country as, without challenge, the national government was allowed to assume a default setting of denying rights merely by omission rather than by intent.

Since Mehta's extensive studies, local awareness and understandings of rights, entitlements, and responsibilities have shifted in both metropolitan and remote areas, both incited by and inciting widely publicized coordinated social movements and court cases related to the right to water and other basic services (Ballard 2005; Dugard 2009; Miraftab and Wills 2005; Robins 2011, 2013a, 2013b; Thompson and Tapscott 2010; Von Schnitzler 2008, 2013). Given the acknowledgment of and now widely understood right to water in South Africa, what factors motivate individual or collective citizen action for improved water services, particularly in remote areas where national infrastructure is limited? How might the relationships between water insecurity and emotional distress influence individual decisions to make claims on the state for improved water services?

I hypothesize that five factors will be associated with citizen action to improve water services: (1) water insecurity; (2) experiences of water-related emotional distress; (3) current engagement in approaches to prevent water-borne disease; (4) economic assets/income; and (5) social assets (age and level of education) (see Figure 1). Prior studies (Goldin 2010; Stevenson et al. 2012; Wutich and Ragsdale 2008) have indicated that greater water insecurity prompts emotional distress. Goldin's (2010) findings from South Africa suggest a possible link between emotional distress resulting from water insecurity and citizen engagement. Considering these findings in combination, I predict that citizen action to improve state supplied water services to decrease among individuals who are emotionally distraught over their water situation. By contrast, individuals committed to water-related health behaviors are likely to be more engaged in actions to improve state water services, reflecting the increasing the movement of defining "good citizenship" as greater self-preservation (Briggs and Mantini-Briggs 2003; Von Schnitzler 2013). I expect that households with greater economic assets, age, and education (Verba et al. 1978) will also be more inclined to engage in citizen action. Here I draw from Bourdieu (1986, 1991, 1998) in considering that social practices and the power to act are constituted by the different forms of capital the actors' possess (e.g., economic, social, symbolic, political) and their dispositions for practice (habitus).

Water Citizenship

For this discussion, I develop and utilize the term "water citizenship" (Bulled 2015), drawing on the theoretical perspective of biological citizenship to indicate the use of science and law to base claims for improved access to government supplied water services. Rose and Navos (2005) offer the term "biological citizenship" as a descriptive to encompass all citizenship projects that link conceptions of citizens to beliefs about the biological existence of human beings as individuals, as communities, as races, and as a species. This sense of citizenship is most clearly developed by Adriana Petryna (2002) in her study of post-Chernobyl Ukraine, where an informal economy of illness and claims developed. Citizens who claimed to they had been exposed to the radiation effects of the nuclear explosion at the Chernobyl reactor believed that they had rights to government health services and social support in the name of their damaged biological bodies. Biological citizenship in Ukraine took the form of demanding redress from the state for specific ills, in the form of benefits, with activism oriented toward demanding medical recognition for a condition and obtaining expert judgment as a credential to obtain state benefit (Petryna 2002).

Scholars have observed and documented similar processes of citizens, making particular rights-based claims on their nation-state based on damaged biologies around the world. Unemployed and poverty-stricken HIV-infected South African citizens have drawn on the scientific language of CD4 counts and viral loads to demand greater government services, termed biomedical citizenship by Steven Robins (2008). Marginalized HIV-positive populations in Cote d'Ivoire have employed analogous processes in their struggles for access to HIV treatment services, coined "therapeutic citizenship" by Vihn Kim Nguyen (2005, 2010). Similarly, citizens of Brazil make claims on the state for access to medical care, given the nation-state's constitutional right to health (Biehl 2007; Biehl and Petryna 2013).

Recognizing the nation-states' responsibility in disease prevention, as well as in the provision of medical care, Charles Briggs and Clara Mantini-Briggs (2003) offered the term "sanitary citizenship" in reference to the mechanisms for accessing civil and social rights in Venezuela during the 1992–93 cholera epidemic. In this case, the nation-state conferred citizenship based on the health maintenance behaviors and disease states of citizens. Individuals and groups depicted as possessing the biomedical understandings of health and disease were granted access to government services as "sanitary citizens." Those incapable of adopting modern hygienic practices were deemed "unsanitary subjects" and excluded from accessing certain disease prevention and treatment services. A similar relationship has been observed among Mexican immigrants in the United States (Horton and Barker 2009). Here, oral health is a marker of citizenship. Given their lack of access to government infrastructure (e.g., fluoridated water, dental checkups), Mexican immigrants have worse oral health and consequently are easily identified as non-citizens. This designation further denies them access to state services for disease prevention and treatment.

Although offering different legal, political, and ethical framings in different geographic, political, social, and disease contexts, in each case of biological, biomedical, therapeutic, and sanitary citizenship claims on authorities are being (or could be) made in terms of damage and suffering of individuals or groups and their "vital" rights as citizens (Rose and Novas 2005). Biological citizenship, and the associated theoretical perspectives, can thus embody a demand for particular protections, for the enactment or cessation or particular policies or actions, or access to special resources, "to a form of social welfare based on medical, scientific, and legal criteria that both acknowledge biological injury and compensate for it" and make efforts to prevent further damage (Petryna 2002:4). Water citizenship relates specifically to improved water services as a way to prevent future disease, which individuals make arguments for based on associated biological, mental, and social health conditions.

