Trust in providers of domestic water: a comparison of the public utility and informal vendors in Dar es Salaam

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Abstract

This article examines factors associated with trust in the public water utility and informal water vendors in the city of Dar es Salaam. We model trust in terms of citizens' perceptions of what water providers deliver, how well the service fits with their lifestyle and values, the ease with which they can contact and influence the provider, and how well the government handles water issues. Our data comes from a survey of the adult population of the four main residential districts of Dar es Salaam, conducted in March 2018. We find that trust in water providers is built on different foundations for the public utility and informal vendors. For the public utility, trust depends mainly on habituation to the service, knowledge of the vernacular and evaluations of government performance. For informal vendors, trust depends mainly on habituation to the service and capacity for engagement with social issues. Our study illustrates the how trust in service providers is an outcome of social accountability at the micro level.

Introduction

Scholars recognise the importance of trust in the water sector (Rahaman, Everett & Neu 2013; Heino, Katko & Pietilä 2015; Fragkou & McEvoy 2016). Since trust involves optimistic acceptance of vulnerability, in the belief that the trustee will look after one's interests (Hall, Dugan, Zheng & Mishra 2001, p. 615), trust is important to provide reassurance about the service, ensure customer loyalty, enhance willingness to pay, and guarantee reputational benefits of delivering the service. Trust is needed in fast growing cities of lower and middle-income countries (LMICs) because consumers cannot easily assess water quality, nor, when they sign up for a connection, predict continuity of supply.

There are two main types of water provider in Tanzania's largest city, Dar es Salaam: the public utility, DAWASA, and informal vendors (Mapunda, Chen & Yu 2018, p. 113).[1] Informal vendors get most of their water from DAWASA, but also buy from private and communal boreholes and water kiosks, who also serve retail customers. Some households manage their own borehole, some collect rainwater, and the most marginal rely on surface water. The utility has a statutory duty to reliably provide water of adequate quality, but it lacks the capacity to do so. The resulting patchwork resembles what Cleaver and De Koning (2015, p. 4) call "institutional bricolage"—" a process through which people, consciously and non-consciously, assemble or reshape institutional arrangements, drawing on whatever materials and resources are available, regardless of their original purpose." The situation offers the opportunity to compare the bases of trust in formal and informal service providers (Smiley 2016; Kjellen 2006).

Consequences of trust for social accountability

Jonathan Fox (2015, p. 346) defined social accountability as "an evolving umbrella category that includes: citizen monitoring and oversight of public and/or private sector

performance, user-centred public information access/dissemination systems, public complaint and grievance redress mechanisms, as well as citizen participation in actual resource allocation decision-making..." The *World Bank Development Report 2004* argued that the short route to accountability involves direct feedback from citizens to providers and the long one goes through elections and government (Devarajan & Reinikka 2003).

The concept of social accountability has stimulated attempts to evaluate services from the point of view of the public or the customer (Antwi, Analoui & Nana-Agyekum 2008; Andrews & Van de Walle 2013). Hickey and King (2016, p. 1225) argue that it needs to be understood in terms of the broader development of social contracts involving not just citizens and service providers but also citizens and public authorities. Zinnbauer (2017, p. 26) argues that social accountability theory and practice need to be embedded in the norms and practices of the host society.

Grandvoinnet, Aslam and Raha (2015, p.13) describe trust as a global and cultural factor conditioning the possibilities of collective action. Institutional trust is thought to be an important condition for social accountability, because citizens will be more willing to make demands of institutions if they trust them (Baez Camargo & Stahl 2016, p. 15). Lubell, Vedlitz, Zahran and Alston (2006, p.151) hypothesise: "If a citizen trusts policy elites and believes they are competent, [the citizen is] more likely to believe the policy subsystem will be responsive to their policy preferences and therefore [that] group actions will be successful." Whether trust is a cause or a consequence of social accountability can be resolved by considering the level of analysis: at the macro-level of whole societies, trust conditions social accountability, but at the micro-level of individual psychology, trust is an outcome of social accountability (Grandvoinnet et al. 2015, p. 9).

Trust is thought to reduce transaction costs which can improve the net benefits to be gained from a resource (Ostrom 2010, p. 660). “Cooperation” in this sense captures various kinds of ongoing relationship. It may involve being a “loyal customer” or paying for an extra service. For example, Fjeldstad (2004, p. 541) argues that payment for water and electricity services in South Africa depends on trust in local government, in the fairness of procedures for revenue enforcement and distribution of services, and in other citizens to pay their share.

