Are poverty dimensions and bad experiences good predictors for the willingness to pay? Evidence from the water sector in Kenya

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> *"Absolute poverty is a condition characterised by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information. It depends not only on income but also on access to services".*
> *United Nations (1995).*

Abstract

Cities in development countries have been experiencing remarkable change due to rapid urbanisation and population growth. These have affected their sustainability and risen many concerns on the access to basic services. Clean water and sanitation are two of them. This study investigates the poverty dimensions and bad experiences of households in Kenya with the aim to understand the determinants of the willingness to pay for better water supply and sanitation services. We exploit a unique dataset from a survey carried out within a project launched by the Government of Kajado County. Our results suggests that poverty dimensions of people in terms of low education, food security, access to information, and income have not the same magnitude to explain the complex mechanism behind the attitude of willing to contribute for public goods. Besides, water crises, water disease and time to fetch water as bad experiences of households related to poor access to water services seem to have robust explanatory power. In our research, the main finding is that poverty dimensions have a not an equal significance on WTP. Rather, the damage caused by poor access to water source and sanitation may impact the perception of value of public goods. Our research gives evidence that local policy should consider a complex mix of factors, in which human sphere is the fulcrum to understand the WTP.

Keywords

Willingness to pay, water and sanitation, public goods, development of economics, Kenya

Acknowledgements

1. Introduction

In Africa millions of people do not have access to quality water services due to poor quality of infrastructures. Among the main reasons there are institutions' weakness, lack of appropriate funds, climate change, growing population, rapid urbanization and economic development (WHO, 2017). The effect of living in poverty conditions make enormous difficulties in adopting sound policy locally based to provide basic services (Null et al. 2012). This topic is well remarked from studies focussed on willingness to pay (WTP) for public goods in these contexts (Echenique and Seshagiri, 2009; Bogale and Urgessa, 2012; Sakketa and Prowse, 2017).

In line with this, our research reorganizes the explanatory variables used for WTP following the United Nations (1995) and United Nations Development Program (2018) statements about poverty and its dimensions. Besides, we include variables to understand how bad experiences of households related to poor access to basic services may influence the WTP (Kahneman et al., 1993). Our study recalls the idea from other contributions that willingness to make a personal contribution of money increases in order to "prevent or to remedy threats to public health or to the environment, attributed either to human or to natural causes" (Ryan and Spash, 2011). Our findings stress that the damage caused by poor access to water source and sanitation may influence WTP and the perception of a public good's value (Kisiangani et al., 2018).

To the best of our knowledge this is one of the few papers investigating WTP in developing countries from a dual perspective, that is focussing on both poverty dimensions and bad experiences. In fact, most of the contributions have used socioeconomic and local context features to explain WTP, whereas few researches investigate the issue stressing the impact of experiences of households. To do that, we exploit a unique dataset from a survey carried out for a water supply and sanitation project, promoted by the Government of Kajado County in Kenya.

The paper proceeds as follows. In the next section we illustrate the conceptual background. Then the following section describes the dataset and the model. After results presentation we discuss policy implications.

2 Background

2.1 Research context: water and basic services

The National Water Development Report (2006) remarks how Kenya water resources have been mismanaged through unsustainable water and land use policies, laws and institutions, weak water allocation practices, growing pollution, and increasing degradation of water resources, and their catchments. This means that water supply does not meet the demand of water among households. Most Kenyans have limited access to water services. They walk for long distances in search of this precious commodity and use it raw and untreated water from rivers, lakes and dams (Marshall, 2011). The 2009 Population and Housing Census and sector data report access to piped water supply in urban areas in Kenya at 53 percent. Kenya has scarce water, with future projections showing the available per capita water, currently at $650m^3$/year, to likely drop to $359m^3$/year by 2020, as a result of massive demographic growth (Kithiia, 2012). This is well below the globally accepted benchmark of $1000m^3$ year per capita level (WHO, 2017). Similar situation regards the access to sanitation. In fact, 69 percent of people use shared, unimproved, or no sanitation facilities in cities (World Health Organisation and UNICEF, 2017). Inadequate sanitation infrastructure contributes to poor public health, particularly in low-income and rural areas, increasing inequality in specific segments of population. World Health Organisation (WHO) estimates that the 17,597 cumulative cases of cholera reported since 2014 are attributed to poor sanitation services and infrastructure (WHO, 2017). This situation persists despite the commitment of Kenyan government to improve water services started in 1967 and the adoption of new water policy was launched in 1999.

The area we analyse if Kajiado County, one of the 47 counties in Kenya. It is located in the southern part of Kenya and composed by sub-counties: Kajiado Central, Kajiado North, Loitokitok, Isinya and Mashuuru. Last census (2009) estimated that 687,312 people lives in this part of Kenya. Population forecasts estimate that annual population increases by 5 percent and that population living in the County would be 999,819 (Kenya National Bureau of Statistics, 2015).