For this study, I further expand the current understandings and articulations of biological citizenship, and citizenship more generally to include both elected civil and inherited traditional authority structures. My understanding of citizenship in the South African context is informed by anthropologist Steven Robins (2008:1), who notes that activist efforts to balance inequities have taken varied forms. Robins argues that a combination of highly individualistic and competitive ideologies of economic liberalism occurring in South Africa have generated a growing culture of corporate capitalism. However, these individualistic notions are offset by communitarian notions of African renewal and *ubuntu* (understood as an indigenous African cultural ethos in reference to people acquiring their humanity in relation to others).

Communitarian notions are in some contexts maintained by the traditional authority structures and associated common/traditional laws that are still recognized in South Africa. The South African government has a designated authority body, the Ministry for Cooperative Governance and Traditional Affairs, whose function is to maintain relationships between national, provincial, and municipal government structures and oversee traditional leadership. This governmental body appoints tribal leaders who receive economic compensations for their roles in maintaining cultural legacies and social order. In addition,

the National House of Traditional Leaders was established as a statutory body to represent and advance the aspirations of traditional leaders and their rural community members. Consequently, South African citizens may function under both authority structures (elected and traditional) concurrently and may draw on either or both to make claims for improved government services. In assessing water citizenship, I did not distinguish between elected or traditional authority structures; rather, I posed questions that referred to engagement with any form of local authority structure that has control over water supplies and infrastructure.

In doing so, this study aims to explore water citizenship using systematic data collection methodologies. It also examines the issue of water citizenship on multiple levels, examining how the experience of water insecurity, in addition to social, cultural, economic, political, and historical context, influences abilities to engage in active discourse to ensure the nation-state fulfills its obligation to provide an adequate supply of safe drinking water. The study offers an experience-based measure for water insecurity, building on the tools developed by Wutich (Hadley and Wutich 2009; Wutich 2006, 2009), to broaden understandings of health impacts to include both biophysical and psychosocial factors. I know of no other studies that measure water citizenship or examine the association between water insecurity, emotional distress, and citizen engagement.

Field Site

I conducted research in the Vhembe district in the Limpopo Province in northeast South Africa (Figure 2). Tourism literature refers to this northern area of South Africa, bordering Zimbabwe, as “Africa’s Eden.” High annual rainfall results in lush vegetation and plentiful food productivity. Water is abundant in the area, flowing through rivers, streams, and agricultural canals, and collecting in dams, as ground water, and in rainwater-runoff storage tanks throughout the year. Projections from studies conducted locally suggest that households could collect sufficient rainwater runoff during the wet season to provide for household and small-scale agricultural use throughout the dry season (Ndiritu et al. 2011).

Despite the abundance of water as a natural resource in the area, access to safe drinking water, free from agricultural contaminants, human and animal fecal matter, and pathogens remains low. In the Limpopo province, only 44% of households have access to purified, state-supplied drinking water (Coovadia et al. 2009). Local census data for the Vhembe district indicate that 88% of households have access to potable running water provided through government infrastructure into the house, the yard, or as a communal standpipe (Statistics South Africa 2012). Nationally, only 43% of the South African population has access to purified piped water in their homes, 29% have a standpipe in their yards, 3% use a neighbor’s tap, and 15% make use of a communal tap. Indeed, 9% or about 4.5 million South Africans have absolutely no access to municipally supplied purified drinking water.

Although the water situation in South Africa has unique political, economic, and cultural dynamics, Dzimauli, a community of villages in the Vhembe district, is relatively typical of many remote and impoverished communities around the world. In Dzimauli, water insecurity, not in terms of quantity but in terms of quality, is a chronic problem as residents have limited access to the local Mutale municipality’s water services. Most households in

this area do not receive a consistent supply of water from any given source and use multiple sources to meet their daily needs. Drinking water is collected directly from rivers, streams, and agricultural canals or diverted to homes either through communal pipes (supplying unpurified surface water) or municipality pipes (supplying purified water) (Mellor et al. 2012). Some communities have organized water committees to lay and manage pipes to bring unpurified water to the household from local streams or rivers. Community members have collectively contributed to cover the cost of these pipes. Individual households pay additional monies to connect pipes to their yards. Other communities share these pipes, with individuals paying their representative water liaison a monthly sum to divert the water to "their side." These pipes run along the ground from the river and frequently need maintenance.