There is empirical evidence from developing countries to support the importance of trust. In Kenya, trust in water utilities has been shown to enhance willingness to pay a surcharge on water bills for improved sanitation services amongst low income households (Acey et al. 2019, p. 174). In Mexico and Chile, cities which had installed desalination plants found trust in water quality was an important influence on whether people consumed desalinated water or preferred to buy bottled water (Fragkou & McEvoy 2016).

Trust in service providers has different implications than trust in government. For example, Acey et al.’s (2019) study found that although trust in water utilities enhanced willingness to pay for sanitation, trust in county government had the opposite effect. Similarly, in Ghana, trust in government was negatively related to willingness to pay for electricity (Amoah, Larbi, Offei & Panin 2017, Table 1). In both of these cases, people who trusted the government assumed it would pay for the services which they used.

Case-based evidence shows how *dis*trust can undermine efforts to improve services, persuade customers to pay, or attract private capital. In Dar es Salaam, distrust of government discourages efforts to provide communal access to improved drinking water sources (Nganyanyuka, Martinez, Wesselink, Lungo & Georgiadou 2014, p. 364). In Uganda, distrust of the main electricity utility complicates efforts to reduce power theft and late payments (Never 2015, p. 202). Similar problems have been found in rural Zanzibar, Tanzania, where

residents justify electricity theft on the grounds that metre readings are inaccurate (Winther 2012, p. 117). In Ghana, distrust in government, the private sector and international donors resulted in considerable opposition to attempts to privatize the main urban water utility (Rahaman et al. 2013, p. 563).

NGOs in Tanzania have identified social accountability as the key to improved performance in the water sector (TAWASANET 2019, p. 39). Water providers, citizens and government form the three points of a "social accountability" triangle. However, according to the NGOs, citizens are reluctant to demand better provision because they do not know their rights and responsibilities, do not know how to recognise problems, do not know who to contact about them, do not have confidence that complaints will be listened to and/or are afraid of negative consequences (TAWASANET 2019, pp. 40–41). Lack of trust undermines social accountability.

Water provision in Dar es Salaam

It is difficult to determine how many Dar es Salaam residents have access to safe drinking water. According to the Tanzanian National Bureau of Statistics (NBS 2016, pp. 37–39), 66% (standard error, 3.7%) of households have access to safe drinking water during the rainy season, and 82% (standard error, 3.4%) during the dry season. Nationwide, 44% (standard error, 1.9%) have access during the rainy season and 55% (standard error, 2.1%) during the dry season. Safe drinking water is defined, following the Millennium Development Goals (MDG) criteria, as water from tube wells/boreholes, protected dug wells, piped water or bottled water. However, this definition does not take account of water quality. As Bain et al (2012, p. 228) found, water from a 'protected' source is not necessarily safe. Careful consumers will often pay more for water resold in jerry cans by informal vendors, than they

would pay for ‘safe’ water from a borehole (Bayliss & Tukai 2011, p. 20). The MDG goal focusses on improving access to protected sources, while neglecting the role of informal vendors (McGranahan, Njiru, Albu, Smith & Mitlin 2006, p. 23).

Even if they have piped water, many residents of Dar es Salaam experience an incomplete and intermittent supply, poor quality water, and/or difficulties affording enough safe water (McGranahan et al. 2016, p. 17). Qualitative studies have found significant injustice, inequity and unevenness in access (Smiley 2016, 2019; Nganyanyuka 2017), linked to the legacy of inadequate infrastructure from the colonial period (Dill & Crow 2014). Some pipes in use date back to colonial times (Smiley 2019, p. 961). Leaks and unauthorised connections cause low pressure, allowing dirty water to enter the system. In some places, pipes are close to the surface, where they may be damaged by passing traffic, or are in poor condition for other reasons (Mapunda et al. 2018, p. 117).

There are also doubts about the sustainability of the piped water supply. DAWASA cannot meet its statutory obligation of providing every citizen with clean drinking water, as its production capacity is only 273 million litres/day, while estimated demand is 533 million litres/day (Mapunda et al. 2018, p. 113).[2] The Sustainable Development Goals (SDG) target of universal water and sanitation coverage by 2030 appears unachievable, because the city is likely to be 300 million litres/day short of the needed quantity (McGranahan et al. 2016, p. 37). There are also questions over financial sustainability. Non-revenue water accounted for 58% of production in 2014, compared to a 20% limit set by the regulator, EWURA (Mapunda et al. 2018, p. 113).