The access to water is proxy of the condition of inequality of people living in Kajado County, where 66 percent of residents use improved sources of water, with the rest relying on unimproved sources. Use of improved sources varies with gender, with 68 percent of male-headed households and 63 percent in female-headed households using it (Kenya National Bureau of Statistics, 2015). Indeed, the access to water and sanitation has enormous differences among the zones of the County. Kajiado North has the highest share of residents using improved sources of (77 percent), 25 percentage points above Kajiado West, which has the lowest share using improved sources of water. Other wards located in the North and Central County, Purko and Kitengela towns for example, have the highest share of residents using improved sources of water worth 86 percent (Kenya National Bureau of Statistics, 2015). This data is partially confirmed from information on piped water. In this case, Kajiado North has a share of only 29 percent compare to Kajiado East, where the highest level of piped water is 37.8 percent. Instead,

Kajado Central and Kajado West have a share of 10.9 percent and 20.4 percent, respectively (Kenya National Bureau of Statistics, 2015).

The situation of improved sanitation is very similar to the discussed for the water access in the County, where 56 percent of residents use improved sanitation, and the rest use unimproved sanitation. Kajiado North has the highest share of residents using improved sanitation at 82 percent. That is almost three times than Kajiado Central (30.6 percent), which has the lowest share of residents using improved sanitation followed by Kajiado West and South, recording a share of 35 and 42 percent, respectively (Kenya National Bureau of Statistics, 2010).

This fragile situation is exacerbated by the intensification of water requirements from population growth, which influence the capacity of government to allocate properly water services and sanitation. Among the current challenges of Kenya and its Counties, prevalence of informal economies, and population pressure and its water requirement are reasons of this fragmented water situation (Chepyegon and Kamiya, 2018). Annual budget for water sector is approximately 2.8% of the national budget, which is enough to cover a small percentage of investment, which is estimated at around 44 percent of the total (Ministry of Environment, Water and Natural Resources, 2013). This financial gap is partially financed by donors, implying that allocation of water services to remote areas of the country is very low. Inadequate funding for water policies leads to gradual decline of public bodies as services provider and imply that the attraction of private stakeholders to fill the gap is a priority. As a consequence, private interests seemed to drive a part of water investments in the country. This makes poor neighbourhood not a "good business" in terms of water revenue from developers' perspective (Chepyegon and Kamiya, 2018). For these reasons water service provision, and in general financing public good, is still a main topic for urban and rural neighbourhood in Kenya. In many cases, the insufficient quality of public goods is associated with corruption and no transparency (Joshi, et al., 2012). This fact combined with poor condition of people in terms of income, education, and food security makes the implementation of basic services a question unsolved for life changes and equal conditions (Null et al. 2012).

This points out the importance of exploring the mechanism behind the WTP in order to set up sound policy and actions locally-based to address local government to implement infrastructures and improve the access to basic services.

2.2 WTP: key issues for developing countries

Financing public good in developing countries is a key issue of the 2030 Agenda for Sustainable Development adopted by all the United Nations Member States. The achievement of these goals, and in general the progress of human being, is strictly linked with the capacity of government to provide appropriate basic services, like water, health, and education. This implies that governments around

the world need financial resources to allocate public goods in contexts rapidly changing due to urbanisation and population growth. Directly, this involves the contribution of people to support the allocation and operation of those services, especially in developing countries. In this field, research has explored the WTP from two main angles, which may be gathered into two main topics regarded the problem of understating the true preference of WTP, and socioeconomic and local factors as main determinants. This emerges from the last two decades of research on WTP for basic services (Randall et al.,1983; Echenique and Seshagiri, 2009; Ali el al., 2014; Sakketa and Prowse, 2017; Jahnke and Weisser, 2018).

From the point of view of the "true preference", it is well-known that "If an individual stated preferences for public commodities influence his tax share, […] it is usually in his interest to mispresent the true" (Bergstrom and Goodman, 1973). Following this, research on WTP attempted to find ways to understand the true preference relating to "goods" not traded in the market (Perman et al., 2003). To tackle this problem academia has widely used the stated preference methods with contingent valuation method (CVM) to capture the value of non-marketed good (Randall et al.,1983; Knife and Berhanu 2007; Echenique and Seshagiri, 2009). Contingent valuation is the most common method for exploring the WTP, using both open and categorical items in a questionnaire (Alberini and Cooper, 2000; Gunatilake et al., 2006, 2007). However this method may suffer from biases (Carson et al., 2000; World Bank, 2004), as familiarity with placing monetary values on environmental goods/services, self-capacity for declaring the true preference and free riding (Gunatilake et al., 2007). These and other biases emerged also in other studies (Balana et al., 2013), and are related the hypothetical answer to value a commodity offered in the future; free riding; the initial value suggested as starting point; and information provided by the surveyor (Whitehead, 2006; Gunatilake et al., 2007).