Purified municipal water, where available, either as a shared standpipe or as a metered supply to a household, is similarly inconsistent in this neighborhood. Even when available, municipal water services are sporadic at best, meters break, water is not always clear, water tastes and smells bad, and the water may not be safe to drink. Although increasingly common in metropolitan areas (Von Schnitzler 2013), there was no report or evidence of vandalized water meters or municipal standpipes. Purified water supplied from the municipality (through standpipes, metered pipes to households, or private pipelines connected illegally to the municipal supply) served as a secondary water source for 44% of participants in this study. Additional households had municipally supplied water in the past (private or communal), but these lines were disconnected due to "inappropriate water use," broken pipes, or broken meters. Households furthest from the municipality headquarters have never had access to municipal water within their communities through shared standpipes or private taps (see Figure 2). Topography contributes to the lack of infrastructure in some communities, as these villages are nestled in the Soutpansberg mountain range. Politics may also play a role in which village receive government services. Fraser McNeill (2011) suggests that the distribution of water infrastructure in the region is a reflection of the relationship between traditional leaders and both pre- and post-apartheid government bodies. Few households have the economic resources to purchase storage tanks for rainwater runoff collection or arrange for connections to municipality water pipes. Community members do not trade water, as all households have access to the stream and river surface water.

Methods

Sample

The sampling frame for this study included a list of 300 females living in the Dzimauli villages, enrolled in the multi-sited malnutrition and enteric disease (Mal-ED) study. The Foundation of the National Institutes of Health, with a grant from the Bill and Melinda Gates Foundation, funded this five-year prospective cohort study, which examined the relationship between malnutrition and enteric disease on childhood development. I generated a list of 75 names by selecting every third name from a randomly generated list of women enrolled in the South Africa cohort. If a selected individual could not participate, or was out of town or lost to follow-up, I randomly selected a replacement, with 50 (67%) women available to participate. With the assistance of local researchers to translate, I interviewed the

female household head who self-identified as responsible for the acquisition and distribution of the household water supply. Table 1 shows the descriptive characteristics of the survey participants. The Institutional Review Board of UVA approved the research design.

Questionnaire Development and Data Collection

UVA, in collaboration with UNIVEN, has conducted numerous research and service projects with individuals living in the study communities over a 10-year period. These engagements have generated a body of knowledge of local water use, water-related emotions, and water acquisition strategies that include collecting surface water, collaborations among community members to divert surface water, and individual engagements with government offices. For example, Cunningham and colleagues (2009) used the method of photo-voice to assess the experience of water insecurity within these communities. UVA system engineering professor Garrick Louis has been involved in a long-term project to develop a community-based water filtration strategy that has required an understanding of the role of traditional authority structures, appointed community water boards, and local municipalities in water supplied to communities. Karen Firehock, professor of urban and environmental planning at UVA, led students in a Geographic Information Systems mapping of the study communities that included identifying the placement of municipality supplied community standpipes and household connections. I used findings from these and other unpublished research and service efforts conducted by my colleagues at UVA and UNIVEN as the qualitative data that guided the development of scales on water citizenship and the modification of validated questionnaires on water insecurity and emotional distress developed by Wutich (2006, 2009; Wutich and Ragsdale 2008).

To ascertain water insecurity, I utilized a scale measure to determine relative levels water insecurity related to quality of water supply linked to water sources. Wutich (2006) argues that measuring quantity of water accessed and used is an inappropriate measure of water-distress particularly in settings where unpurified surface and ground water is readily available. The scale to measure emotional distress was based on Wutich and Ragsdale's (2008) scale used in Bolivia, altered to specifically address the concerns of and socially appropriate means of experiencing and expressing distress among the Venda people of Vhembe, South Africa.

The semi-structured questionnaire included: (1) 18 questions about water insecurity including how and where an individual acquires water; (2) 12 questions on water-related experiences and emotional responses; (3) six questions about water-related health behaviors; and (4) nine questions about water citizenship (see Appendix 1). I collected data as binary (Yes/No), with descriptions prompted for each answer to provide context. I also collected data on socioeconomic status and general demographics.

Questions on the study questionnaire were translated into the local language, TshiVenda, using culturally appropriate vocabulary. To ensure content validity, extensive pretesting of the final survey was conducted with key informants (research staff living within the area and surrounding neighborhoods) using cognitive interviewing methodology (DeMaio and Rothgeb 1996). Questionnaires were administered in face-to-face interviews conducted at

the respondent's home. Interviews took an average of 45 minutes to complete. All interviews were conducted in December 2014, the local rainy season.

Data Analysis

Citizen engagement was measured with nine questions creating a single sum score of water citizenship. Values for water-related emotional responses and health behaviors were calculated the same way. Crohnbach's alpha is conventionally used to assess the internal consistency and reliability of scale data. A reliability score of 0.70 or higher is desired (Special Advisory Committee of the Medical Outcomes Trust 2002). The Dzimauli data yielded alpha values of 0.706 for water insecurity, 0.845 for water-related emotional responses, 0.565 for health behaviors, and 0.579 for water citizenship. While the alpha values for health behaviors and water citizenship are low, reassessing the questions in relations to the context of Dzimauli and examining the open-ended responses to each question, I considered that the scale indicators provide a sufficiently reliable measure of health behaviors and citizen engagement within the context.