The reasons for supply-side difficulties are complex. Pre-colonial and colonial habits interact with current dominant party rule and donor dependence to produce cultures of clientelism and corruption (Carlitz 2017; Katomero 2017). Inadequacy of infrastructure also

results from the rate of growth of the city: its population is doubling every 20 years, and informal settlements grow at twice the rate of the city as a whole (McGranahan et al. 2016, pp. 16–17). Even though institutions for managing and regulating Tanzania's formal water sector are underfunded, as little as 28% of allocated funding is actually spent (TAWASANET 2019, p. 37). Relations between DAWASCO, formerly the operational arm of DAWASA, and its customers are poor; in some cases, retail customers suspect DAWASCO staff of collusion with private vendors (Bayliss & Tukai 2011, p.6, p. 18).

Multiple, largely unregulated informal vendors of different types and scales fill the gaps between islands of urban reticulation (Kjellen 2006, p. 241). McGranahan et al. (2006, p. 14) estimated that 42 per cent of the city's population rely on a piped connection and 35 per cent rely on resellers of utility water. The remainder include 13 per cent who use private and communal boreholes, four per cent who use communal utility kiosks, and two per cent who use unprotected sources. Poor households economize on water, consume water of poor quality, use different types of water for different purposes, recycle water, collect water from unsafe sources, or else relying on charitable water from mosques and churches (Bayliss & Tukai 2011, p. 19).

Resold water is delivered by piped connections, in tankers, by bicycle in 20 litre containers, or even in buckets. Hand delivered water is competitive where streets are too narrow for trucks (Bayliss & Tukai 2011, p. 11). Prices vary according to type of water, volume, distance transported, and convenience of delivery, but are usually higher than those of the public utility (Mapunda et al. 2018, pp. 115–116). Generally, the further the distance transported, and the smaller the volume, the higher the unit price (Bayliss & Tukai 2011, p. 18).

Informal vendors sometimes sell poor quality water. Tankers may transport river water for construction and then get refilled with drinking water before being properly cleaned (Bayliss & Tukai 2011, p. 11). If the water comes from a borehole, it may have incurred saltwater intrusion and faecal contamination (Chen 2019, p.i). Sometimes this pollution is caused by building where the water table is high, where boreholes are located close to or downhill from pit latrines. It is difficult to regulate the quality of water provided by informal vendors, and their activity offers only limited scope for investment and economies of scale (McGranahan et al. 2006, p. 9).

Nevertheless, informal vendors generally understand the needs of their customers, are keenly responsive to price signals from their competitors, and deliver water where the public network does not reach (McGranahan et al. 2006, p. 2, Bayliss & Tukai 2011, p. 12). They provide livelihoods for a great number of people. In some cases, they choose not to charge the highest possible price because they see themselves as responsible for providing affordable water (Bayliss & Tukai 2011, p. 14). Sometimes they may ask a colleague to serve their regular customers if for some reason they cannot, suggesting there is relationship of trust between them and their customers, and that informal systems of regulation exist (Bayliss & Tukai 2011, p. 20). Customers often benefit from good relations with their water vendor (McGranahan et al. 2006, p. 30).

Hypotheses about the sources of trust in water providers

The literature on sources of trust pays scant attention to water providers. One study in South Australia during a drought found that trust in the utility is contingent on citizens' capacity for reflexivity about scientific knowledge, experts and political processes (Willis, Pearce, Mamerow, Jorgensen & Martin 2013). Game theoretic models assume that trust is a

function of the payoffs of the decision to trust (Ostrom 2005, p. 71). This mean trust is equivalent to some monetary amount, T, that the trusting party pays out of her total resources, X, in return for service. The trustee spends an amount, Y, on delivering the service, and also benefits from a rate of return, r, on the amount T. The outcome for the trusting party can be modelled as (X-T)+Y, and for the trustee as (1+r)T-Y. Thus, willingness to trust depends on the trusting party's resources and the benefit expected, and trustworthiness depends on the amount paid, cost of delivering and rate of return on the payment. Although this encourages us to think in economic terms, the payment, cost and rate of return need not be measured in money.

Distilling a large body of research on trust in American local government, Rahn and Rudolph (2005) model trust in terms of outcomes, the congruence of provision with citizens' preferences and values, procedural considerations such as justice and access to decision-making processes, and perceptions of office holders' competence and responsibilities. They thus provide a framework for exploring the bases of trust in informal and public service providers. Applying this framework in Dar es Salaam, we have to consider both the outcomes which people expect and the ability of providers to deliver. Two outcomes are crucial: continuity of supply and water quality. In addition, other outcomes may also be important, including taste, affordability, incidents of illness, and other day-to-day problems. *Hypothesis 1 is people trust water providers on the basis of outcomes, particularly in terms of continuity of supply and perceived water quality.*