In order to tackle these issues, a set of papers recommended appropriate design and conduct of the survey based on participatory approach (Whittington, 1998). The participatory perspective is particularly important to understand the milieu where the public goods will be provided and the community. As mentioned in Balana et al. (2013), participatory approach may have a strong impact on WTP bias, creating the right conditions to conduct a survey especially in developing contexts. Indeed, most of the research in developing countries adopted workshops or meetings with local communities in order to have better knowledge of critical factors, like water tariffs, technical and maintenance problems, administrative, institutional and policy issues. The capacity of involvement of local community seems to be a key factor, especially when there are few researches in the field and lack of updated data. This is evident from studies on WTP, which use primary data source collected by authors directly from communities or stakeholders (Sakketa and Prowse, 2017). This has become frequent in the development economics literature.

Turning to the second point, also research in developing countries stresses the idea that the willingness to pay is anchored to several local features and socio demographic characteristics of respondents, like age, gender, education, marital status, household size, income, type of house built, type of water source, and quality of water. This approach is well consolidated from waves of studies (Adenike and Titus, 2009; Echenique and Seshagiri, 2009). Others point out that four main factors influence WTP for public goods such as water in developing countries (Ellis, 2000; Sakketa and Prowse, 2017) like human capital, physical capital, social capital, and financial capital. In a recent study conducted on WTP from villages in rural Kenya, this is partially confirmed by the fact that purchase behaviour is very sensitive to the level of income and to the price of water, and that at the same time food security, malnutrition, and water disease as proxy of living conditions of households do not appear significant (Blum et al., 2014). This opens insights whether proxies of living experiences matter to explain the perception of people and their WTP for water. As stressed in Bontemps and Nauges (2015), these factors may have a crucial role, especially if we take into consideration such experiences explaining the impact that poor water access and its distance may have on the population in poor contexts. Measured as time to fetch water, the water source distance is a key component of this approach especially in Africa, where over two-thirds of the population used to leave in their own homes to collect water to meet basic needs like drinking, bathing, cooking, and washing (Graham et al., 2016). This fact involves both adults and children, becoming a daily labour. In some case the percentage of people leaving home to collect water may reach 90 percent of a sample from a study in Ivory Cost, and most of them were adult females as primary collectors (Graham et al., 2016). The provision of water sources in proximity to households is a sensitive issue for human health and its economic implications for the development of poor regions of the world. Even if the disease burden of poor access to water and sanitation declines across African countries, the non-health problems, and among them mainly the time of water collection is still a persistent issue. This emerges from a study conducted in one rural area of Kenya, where sixty percent of interviewed households collected water outside their home, spending an average time of 2-3 hours per day for this activity (Cook et al., 2015). Poor water access may generate an excessive cost. In this instance, the same study estimates that the coping costs per month are approximately USD 20 per month, higher than average household water bills in many utilities, or 12 percent of monthly income [1].

Fragile institutions and corruption also affect the compliance to contribute to public goods and taxation all over the world (Levi et al., 2009; Tabellini 2010; Rothstein, 2011; D'Arcy, 2011; Sacks, 2012). Recently, research has explored the impact of trust in Africa, giving evidence that in countries

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[1] The coping costs estimated by the study of Cook et al. (2015) includes capital costs for water storage, money paid either to water vendors or at sources that charge volumetrically, costs of treating water disease cases, and expenditures on drinking water treatment.

like Kenya, Uganda, Tanzania and South Africa with large informal sectors, illiteracy, and lack of trust in government these strongly impact on WTP (Joshi, et al., 2012). A a consequence lack of trust discourages people to comply because of perceived unfairness in the exchange between payers and the state, influencing social attitude (Feld and Frey, 2007). This is confirmed in Balana et al., (2013) which assert that key challenge in implementing water services is not the willingness, but rather the lack of viable institutional and administrative framework. In fact, nearly 90 percent of respondents identified the lack of accountable and honest administrative and institutional regime as influencing water supply in Nairobi (Balana et al., 2013). More in general, corruption may affect the trust of people and their attitudes toward taxation in Kenya (Ali el al., 2014; Jahnke and Weisser, 2018). This statement is well remarked also by Afrobarometer data, showing that 54 percent of the respondents living in Kenya had direct corruption experience with water service provision (Afrobarometer, 2018). Although this may affect all people from different income levels, it can be said that people with higher level of income have experienced corruption more frequently as confirmed by Jahnke and Weisser (2018) who focus on the correlation between income level, level of trust, and WTP. Sound institutions and transparency may increase social morale to contribute for basic goods or services in development arenas (Transparency International, 2013).