All variables were transformed into standardized *z*-scores. Pearson's correlation coefficients were calculated to assess the associations between these variables. Path analysis (Baron and Kenny 1986; Kline 2005; Loehlin 1987; Wright 1921, 1934), a form of structural equation modeling, was conducted to determine relationships between independent variables (water insecurity, emotional distress, health behaviors, income, age, and education), and their combined impact on water citizenship. Structural equation modeling allows all variables to be examined simultaneously. It is also able to test for all the possible associations between variables at the same time and to test if the model fits or not. As a form of mediation analysis, structural equation modeling entails the examination of how a variable accounts for the relationship between a predictor variable and a criterion variable. The test involves estimating correlations between variables. Although correlations do not imply directionally, we can hypothesize the direction of certain relationships. For example, the literature suggests that water insecurity heightens emotional distress, which could influence water citizenship. The path analytic approach starts with describing the model using the basic building blocks of the path (see Figure 1). This requires specifying such presumed causal relationships between variables. Relationships were determined based on Pearson correlation coefficients. Statistical analyses were performed in SAS version 9.3 and the CALIS procedure for path modeling.

Findings

Water Insecurity

More than 56% of households used unpurified surface water as their primary source of drinking water. Over a third of these households had installed a piping system that connected them to the communal pipes laid throughout the village to capture and divert nearby stream or river water. The remaining households used purified municipal water as their primary drinking water source, acquired from either a shared standpipe or taps within their yards or households. Most of these households continued to have access to surface water via a system of makeshift pipes laid overland for times when municipal water was not available.

Everyone continued to access the local streams and rivers for routine laundry. More than 75% of respondents reported spending no time or less than 10 minutes to fetch water. Informants considered municipal water cleaner than surface water and thus preferable for cooking and drinking. Less than 10% of participants reported limiting their water use or reusing water, as they were able to routinely collect surface water from streams, rivers, and agricultural canals in the area. A quarter of participants reported paying some amount of money for water, either to their local water committee to connect to the makeshift piping system, or to the municipality based on readings from a water meter. Water insecurity was not significantly correlated with income, age, or education, although it was significantly correlated with emotional distress (r=0.623, p<0.0001).

Emotional Distress

Given the consistent supply of surface water throughout the year, and particularly at the time of the interviews (the wet season), few participants expressed distress regarding wasting time or money to acquire water. However, at least a third of participants expressed worry, fear, and annoyance over the quality of water. Participants occasionally mentioned feeling embarrassed about their water situations, usually in relationship to known improvements in water infrastructure in neighboring villages. For example, one participant noted that she felt "ashamed, because in other villages people use tap water [from the municipality], which is treated." Participants reported expressing anger toward someone within their household or within the village over inappropriate use of water, which prompted the termination of municipal water supplies. Emotional distress had a significant negative correlation with education (r= −0.299, p=0.035). This relationship was not independently associated with health behaviors, income, or age.

Water-related Health Behaviors

All participants agreed that bad water could cause sickness. However, only 6% of participants routinely treated the water they collected. An elderly woman explained: "Water from the river is clean because it flows day and night." Three individuals obtaining water from the municipality treated their drinking water, yet none of the individuals obtaining drinking water directly from the stream treated it before drinking. Adding bleach and boiling water were common methods identified to treat water. On average, only 50% of participants reported washing their hands after helping their children defecate, before preparing food, or after using the latrine. A quarter reported always using toilet paper. Health behaviors were not correlated with income, age, or education.

Water Citizenship

Over 80% of participants felt they had a "right to water" and that this right was shared equally by all South Africans, whether residing in urban or rural spaces. A community elder explained her right to water in relation to South Africa's democracy, saying: "Because when I vote, I do it for better services including water." More commonly, participants noted: "Water is the source of life. We cannot live without water. We are also human beings." Half of the participants reported having complained either to traditional authorities (24%) or elected authorities (26%) about their water services. Community members directed their complaints at the water supplier—elected officials for municipally supplied water, traditional

structures including local water committees, and headmen for surface water obtained through the community-developed piping system. Only 38% felt that they should do more to improve their water services, and only 4% were actively working with organizations within their communities to improve water services. One 32-year-old mother explained that she did not have the knowledge or the power to be able to make complaints for better water services. Forty percent of households noted a willingness to pay for water, either as a flat rate or in relation to water consumed.

Correlates of Water Citizenship

Pearson correlations and path analysis using standardized variables tested for the association between the independent variables and water citizenship. Descriptive statistics for the independent variables (non-standardized) are show in Table 2.

Distinct patterns emerged in the relationships between the independent variables and the dependent variable—water citizenship. First, water insecurity was significantly correlated with water citizenship (r=0.314, p=0.027) (H1). Water-related emotional distress, which includes concerns about water quality were also positively associated with water citizenship (r=0.407, p=0.003) (H2). Health behaviors were significantly correlated with water citizenship (r=0.306, p=0.039) (H3). Income (economic assets) was not significantly associated with water citizenship (r= −0.077, p=0.595) (H4). This indicates that income is neither a barrier to, nor a promoter of, engagements with authority structures as I had hypothesized. Similarly, level of education was not associated with water citizenship (r= −0.078, p=0.591) (H5). Emotional distress was associated with education (r= −0.299, p=0.035), suggesting that emotional distress may mediate the relationship between education and water citizenship. Age had a significant correlation with water citizenship (r=0.313, p=0.027) (H5), and, as predicted, in the positive direction. Finally, the covariates of income, age, and education are correlated (income–education: r=0.368, p=0.009; age–education: r=−0.495, p<0.001).