In a market, congruence with preferences refers to choice. We would expect people to trust the provider they have, because the relationship is established, and they know what to expect. *Hypothesis 2a is people trust their existing provider.* However, in Dar es Salaam, customers do not necessarily have a choice, because the piped network only reaches about half the population. Therefore, not only congruence with preferences but also availability

matter, a form of rationality which corresponds to the notion of 'satisficing' (Slote and Pettit 1984). *Hypothesis 2b is people trust the public utility if service is locally available.*

Rahn and Rudolph's (2005) framework suggests congruence with values matters. Tanzanians do not have a justiciable right to clean water, but some other African states do, including South Africa (Matchaya, Kaaba & Nhemachena 2018, p. 10). We would expect those who believe in the right to clean water to trust DAWASA, since that value is congruent with subsidised public provision. *Hypothesis 2c is people trust the public utility because they believe that people have a "right to water."*

In terms of access to decision-making, DAWASA has formal mechanisms for people to report interruptions in supply and make complaints. Since notifications are made by telephone, there is an advantage in being able to speak Swahili, the vernacular national language. Some matters might require knowledge of English, since that is the language of legislation. More generally, people with a high capacity for engaging with public affairs should be more confident about dealing with providers and better able to defend their rights. *Hypothesis 3 is people trust water providers because they are able to access decision-makers.*

The government is responsible for DAWASA's work even if operational matters are left to managers. They have no such responsibility for informal vendors. The notion that DAWASA is upwardly accountable to government leads to *Hypothesis 4: people trust the public utility because they approve government handling of water issues.*

Data and Method

We test these hypotheses in an analysis of data from a stratified random sample of adults in the four mainly districts of Dar es Salaam, a population of about 5.6 million people. Fieldwork took place between 7th and 29th March 2018. To build the sample, we relied on

stratification of wards by population size and by main source of drinking water. Wards were categorised as high or low population according to whether they were above or below average ward size for their district. After consultation with DAWASCO about the overall patterns of water provision within each ward, wards were further categorised according to the predominant type of water used—piped connections, wells and other sources (rivers, dams etc.). A total 30 wards were selected—eight each from Kinondoni, Ilala and Temeke, and six from Ubungo, to give a spread of high and low population-density wards with different kinds of water provision. Households within wards were chosen by random route, and individuals within households were chosen with Kish tables, resulting in a sample of 1804. Post-stratification weights were then applied to match the age and gender distribution according to the most recent (2012) census, as well as revised (2017) estimates of population size in each district (NBS 2018), resulting in a weighted N of 2048. Details of sampling, methodology, coding, results of the survey and the original data set are provided in the supplementary material.[3]

Our survey asked respondents: *To what extent do you think the following groups or organisations look after the needs of your community for safe and sustainable water?* The list of groups or organisations included DAWASCO (now DAWASA) and 'private vendors' and gave as possible answers: *not at all, not much, to some extent* and *all the time*. Because DAWASCO is the only water utility company allowed to operate, it is not ambiguous to refer to DAWASCO as 'the public utility.' Because of the private vendors are not formally recognised by the Water Act 2009, we can refer to them as 'informal vendors.'

In terms of content validity, the question has all three elements in the definition of trust by Hall et al (2001, p. 615). First, by choosing positive answers, respondents can express *optimism* about their relationships to organisations or groups. Second, the question underlines the community's *vulnerability* by mentioning the need for 'safe and sustainable' water. Third,

the question emphasises the moral duty of *care* by using the verb 'look after.' The question is less literal than in the US where researchers asked about agreement with the statement *I trust my wastewater provider to make appropriate decisions that are in my best interest* (Yang & Faust 2019, p.3), but it includes the key conceptual components of trust. Our question thus passes a key test of content validity.

The data show that more than four fifths (84 percent) trust informal vendors. Collectively, they are the most trusted group involved in water provision in Dar es Salaam. Just over half (51 percent) trust DAWASCO (now DAWASA). The full distributions of the dependent variables are shown in Figure 1.

[Figure 1 about here]

To test Hypothesis 1, we use measures of continuity of supply, acceptability of water quality, number of incidents of illness because of water, whether the water tastes salty, and difficulty affording water (Appendix Table 1). To test Hypothesis 2a, we use variables identifying respondents' main supplier—whether the household has piped water supplied by the utility, relies on informal vendors or manages its own water source. To test Hypothesis 2b, we use DAWASCO's classification of whether piped connections are the main source for the ward. For Hypothesis 2c, we use a measure of agreement with the right to water. To test Hypothesis 3, we use a series of dummies tapping access to decision-making: whether the respondents knows the number to call about non-functional water points; whether they know English well enough to write a letter, and whether they know Swahili to the same standard. We also use a general measure of capacity for engagement based on self-assessed ability to carry out actions aimed at solving problems in the community (see note 7 in Appendix Table 1). To test Hypothesis 4, we use an evaluation of how well the government is handling water issues.