3 Methods and results

3.1 Data collection

Our research targets households living in the cities of Kajado and Kitingela in the Kajado County. Data collection is part of a water supply and sanitation project launched in these two cities by the County Government. Following some previous approaches (Whitehead, 2006; Gunatilake et al., 2007), we used a pre-survey participatory approach to build-up the questionnaire and then conducted the survey through convenience sampling (Whittington, 1998). This approach drew inspiration from collective-action theory, which stresses importance to engage local communities in tackling potential social dilemmas (Arrow, 1974).

The pre-survey approach consisted in field visits and extensive consultations within the township of Kajado and Kitingela, under the guidance of town clerks, municipality representatives, and local communities leaders, as also recommend also by International Water Management Institute (2006) and research in this field (Golooba-Mutebi, Frederick, 2003; Miguel, et al. 2005). The main purpose was to develop a better understanding of local contexts and their communities, and collect relevant information, i.e. water policy and tariffs, water supply and sanitation situation, technical and maintenance problems, administrative issues, rules and regulations.

Following the water supply and sanitation infrastructure system map, we selected the four neighbourhoods for each city to involve in the survey. In particular we chose those areas with very poor infrastructure – see Balana et al. (2013). The same number of households for both cities of Kajado and Kitingela was then selected via convenience sampling. Several contributions were consulted in order to elaborate the questionnaire items. Besides those we discussed above, we considered Whitehead (2006) and Gunatilake et al. (2006) indications. Both authors recommended to tackle the problem of CVM accurately, using focus group with cultural mediators, and training interviewers on how to introduce the scope of the survey and how to approach with local community,

The questionnaire was reviewed several times in order to include the indications of stakeholders and cultural mediators. We aimed to make questions easy both to understand by different people, often not well educated, and to be translated and explained in Swahili by local interviewers. In particular, WTP categories were rearranged several times by stakeholders in order to be appropriate (see Kisiangani et al., 2018). Three categories were then selected after extensive consultations, namely <100; 100-500; and 501-1000 Kenyan Shillings[2] (KES).

As to other questions, we based our choice on the United Nations (1995) and the United Nations Development Program (2018) frameworks to properly obtain items closely related to their definition of basic human needs, including income per day, food security, education and information access. Items on household bad experiences were built according to the literature (Kahneman et al., 1993, 1999; Ryan and Spash, 2011; Graham et al., 2016). After consultations with municipality representatives and community leaders, we selected three main questions representing the bad experience correlated to poor water services, namely, water disease, water crises, and time to fetch water. These are frequent events that often affect households living in Kenya as mentioned also in a technical report from Ministry of Environment, Water and Natural Resources (2013).

Final questionnaire consists of four main sections, namely, demographic information; living condition; situation of water supply and sanitation; and WTP. The survey was conducted in April and May 2018. The initial number of 120 households reduced to 99 because of missing data in the variables of interest. The results of our survey shows that 41 percent and 45 percent of respondents want to pay, respectively, less than 100 Kenyan shillings (KES) and from 100 to 500 KES, whereas the remainder 14 percent declare they are willing to pay from 500 to 1000 KES. At glance, the findings seemed to be robust with other studies in Kenya, in which the median willingness to pay for water services is 100 KES/month (Kisiangani et al., 2018).

3.2 Model

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[2] 1 Kenyan shillings is equal to 0,0100 US Dollars. Central Bank of Kenya. Retrived from https://www.centralbank.go.ke

The model we will test has the following specification.

$$y_i = f(pov_i, exp_i)$$

where i is the single household. Dependent variable y_i is a measure of willingness to pay. We test two different measures (see Halstead et al., 1991; Larson et al., 2006). The first one is an ordinal polytomous variable (PAY) indicating the amount the respondent would additionally pay for better water services, choosing between three alternatives (<100, 100-500, and 501-1000 KES). As a robustness check, and similarly to Blum et al. (2014), we use a second dependent variable (LOGPAYMED), equal to the log of the median value for each PAY class. We then use standard ordered logit regression for PAY (Sakketa and Prowse, 2017). For what concerns the LOGPAYMED, we used tobit regression in place of two-part.

Right hand-side variables include two groups. The first one (*pov_i*) consists in the following poverty dimension measures.

- Daily income in dollars (DOLLARSDAY);
- Dummy variable for low education (PRIMARY);
- Dummy variable for food shortage (FOOSHORT);
- Dummy variable for regular access to information through mass media (INFO).

The second one includes information on households' experiences related to poor access to water and sanitation. This follows the cited literature contributions and the suggestion of the Ministry of Environment, Water and Natural Resources (2013):

- Dummy for time to fetch water > 30 minute per day (FETCHMORE30MIN);
- Dummy for household member experienced water disease in the last year (WATERDISEASE);
- Dummy for experience related water crises in the last year (WATERCRISIS). [3]

Tables 1 and 2 describe the variables and reports descriptive statistics.