To test whether water insecurity, emotional distress, and water citizenship may be interconnected, I developed a path analysis model, positioning emotional distress as the mediator between water insecurity and water citizenship (see Figure 3). The path model fit indices were: chi-square=2.302 (d.f.=3, p<0.51); root mean square residual (RMSR)=0.025; goodness of fit index (GFI)=0.98; Akaike information criterion (AIC)=52.3; Schwarz Bayesian criterion (SBC)=100.10. The errors in this model are 0.757 (error 1) and 0.807 (error 2). RMSR was less than 0.05 and GFI is greater than 0.90, indicating that the model was a good fit for determining the relationship between water insecurity, emotional distress, and water citizenship. Path analysis also revealed that education had a positive impact on water citizenship. This supports my hypothesis that individuals with greater levels of education are more likely to engage with authority structures, but only when mediated by emotional distress.

While the model placing emotional distress as the mediator between independent (water insecurity and education) and dependent (water citizenship) variables is a good fit statistically and logically, certain determinants directly affect water citizenship (i.e., health behaviors, age, and education). Furthermore, the forced direction, whereby emotional

distress influences water citizenship, is equally strong in the reverse (not shown). This suggests a possible bidirectional or cyclical relationship between water insecurity, emotional distress, and water citizenship; the outcomes of citizen engagement for improved water security may influence emotions—reducing distress if citizen engagement proves successful in addressing water insecurity or increasing distress if water insecurity is not altered.

Discussion

The data presented in this study highlight a number of important issues and identify factors predicting water citizenship. Acknowledging the importance of both traditional and elected authority structures when considering citizen action in rural communities in South Africa and similar communities worldwide is of paramount importance. In the study sample, an equal proportion of individuals approach traditional authority structures as elected government bodies for improved water services. Robins (2008) argues that engagement with traditional authorities is citizen action. For some communities, traditional authority structures remain the more accessible forms of government/authority. Traditional leaders granted a voice in government through multiple government bodies can relay citizen concerns and negotiate for improvements. As long as the national government continues to acknowledge and support traditional leaders economically and politically, traditional authorities remain an extension of national government. Ignoring that multiple authority structures may operate concurrently can lead to an inaccurate perception that citizens are inactive, allowing or expecting government to assume a paternalistic role in providing (or not providing) needed infrastructural services.

In acknowledging this alternate form of citizen engagement, it is clear that residents in the rural area studied are practicing water citizenship. Drawing on language of “water is life,” individuals look to authority structures for improved water services. This may involve access to communal pipes that feed water from local streams directly to households, municipality pipes servicing shared standpipes, or metered household purified water supplies. Individuals are also willing to pay for such services, by purchasing the piping for communal pipes, directing the water to their areas, or paying the municipal water bill linked to their private water meters. These actions are, to some extent, counter to those observed by Anand (2011) in Mumbai, whereby individuals circumvented government structures to access water services. However, one could also argue that the makeshift community water pipes in Dzimauli and associated local water committees that accept payments from citizens similarly bypass government.

In this, the relationships between water citizenship, water insecurity, and emotional distress require a nuanced understanding. Emotional distress is positively related to water insecurity, confirming the results of Wutich and Ragsdale (2008). This emotional distress appeared to drive citizen action among female Dzimauli residents, counter to Goldin’s (2010) findings that found reduced citizen action among communities experiencing emotional distress given water insecurity. This discrepancy may be a consequence of two issues. The first relates to the types of authority structures. Dzimauli residents have multiple authority structures to direct requests for improvements in their water situation. For residents in other areas of South Africa, including the communities Goldin studied, traditional structures no longer

exist. These citizens are limited to appealing directly to elected government structures. As described in Bulled (2015) and argued by Mehta (2006), not only are appeals to government structures difficult, time consuming, and potentially expensive, efforts may not result in the desired improvements in water access, quality, and service. This then drives a second aspect of the complex and dynamic relationships between water insecurity, emotional distress, and water citizenship. Civic engagement for improved water services can be costly and prolonged. Improved access to quality water, because of citizen action, may reduce emotional distress. However, if citizen action had no effect on improving water security, emotional distress can be further increased.

Family income further alters this dynamic as citizens with greater income can afford safety nets (e.g., water storage tanks), alternative private sources (e.g., boreholes), or payments to improve supply (e.g., fixing broken water meters, fixing broken pipes, paying to have water diverted to households). As such, there is an inverse associated between income and emotional distress and an independent inverse relationship between income and water citizenship, counter to expectations. This inverse relationship is an indication of the self-sufficiency in health maintenance obtained with greater income (Bulled 2015; Von Schnitzler 2013).