We use Mplus software to develop censored regression models with minimum values of one for the two dependent variables, where one is interpreted as "no trust at all." The models use maximum likelihood estimation and compute robust standard errors clustered by ward, [4] as well as standardized coefficients for the significant variables. To reduce missing data, we report pooled estimates from five imputations. In order to be sure that the observed relationships are not artefacts of social structure and personal characteristics, we control in each model for age, gender, education, whether the settlement is formal ('surveyed'), owner occupier status, experience of unemployment, number of consumer durables owned, internet use and generalised trust.

Results

For trust in the public utility, the model explains 23% of the variance at individual level and 15% at ward level, and for trust in informal providers, the model explains 9% of the variance at individual level at 4% at ward level (Table 1). The estimates offer only weak confirmation of Hypothesis 1 that people trust water providers on the basis of outcomes. Only one outcome, acceptability of water quality, is associated with trust in the utility, but the effect is of marginal significance (estimate 0.22, $P<.05$), and none of the outcomes is associated with trust in informal vendors.

The estimates provide strong confirmation of Hypothesis 2a, that people trust water providers on the basis of habituation to their existing provider. Trust in the utility is associated with having a piped connection (est. 0.29, $P<.01$), and trust in informal providers is associated with relying on them for one's main water supply (est. 0.38, $P<.001$). The estimates provide weak confirmation of Hypothesis 2b, that people trust the public utility on the basis of the availability of service in their area. Although living in a ward which has good

tap water provision is associated with trust in the utility, the coefficient is at the margin of significance (est. 0.83, P<.05). Similarly, the estimates provide weak confirmation of Hypothesis 2c, that people trust the utility on the basis of their belief in the right to water (est. 0.17, P<.05). Unexpectedly, belief in the right to water is also marginally associated with trust in informal providers (est. 0.09, P<.05).

The estimates provide partial confirmation of Hypothesis 3, that people trust water providers on the basis of access to decision-making. In particular, we find that knowledge of Swahili is associated with trust in the public utility (est. 0.58, P<.001) and capacity for engagement is associated with trust in informal vendors (est. 0.13, P<.001). However, none of the other measures related to access to decision-making are significant.

The estimates provide strong confirmation of Hypothesis 4, that people trust the public utility, but not informal vendors on the basis of their perceptions of how well the government is handling water issues (est. 0.34, P<.001). Two control variables are marginally significant. Age (est. 0.01, P<.05) is positively associated with trust in the utility, and education is negatively associated (est. -0.07, P<.05).

[Table 1 about here]

Computing the standardized coefficients (or Betas) shows the relative importance of the significant independent variables in the model. In descending order of influence these are, for trust in the utility: whether the ward mainly relies on piped utility water (Beta 0.41), perceived government handling of water issues (Beta 0.28), knowledge of Swahili (Beta 0.16), whether the household has piped water supplied by the utility (0.12), education level (-0.10), belief in the right to clean water and sanitation (0.09), acceptable water quality (0.07) and age (0.06). For trust in informal vendors, reliance on informal vendors is the strongest

influence (Beta 0.20), followed by capacity for engagement (Beta 0.14), and belief in the right to clean water and sanitation (Beta 0.08).

Discussion

The question arises why trust in informal vendors is not associated with acceptability of water quality. McGranahan et al. (2006, p. 14) found that the vast majority of water sold by informal vendors is actually utility water. Our data show that 82 per cent of those who rely on informal vendors find the water quality acceptable, as do 83 per cent of those who rely on the public utility. It seems possible that the marginally significant effect of acceptable water quality on trust in DAWASA comes from differing expectations: people who have invested in a piped connection expect higher quality water. However, this is a weak effect, which underlines that the perceived difference in quality is not great. The fact that informal vendors mostly resell DAWASA water means, first, that their water may be as safe to drink as piped water, and, second, that the role of DAWASA as the ultimate provider of safe water is greater than one would think if one assumed that informal providers relied on separate supplies.

One can also ask why continuity of supply is not associated with trust in either type of provider. As discussed by Bayliss and Tukai (2011, p. 18), households have multiple coping strategies to deal with shortages, so temporary interruptions may be tolerable. In addition, the ways in which people answer questions about whether they have 'enough' water are likely to depend on how much others within the same community have, rather than meeting an absolute standard (Bayliss & Tukai 2011, p. 19). Crosstabulations show that 53 per cent of those who rely on informal vendors have gone without enough clean water several or many times in the past year, compared to 44 per cent of those who rely on the public utility.