TABLE 1 HERE

TABLE 2 HERE

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[3] It estimates that one of the main causes of water crises in Kenya is related to environmental destabilisation, which have direct impact on both the water quality and availability of water resources (Ministry of Environment, Water and Natural Resources, 2013).

4. Results and discussion

In Table 3 we report the results of ordered logit where PAY is the dependent variable. We also include odds ratios and marginal effects at mean. We then show the findings from using the dependent variable (LOGPAYMED) in a tobit model, and also in this case we report marginal effects (Table 4). For both models we consider an initial specification with only those variables related to poverty conditions (models 1 and 3), and then added those proxying household experiences (models 2 and 4).

From Table 3, for both models (1) and (2) DOLLARSDAY is significant and reports positive and expected relationship with willingness to pay (see also Bogale and Urgessa, 2012). Daily access to mass media for information (INFO) is also significant though in an inverse relationship. This may be due to the quality of media access, which does not necessarily inform on the key role of improved sanitation for population. Its marginal effect increases with WTP, indicating that higher WTP is associated to relatively lower use of media. This aspects needs to be investigated more in depth, but from here it could emerge that media would not play an informative role on sanitation issues *coeteris paribus*, the latter including the education level. In addition, model (2) suggests the importance of some past bad experiences. In particular, those that experienced water crises (WATERCRISIS) are willing to pay more. Time to fetch water and previous diseases are not significant.

TABLE 3 HERE

TABLE 4 HERE

Also in models (3) and (4), household income (DOLLARSDAY) and past water crises significantly explain WTP, both reporting the same sign as models (1) and (2). Concerning the other dimensions of poverty, basic education level and food shortage do not report significance, including INFO. With regards to primary level of education and its lack of significance, we may find same evidence as in Balana et al. (2013), then suggesting the complexity of the relationship between WTP and poverty dimensions. This time, the other two types of past bad experiences, FETCHMORE30MIN and WATERDISEASE, are likely to matter and positively predicting WTP.

Overall, it seems that the impact on the willingness to pay, and thus the perception of the value of a public good, may be influenced by past experience, and not simply by income. Further analysis, and perhaps a bigger dataset, is needed to further investigate this issue in developing countries, for an essential service like water access. Indeed, this evidence is in line with those studies stressing the psychological interpretation of the WTP, originating from the damage that the intervention for which is required to pay more is intended to mitigate (Ryan and Spash, 2011), and then based upon a sort of psychological appraisal (Kahneman et al., 1993).

This assumption is more meaningful if we take account that fragile institutions and corruption may have a strong impact on the WTP of people belonging to higher income level (Jahnke and Weisser, 2018). As pointed out by these studies, richer people may have experienced more frequently corruption events with regards to services provided by public bodies. This may mislead the same interpretation of financial variables like income (Kisiangani et al., 2018). People with higher income level may have all reasons not to want to pay more for water services, because they don't trust that the services is well allocated and managed by government. This does not appear to be the case of our sample, which shows positive sign in line with a positive relationship between wealth and willingness to pay. However, more research is needed to analyse WTP more in depth, given institutions' perceived quality and corruption perception. This makes room to further research on how lack of public goods may influence the compliance to contribute to mitigate adverse effects. In this sense, our findings may support this idea, giving an indication on the role of bad experiences and their impact on social morale.

5 Conclusions

Using a unique dataset from a survey on households living in Kajado and Kitingela within Kajado County, this paper investigated the WTP from dual perspectives, using the poverty dimensions and bad experiences as determinants.

To the best of our knowledge, this is one of the few contributions exploring the WTP from these two angles together. Unlike previous works this research examines the determinants on WTP based on local context features. Also, few researches explored the household experiences attempting to explain the perception of public goods.

In our research, the main finding is that poverty condition and its dimensions have not necessarily a key role in explaining WTP. Rather, the experiences linked to low public good quality may change the perception to pay for them.

References

Adenike, A.A., Titus, O.B. (2009). Determinants of willing- ness to pay for improved water supply in Osogbo Metropolis, Osun State, Nigeria. *Research Journal of Social Sciences*, 4: 1-6.

Afrobarometer (2018). A pan-African series of national public attitude surveys on democracy, governance, and society, http://www.afrobarometer.org/pan-africa-profiles

Alberini, A., & Cooper, J. (2000). Applications of the Contingent Valuation Method in Developing Countries, FAO economic and social development, paper 146, http://www.fao.org/3/X8955E/x8955e00.htm

Ali, M., Fjeldstad, O.H., &Sjursen, I. H. (2014). To pay or not to pay? Citizens' attitudes toward taxation in Kenya, Tanzania, Uganda, and South Africa. *World Development*, 64, 828–842.

Arrow, K. J. (1974). The Limits of Organization, New York: W. W. Norton.