This study offers some understanding of the relationships between water insecurity, emotional distress, and water citizenship. However, greater exploration of how these relationships may exist regionally and globally is warranted. Data were collected during the rainy season, in a remote area where traditional authority structures continue to operate. Results are likely to alter when water becomes less accessible, in metropolitan areas, and where government is limited to large and difficult to navigate bureaucratic agencies. Recent work conducted in rural communities in Ethiopia, where water is scarcer, similarly observed a relationship between water insecurity and citizen engagement (Tesfaye and Maes 2015), in that women with improved water services were more involved with the new “Women’s Development Army”—a national effort to engage women in citizen action to facilitate gender equality. While this is preliminary work, it raises similar questions about possible relationships between water security, emotional states, and engagements in civic action.

Not only does the study reported on here involve a small population, it also only explored women’s experiences of water insecurity, emotional distress, and water citizenship. In Bolivia, Wutich (2009) recognized that water insecurity and related emotional distress were experienced differently by gender. While men tend to have less responsibility to manage household water supplies globally, future studies should consider how the relationships between water insecurity, emotional distress, and water citizenship might be unique for men.

Conclusion

Access to purified drinking water, and consequently prevention of deadly disease, has significantly improved over the last two decades. In 2010, 89% of the world’s population used improved drinking water sources, with two billion people gaining access to improved sources between 1990 and 2010 (JMP 2013). The period between 2005 and 2015 has been declared the “International Decade for Action ‘Water for Life’” (UN 2004). However, many

communities, even those in countries where water is a human right, remain disconnected from national water infrastructure. This study aimed to examine the motivators for citizen action to improve water services. The emotional distress related to water insecurity influences, and is influenced by, water citizenship. This relationship is mediated by the personal characteristics (age and education) that offer an individual the social and political capital valuable to the political landscape in which they operate.

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Appendix 1. Scale items for water insecurity, emotional distress, health behaviors, and water citizenship

Water insecurity

What is the main source of drinking water for your household? 0=Surface water; 1=Municipal water

Have you had to pay for water?

Have you lacked the money you need to buy water?

Did you ask water from someone in the village?

Have you given water to anyone in the village?

Have you refused to give water to anyone in the village?

Have you sold water to anyone in the village?

Have you wasted time because of a lack of water?

Have you not been able to work or earn money because of the water supply?

Have you used the same water more than once in the last week?

Did you fetch water from the stream?

Did you collect rainwater?

Have you cleaned your house with clean water? (reversed code)

Have you limited the amount of water you usually use when cleaning the house?

Have you limited the amount of water you usually use when cooking?

Have you limited the amount of water you usually use when washing the laundry?

Have you limited the amount of water you usually use when bathing?

Have you thought of leaving the village because of the water supply and water quality?

Emotional distress

Have you worried every day over the last week about a lack of water?

Have you gotten angry with someone from your house over water?

Have you argued with someone from your house over water?

Have you gotten angry with someone from the village over water?

Have you argued with someone from the village over water?

Have you been afraid that water would run out in your house?

Have you felt annoyed/tired about having to fetch water?

Are you happy with your water supply?

Are you worried that the water you get isn't clean?

Health outcomes and beliefs

Do you think bad water can cause sickness?

Do you treat your water in any way to make it safer to drink?

Do you wash your hands after helping your child defecate?

Do you wash your hands before preparing food?

Do you wash your hands after using the toilet?

Do you use toilet paper?

Water citizenship

Do you ever complain when you can't get water from the public tap?

Have you ever thought of doing more to make sure you get clean water?

Do you know of any organizations that are working on improving the water supply to the village?

Have you worked *with* any of these organizations? (no pay)

Do you think you should have to pay for water?

Do you think you have the right to better water services?

Do you think SOUTH AFRICANS should have the right to water?

Do you think URBAN people should have the right to water?

Do you think RURAL people should have the right to water?

Additional water citizenship questions not included in scale

Do you feel confident in approaching the municipalities?

Do you think the government should provide better water services?

What do you think the *government/municipality* should be doing to improve water services?

What do you think the *civil leaders* should be doing to help with water services?

What do you think your *traditional leaders* should be doing about the water situation?

What can be done to motivate or force the municipality to provide better water services?

What do you think private local or international organizations should be doing to help with water services?

Do you know that you can take the government to court for better water services?

Do you know HOW to take the government to court to get better water services? DESCRIBE HOW.