One could ask why knowledge of Swahili has such a strong relationship with trust in the public utility. Since only 11 per cent of respondents do not know Swahili, and of these, 95 per cent do not know English either, what the data points to is distrust in the utility amongst those who are culturally marginalised. As Dill and Crow (2014, p. 192) point out, marginal populations have historically been concentrated in informal settlements which are much less likely to be served by piped networks. Our finding points to the existence of cultural barriers which reinforce inequalities of access to decision-making even when controlling for access to piped water.

For informal vendors, it is reasonable to ask why capacity for engagement with social and public issues should associate with trust in (private) informal providers. One explanation is that people with a high capacity for engagement in public affairs have the ability to affect the rate of return, r, which in Ostrom's (2005, p. 71) game theoretic model enhances the value, T, of the customer's trust. This return could include, for example, having a good reputation in the local neighbourhood. Those who have the capacity to engage in public affairs can spoil this reputation, and this gives them more power vis-a-vis informal vendors and makes the latter more accountable. Although there is great variety amongst informal vendors, in terms of the size of their operations and the types of water they sell, the vast majority earn quite a modest income (Bayliss & Tukai 2011, p. 15). It is easy to see how they could be vulnerable to changes in the rate of return on their customers' trust.

Our finding that government performance in handling water issues matters for trust in the utility makes sense in the light of the fact that DAWASCO/DAWASA is upwardly accountable to the central government's Ministry of Water and Irrigation (McGranahan et al. 2016, p. 18). It is noteworthy that municipal (district) governments play only a small role in water governance, which justifies the focus of the question on central government.

The fact that older people trust the utility more readily is consistent with findings from South Australia (Willis et al. 2013) and may reflect their feeling of being established in their communities. Education's negative association also reflects poorly on DAWASA as the better educated generally have more information on which to base their trust. The fact that none of the controls matter for trust in informal vendors suggests that such trust is a widely dispersed attitude.

Conclusion

This study is the first examination of water provision in Dar es Salaam based on a representative sample survey of public attitudes and behaviour. It is also the first to explicitly compare trust in informal vendors with trust in a public utility company, and to show how trust emerges from social accountability at the micro-level and reinforces it at the macro-level. It adds to our understanding of the importance of institutional bricolage in municipal service provision.

The literature suggests that social accountability for service provision depends on trust, but very little has been written about the sources of trust in service providers in low-and-middle-income countries. Our findings show that trust is partly a natural outcome of long-term relationships between customers and providers. Trust is also partly an outcome of the ease with which customers can communicate with their providers and are empowered to affect decision-making. Finally, trust is the outcome of effective policies, delivered by a competent government which is in control of the public utility.

The patterns of association are different for informal vendors and the public utility. Citizens trust informal vendors much more than the utility, perhaps because they see them as closer to the people they serve. Even though both provide a service for money, informal

vendors are literally within arms' reach of their customers, and this may make them easier to trust. However, informal vendors and the public utility form part of a single system.

As argued by Ostrom (2016, p. 97) government in a large, complex metropolitan area is typically a 'polycentric political system' characterised by many centres of decision-making which variously compete, cooperate or have recourse to central authority to resolve disputes. Dar es Salaam is an example of polycentrism at work. It is 'a complex system that is self-organising …much like a market-based system…' (McGranahan et al. 2016, p. 35). As Cleaver and De Koning (2015, p. 4) argue 'People's motivations to cooperate in collective arrangements are a mix of economic, emotional, moral and social rationalities informed by differing logics and world-views. Institutions are dynamic in that they operationalised by human actions, and there is no simple relationship between institutional form and outcomes.'

Given the important role played by informal vendors it is puzzling that government officials are reluctant to integrate them into the formal system of regulation run by EWURA (Mapunda et al. 2018, p. 118). The attitude of government officials could imply that they see informal vendors more as competitors for public funds than as partners in the co-production of Dar es Salaam's water supply. Kenyan experience in developing partnerships between the public utility and informal vendors and delegating regulatory authority over informal vendors to ward level, may be useful in Dar es Salaam (Mapunda et al. 2018, p. 120).

Further research is needed in several directions. We need case studies exploring the structure of the informal water sector in Dar es Salaam. We need more recent and more accurate measures of how people use different water providers, in particular on whether citizens have different attitudes to and uses for vended DAWASA water and vended groundwater. Finally, we need to learn more about how the utility and informal providers compete and cooperate with one another.

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Declarations of interest: none.

Endnotes

[1] Dar Es Salaam Water and Sewerage Authority (DAWASA) is now both the owner of the assets and the operator of the service. However, at the time of our fieldwork, the operation of services was entrusted to a separate publicly owned company, DAWASCO.