Balana, B.B., Catacutan, D., & Mäkelä, M (2013). Assessing the willingness to pay for reliable domestic water supply via catchment management: results from a contingent valuation survey in Nairobi City, Kenya. *Journal of Environmental Planning and Management*, 56:10, 1511-1531, doi:10.1080/09640568.2012.732934

Bergstrom, J. C., Dillman, B. L. & Stroll, J. R. (1985). Public environmental amenity benefits of private land: The case of prime agricultural land. *Southern Journal of Agricultural Economics* 17, 139-50.

Blum G.A., Null C., & Hoffmann V. (2014). Marketing household water treatment: willingness to pay results from an experiment in rural Kenya. *Water*, 6:1873–1886.

Bogale, A., & Urgessa, B. (2012) Households' Willingness to Pay for Improved Rural Water Service Provision: Application of Contingent Valuation Method in Eastern Ethiopia. *Journal of Human Ecology*, 38 (2), 145-154, doi:10.1080/09709274.2012.11906483.

Bontemps C., &Nauges C. (2015). The Impact of Perceptions in Averting-decision Models: An Application of the Special Regressor Method to Drinking Water Choices. *American Journal of Agricultural Economics*, 98 (1), 297–313, doi:10.1093/ajae/aav046

Carson, R. T., Flores, N. E., & Meade, N. F. (2000). Contingent valuation: Controversies and evidence (Discussion Paper, 96/ 36). San Diego: University of California.

Cook, J., P. Kimuyu, & D. Whittington (2016), The costs of coping with poor water supply in rural Kenya, Water Resour. Res., 52, 841–859, doi:10.1002/ 2015WR017468.

Chepyegon, C. & Kamiya, D. (2018) Challenges Faced by the Kenya Water Sector Management in Im- proving Water Supply Coverage. *Journal of Water Resource and Protection*, 10, 85-105., doi:10.4236/jwarp.2018.101006

D'Arcy, M. (2011). Why do citizens assent to pay tax? Legitimacy, taxation and the African state. Afrobarometer working paper No. 126.

Duncan, G. J., Magnuson K., Kalil A., & Ziol-Guest K. (2012) The importance of early childhood poverty. *Social Indicators Research*.108(1):87-98.

Echenique, M., & Seshagiri, R. (2009). Attribute-based willingness to pay for improved water services: A developing country application. *Environment and Planning B: Planning and Design, 36*, 384–397. doi:10.1068/b33126.

Ellis, F. (2000). Rural livelihoods and diversity in developing countries. Oxford: Oxford University Press.

Feld, L., & Frey, B.S. (2007). Tax compliance as the result of a psychological tax contract: the role of incentives and responsive regulation. *Law & Policy*, 29, 102–120.

Food and Agriculture Organization of the United Nations (2000). Applications of the contingent valuation method in developing countries.

Fosu A., Bates R., & Hoeffler A. (2006). Institutions, Governance and Economic Development in Africa: An Overview. *Journal of African Economies*, 15 (1), 1–9, doi:10.1093/jae/ejk004.

Georgiou, S., Langford, I. H., Bateman, I. J., & Turner, R. K. (1998). Determinants of individuals' willingness to pay for perceived reductions in environmental health risks: A case study of bathing water quality. *Environment and Planning A*, 30 (4), 577–594.

Graham, J. P., Hirai, M., & Kim, S. S. (2016). An analysis of water collection labor among women and children in 24 Sub-Saharan African countries. *PLoS ONE*, 11, e0155981. doi:10.1371/journal.pone.0155981

Gunatilake, H., Yang, J. C., Pattanayak, S., & Van Den Berg, C. (2006). Willingness-to-pay and design of water supply and sanitation projects: A case study (ERD Technical Note series No.19). Manila: Asian Development Bank.

  Gunatilake, H., Yang, J. C., Pattanayak, S., & Choe, K. A. (2007). Good practices for estimating reliable willingness-to-pay values in the water supply and sanitation sector (ERD Technical Note series No.23). Manila, Philippines: Asian Development Bank.

Habibov N, Cheung A, & Auchynnikava A. (2018). Does institutional trust increase willingness to pay more taxes to support the welfare state? *Sociological Spectrum*. 38(1):51‐68. doi:10.1080/02732173.2017.1409146

Halstead J. M, Lindsay B.E., & Brown C.M. (1991). Use of the Tobit model in contingent valuation: experimental evidence from Pemigewasset wilderness area. *Journal of Environmental Management,* 33 (1), 79-89.

Jackson K. (2013). Diversity and the Distribution of Public Goods in Sub-Saharan Africa. *Journal of African Economies*, 22(3), 437–462, doi:10.1093/jae/ejt002

Jahnke   B., & Weisser R.A. , 2018. How does petty corruption affect tax morale in Sub-Saharan Africa? *European Journal of Political Economy*, Available online 19 September 2018

Joshi, A., Prichard, W., & Heady, C. (2012). Taxing the informal economy: Challenges, possibilities and remaining questions. ICTD working paper 4: 2102. Brighton: International Centre for Tax and Development.