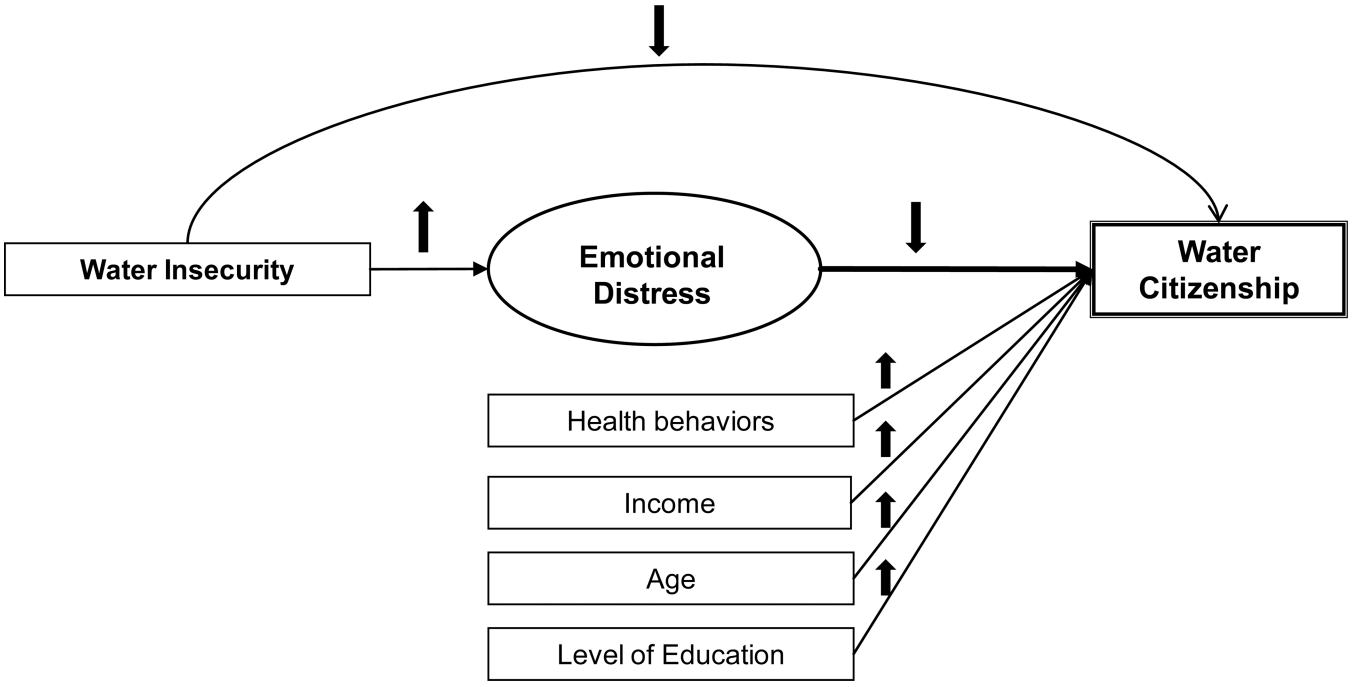

Figure 1.
Anticipated relationships between water citizenship and independent variables (water insecurity, emotional distress, health behaviors, income, age, and level of education).

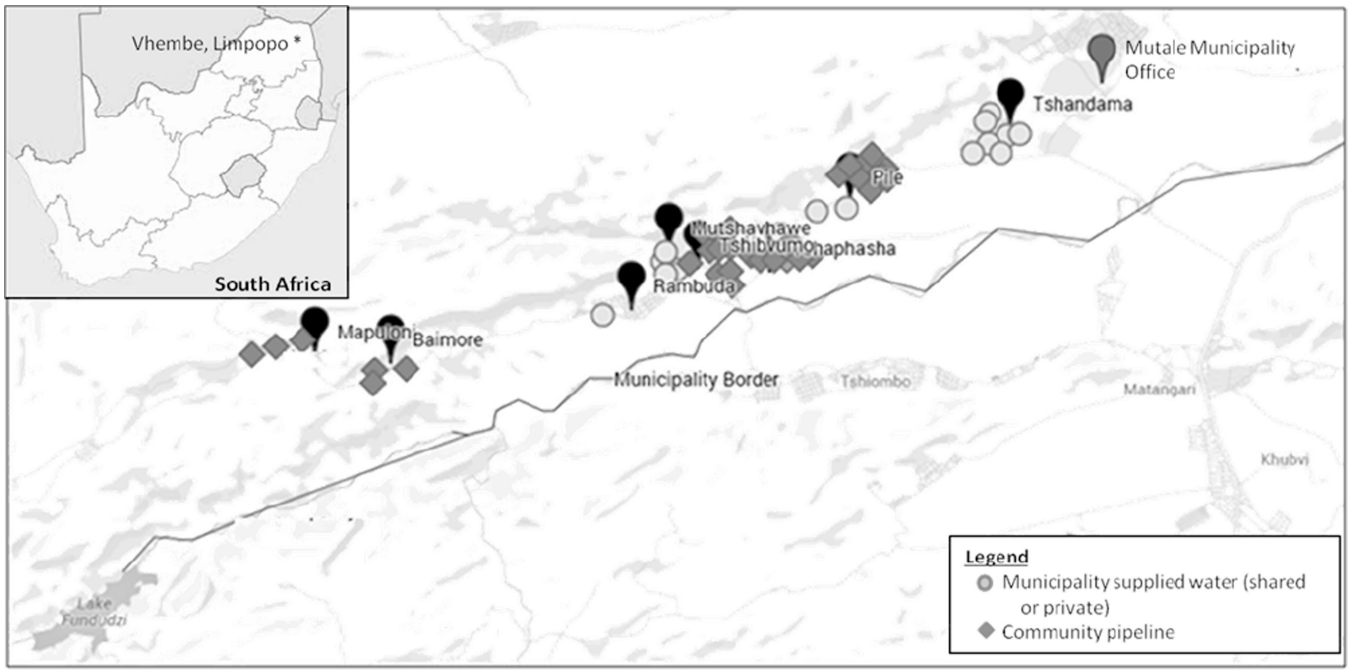

Figure 2.