[2] These figures are disputed. DAWASA states that it produces 510 million litres/day, but the Energy and Water Utilities Regulating Authority (EWURA) gave a figure of 357 million litres/day in 2018 (Smiley 2019, 969).

[3] The supplementary material may be found using DOI XXXX. The survey also covered the urban area of Morogoro, a town around 200 kilometres west of Dar, but for the purposes of this article, the data from Morogoro are excluded.

[4] We allow for clustering by ward rather than by district because it is at ward level that the variation in water infrastructure provision occurs. All districts have a mix of poorly and well provided wards.

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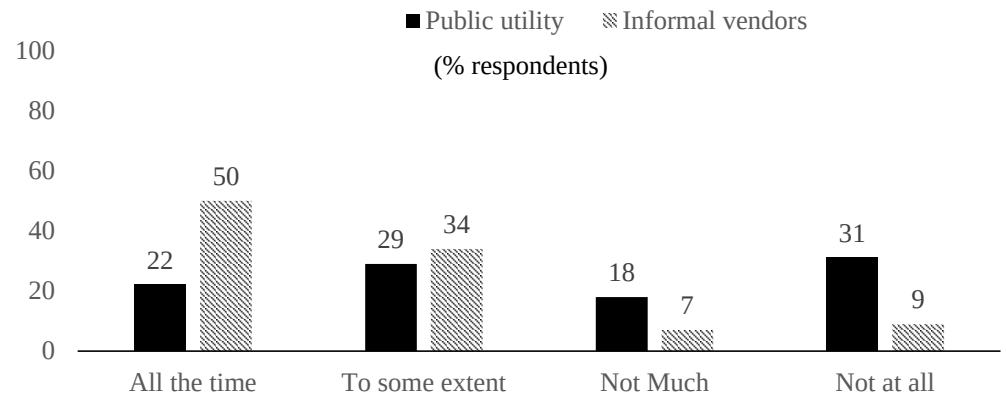
Q. To what extent do you think the following groups or organisations look after the needs of your community for safe and sustainable water?



Source: Survey on Social Accountability for Safe and Sustainable Domestic Water Provision in Kinondoni, Ubungu, Ilala and Temeke districts of Dar es Salaam, fieldwork 7-29 March 2018, unweighted N=1804, weighted N=2048. No replies (2% for utility and 4% for informal providers) excluded.

Figure 1. Trust in Informal vendors and the Public Water Utility

Table 1. Results of Censored Regression Model for Trust in Main Water Utility in Dar es Salaam (DAWASA)

	Public Utility				Informal Vendors			
H1. Outcomes	Est.		S.E.	Beta	Est.		S.E.	Beta
Gone without enough clean water in past year	*-0.08*		*0.06*		*0.02*		*0.05*	
Water quality is acceptable	0.22	*	0.09	0.07	0.06		0.11	
N incidents of illness because of water	-0.09		0.07		-0.03		0.10	
Drinks salty water	-0.07		0.10		-0.07		0.09	
Difficulty affording water	*0.04*		*0.06*		*0.02*		*0.05*	
H2. Congruence								
Has piped water supplied by utility	0.29	**	0.10	0.12	-0.01		0.08	
Informal providers manage water source	-0.12		0.11		0.38	***	0.09	0.20
Household manages main water source	-0.03		0.08		-0.04		0.08	
Ward relies mainly on bore holes[#]	omitted				omitted			
Ward relies mainly on piped utility water[#]	0.83	*	0.41	0.41	-0.04		0.17	
Ward relies mainly on other sources[#]	0.09		0.48		-0.14		0.16	
Everyone has right to clean water/sanitation	*0.17*	*	*0.08*	*0.09*	*0.14*	*	*0.06*	*0.08*
H3. Access to Decision-making								
Knows number to call if water point broken	0.11		0.10		-0.07		0.10	
Knows English well enough to write a letter	0.09		0.10		0.08		0.07	
Knows Swahili well enough to write a letter	0.58	***	0.15	0.16	-0.12		0.10	
Capacity for engagement	*0.07*		*0.05*		*0.13*	***	*0.04*	*0.14*
H4. Politics								
Govt handling water issues satisfactorily	*0.34*	***	*0.06*	*0.28*	*0.04*		*0.06*	
Control variables								
Age (years)	*0.01*	*	*0.00*	*0.06*	*0.01*		*0.00*	
Gender: male	-0.08		0.08		-0.06		0.06	
Education level	*-0.07*	*	*0.03*	*-0.10*	*-0.02*		*0.02*	
Formal settlement	0.17		0.13		0.00		0.09	
Owner occupier	-0.06		0.07		0.09		0.06	
Unemployed in last five years	0.00		0.08		-0.04		0.11	
Number of consumer durables owned	0.09		0.05		-0.03		0.03	
How often uses internet	*0.03*		*0.04*		*0.03*		*0.03*	
Trusts most people	0.17		0.17		0.08		0.09	
Model R-square (individual level):	0.23				0.09			
Model R-square (ward level):	0.15				0.04			