Kahneman, D., Ritov, I., Jacowitz, K., & Grant, P. (1993). Stated willingness to pay for public goods: A psychological perspective. *Psychological Science*, 4(5),

310–315. Kahneman, D., Ritov, I., & Schkade, D. (1999). Economic preference or attitude expression? An analysis of dollar responses to public issues. *Journal of Risk and Uncertainty*, 19 (1–3), 203–236.

Kenya National Bureau of Statistics (2010) The 2009 Kenya Population and Housing Census.
Kenya National Bureau of Statistics (2013 a) Statistical Abstract. ISBN: 9966-767-45-2
Kenya National Bureau of Statistics (KNBS) and Society for International Development (2013b). Exploring Kenya's Inequality. ISBN – 978-9966-029-18-8
Kenya National Bureau of Statistics (2015) County Statistical Abstract, Kajiado County.
Kisiangani J., MacLeod C., Acey C., Levine D., Ronoh P., Makena E., Norman G., Khush R., Delaire C., & Peletz R. (2018). Are Kenyan water customers willing to pay a pro-poor sanitation surcharge?. IN: Shaw, R.J. (ed). Transformation towards sustainable and resilient WASH services: Proceedings of the 41st WEDC International Conference, Nakuru, Kenya, 9-13 July 2018, Paper 2905, 5 pp
Kithiia, S.M. (2012). Water Quality Degradation Trends in Kenya over the Last Decade, Water Quality Monitoring and Assessment, Dr. Voudouris (Ed.), ISBN: 978-953-51-0486-5, InTech, Available from: http://www.intechopen.com/books/water-quality-monitoring-and-assessment/water-quality-degradation-trends- in-kenya-over-the-last-decad

Kinfe, G., & Berhanu, A. (2007). Valuing water supply service improvements in Addis Ababa. In Proceedings of the Fifth International Conference on the Ethiopian Economy (Vol. 3, pp. 64–77).

International Water Management Institute. (2006). Taking a multiple-use approach to meeting the water needs of poor communities brings multiple benefits. Water Policy Briefing 18. Colombo, Sri Lanka: International Water Management Institute (IWMI). doi:10.3910/2009.335.

Larson B., Minten B., & Razafindralambo R. (2006). Unravelling the linkages between the millennium development goals for poverty, education, access to water and household water use in developing countries: Evidence from Madagascar. *The Journal of Development Studies*, 42:1, 22-40, doi:10.1080/00220380500356258

Levi, M., Sacks, A., & Tyler, T. (2009). Conceptualizing legitimacy, measuring legitimating beliefs.

American Behavioral Scientist, 53, 354–375.

Lindblad, M.R., Manturuk, K.R., Roberto G., & Quercia, R.G. (2013). Sense of Community and Informal Social Control Among Lower Income Households: The Role of Homeownership and Collective Efficacy in Reducing Subjective Neighbourhood Crime and Disorder. *American Journal of Community Psychology*, 51, (1-2), 123–139.

Maddala, G. S. (1983). *Limited Dependent and Qualitative Variables in Econometrics.* Cambridge: Cambridge University Press.

Marshall, D., (2011); The perception of adaptation to climate change in Africa. CEEPA. Discussion Paper No. 10. Centre for Environmental Economics and Policy in Africa. University of Pretoria, Pretoria, South Africa.

Ministry of Environment, Water and Natural Resources 2013 *National Water Master Plan 2030 Exec. Summary Vol. 1 Main 1.pdf*. Retrieved from https://wasreb.go.ke/downloads/National%20Water%20Master%20Plan%202030%20Exec.%20Summary%20Vol.%201%20Main%201.pdf

Morrell D., (2011) Who is Poor?. Harvard Magazine. Retrieved from: https://harvardmagazine.com/2011/01/who-is-poor

Null C, Kremer M, Miguel E, Hombrados J.G., Meeks R, & Zwane A.P. (2012). Willingness to pay for cleaner water in less developed countries: systematic review of experimental evidence. Systematic Review 006. 3ie: International Initiative for Impact Evaluation: London.

Perman, R., Gilvray, Y., & Common, M. (2003). Natural resource and environmental economics (3rd ed.). Glasgow: Person Education Limited.

Randall, A., Hoehn, J., & Brookshire, D. (1983). Contingent Valuation Surveys for Evaluating Environmental Assets. *Natural Resources Journal*, 23(3), 635–648.

Rothstein B., 2011. The Quality of Government: Corruption, Social Trust, and Inequality in International Perspective. University of Chicago Press.

Ryan A.M., & Spash C.L. (2011). Is WTP an attitudinal measure? Empirical analysis of the psychological explanation for contingent values. *Journal of Economic Psychology*, 32, 674–687

Sacks, A. (2012). Can donors and non-state actors undermine citizens' legitimating beliefs? World Bank Policy Research working paper No. 6158. World Bank.