Map of the Dzimauli neighborhood in Limpopo Province, South Africa, showing the villages included in the study and the type of primary water source identified for each household.

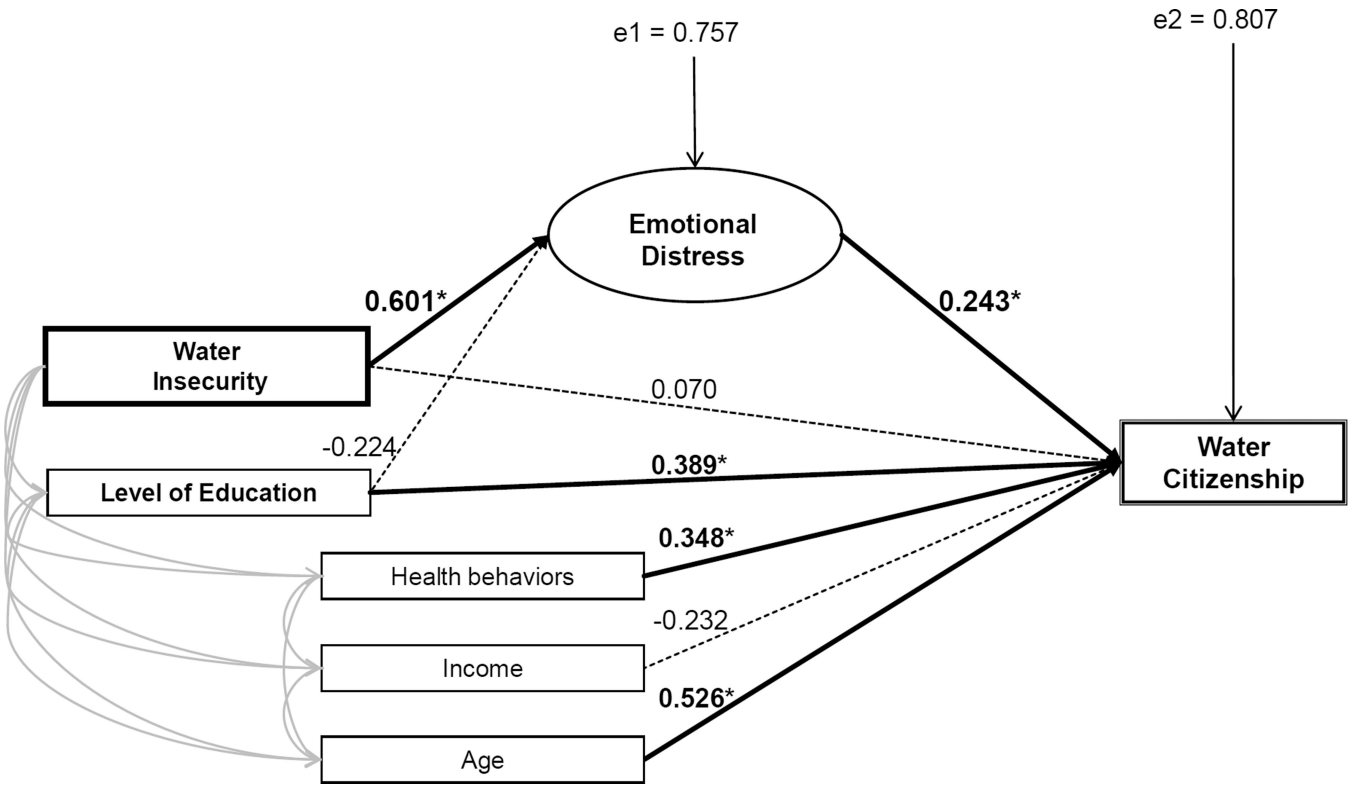

Figure 3.

Path analysis model of water citizenship showing both direct and indirect relationships of independent variables (water insecurity, health behaviors, income, age, and education) with emotional distress serving as a mediator; note *p<0.05.

Table 1

Sample Characteristics of 50 female heads-of-households heads living in the Dzimauli neighborhood of the Mutale Municipality, in the Vhembe District, Limpopo Province, South Africa.

Characteristic	Value
Married	78.72%
Duration within house (> 20 years)	54%
Pit latrine toilet facility	94%
Electricity supply	90%
Median Household Size	3

Table 2

Descriptive statistics of 50 female heads-of-households (non-standardized).

Variable	Mean	SD	Min	Max
Water Citizenship (9 questions)	5.24	1.40	2	9
Water Insecurity (18 questions)	3.32	2.34	0	10
Emotional distress (8 questions)	2.38	2.57	0	8
Health behaviors (6 questions)	3.60	3.00	5	18
Income (monthly)	3,863.00	3,949.87	800	17,000
Age	50.94	14.00	27	82
Years of school attended	8.98	3.51	1	16