Source: Censored Regression Analysis with a Random Intercept Based on Average of Five Imputations of Missing Data. Survey on Social Accountability for Safe and Sustainable Domestic Water Provision in Kinondoni, Ubungu, Ilala and Temeke districts of Dar es Salaam, fieldwork 7-29 March 2018,weighted N=1980. *** P<.001, **P<.01, * P<.05. Variables in italics are centred on their grand mean, for which Beta should be interpreted as the number of standard deviation changes in the dependent variable for a standard deviation change in the independent variable. For all other variables, Beta should be interpreted as the number of standard deviation changes in the dependent variable when the independent variable changes from zero to one. # indicates variables measured at the ward level.

Appendix Table 1. Coding and Summary Statistics of Measures Used

	Min	Max	Mean	Std. Dev
Trust DAWASA	1 not at all	4 all the time	2.41	1.14
Trust informal vendors	1 not at all	4 all the time	3.24	0.93
H1. Outcomes				
Gone without enough clean water in past year	1 never	4 many times	2.27	1.03
Water quality is acceptable	0 no	1 yes	0.83	-
N incidents of illness because of water (1)	0 none	3 or more	0.15	0.45
Drinks salty water (2)	0 no	1 yes	0.13	-
Difficulty affording water	1 Easily afford	4 Always difficult	2.20	0.93
H2a/b/c. Congruence				
Has piped water supplied by utility (3)	0 no	1 yes	0.30	-
Informal vendors manage main water source (4)	0 no	1 yes	0.47	-
Household manages main water source (5)	0 no	1 yes	0.33	-
Ward relies mainly on bore holes	0 no	1 yes	0.33	-
" " " " piped utility water	0 no	1 yes	0.33	-
" " " " other sources (6)	0 no	1 yes	0.33	-
Everyone has right to clean water and sanitation	1 strongly	4 strongly agree	3.67	0.56
H3. Access to Decision-making				
Knows number to call if water point not working	0 no	1 yes	0.12	-
Knows English well enough to write a letter	0 no	1 yes	0.40	-
Knows Swahili well enough to write a letter	0 no	1 yes	0.89	-
Capacity for engagement (7)	1 definitely	4 definitely can	2.32	1.00
H4. Politics				
Government handling water issues satisfactorily	1 very badly	4 very well	2.73	0.90
Control variables				
Age (years)	18	91	34.68	12.12
Gender: male	0 female	1 male	0.49	-
Education level	0 no formal	9 postgraduate	4.09	1.63
Formal settlement	0 no	1 yes	0.46	-
Owner occupier	0 no	1 yes	0.60	-
Unemployed in last five years	0 no	1 yes	0.20	-
Number of consumer durables owned (8)	0 none	5 goods	3.06	1.23
How often uses internet	1 never	4 daily	2.20	1.31
Trusts most people	0 no	1 yes	0.10	-

Source: Survey on Social Accountability for Safe and Sustainable Domestic Water Provision in Kinondoni, Ubungu, Ilala and Temeke districts of Dar es Salaam, fieldwork 7-29 March 2018,weighted N=2048. Notes:

(1) Count of positive replies to the following question: *Has anyone in your household ever suffered illness which you attributed to poor quality water?* (self; children; other adults).

(2) In answer to *How do you assess the quality of the water you drink in terms of…taste?* Answers "a bit salty" or "salty."

(3) Names as a source of water for any purpose water which is: piped into dwelling, piped into compound, yard or plot, piped to neighbour or public tap/standpipe AND says that the household's piped water is supplied from a large piped water network managed by a utility.

(4) Says that informal vendors manage the household's main source or sources of domestic water.

(5) Says that household manages their main source or sources of domestic water themselves.

(6) Other sources include surface water, dams etc.
(7) Mean of four items (Cronbach's alpha 0.90), in answer to the following question: *If you found out about a problem in your community that you wanted to do something about (for example poor drainage, erratic water supply, non-collection of garbage) how well do you think you would be able to do each of the following? Get other people to care about the problem; identify individuals and/or groups to help; organise people within your community; call someone you had never met before*.
(8) From a list of five durables: radio, television, computer, mobile phone and fridge.