Sakketa, T.G., & Prowse, M. (2017). Women, Wealth and Waterborne Disease: Smallholders' Willingness to Pay for a Multiple-Use Water Scheme in Ethiopia. *The Journal of Development Studies,* 54(3), 426-440.

Sen, A. (1976) Poverty: An Ordinal Approach to Measurement. *Econometica*, 44, 219-231.

Tabellini G., 2010. Culture and Institutions: Economic Development in the Regions of Europe. *Journal*

of the European Economic Association, 8(4): 677–716.

Transparency International, 2013. Global Corruption Barometer 2013. https://www.transparency.org/gcb2013/report. https://www.transparency.org/gcb2013/report

United Nations (1995). World Summit for Social Development 1995 Agreements. Programme of Action of the World Summit for Social Development. https://www.un.org/development/desa/dspd/world-summit-for-social-development-1995/wssd-1995-agreements.html

Whitehead, J.C., 2006. A practitioner's primer on the contingent valuation. In: A. Alberini and J.R. Kahn, eds. Handbook on contingent valuation. Cheltenham: Edward Elgar, 66–91.

Whittington, D., 1998. Administering contingent valuation surveys in developing countries. *World development,* 26 (1), 21–30.

WHO (2012), Climate-resilient water safety plans. Managing health risks associated with climate variability and change. https://www.who.int/water_sanitation_health/publications/climate-resilient-water-safety-plans/en/

WHO and UNICEF 2017 *Progress on Drinking Water, Sanitation and Hygiene*. https://www.unicef.org/publications/index_96611.html

WHO, Cholera – Kenya 2017 *WHO* Retrieved from http://www.who.int/csr/don/21-july-2017-cholera- kenya/en/

World Bank. (2004). Water resources sector strategy: Strategic directions for World Bank engagement. Washington, DC: Author.

World Bank (2017). World development indicators 2017. Washington, DC: The World Bank. Retrived from https://openknowledge.worldbank.org/bitstream/handle/10986/.../WDI-2017-web.pdf

World Bank (2019). World Bank Open Data. Retrived from https://data.worldbank.org

WSP 2011 *Water Supply and Sanitation in Kenya Turning Finance into Services for 2015 and Beyond An AMCOW Country Status Overview*. Retrieved from http://wsp.org/sites/wsp.org/files/publications/CSO-Kenya.pdf

United Nations (2018). Report on the World Social Situation. https://www.un.org/development/desa/dspd/report-on-the-world-social-situation-rwss-social-policy-and-development-division/2018-2.html

United Nations (2016) Kenya national water development report: case study. https://unesdoc.unesco.org/ark:/48223/pf0000148866

United Nations Development Programme (2018) The 2018 Global Multidimensional Poverty Index (MPI). Retrieved from http://hdr.undp.org/en/2018-MPI

Table 1. List of considered variables

Variable	Name	Type of variable	Measurement
Willingness to pay more to have better water access	PAY	Categorical	Three alternatives: <100, 100-500, and 501-1000 Kenyan Shillings
Willingness to pay more to have better water access	LOGPAYMED	Logarithm	Median of three alternatives expressed as logarithm
Income level per day	DOLLARSDAY	Metric	Dollars/day
Education level	PRIMARY	Categorical	1 if yes, 0 otherwise
Household member experienced at least once food shortage in the last year	FOOSHORT	Categorical	1 if yes, 0 otherwise
Daily access to media for information	INFO	Categorical	1 if yes, 0 otherwise
Time for fetch water	FETCHMORE30MIN	Categorical	1 if > 30 minute, 0 otherwise
Household member experienced water disease in the last year	WATERDISEASE	Categorical	1 if at least one water disease in the last year, 0 otherwise
Experienced water crisis	WATERCRISIS	Categorical	1 if Yes, 0 otherwise

Table 2. Descriptive statistics

Variable	%	Mean	Standard Deviation	Min	Max
PAY					
<100 (0)	41%				
100-500 (1)	45%				
501-1000 (2)	14%				
LOGPAYMED		2.61	.19	1.47	2.87
DOLLARSDAY		5.3	3.89	2	21
PRIMARY	22%			0	1
FOOSHORT	34%			0	1
INFO	41%			0	1
FETCHMORE30MIN	31%			0	1
WATERDISEASE	35%			0	1
WATERCRISIS	33%			0	1

Table 3. Ordered logit regression models for declared willingness to pay (PAY). Standard error in parenthesis, odds ratios in italics.

Model	(1)	(2)	(1)			(2)		
			Marginal effects					
			<100	100-500	501-1000	<100	100-500	501-1000
DOLLARSDAY	0.283*** (4.62) *1.32*	0.291*** (4.64) *1.33*	.040	.018	.005	.043	.018	.005
PRIMARY	-0.659 (-1.41) *.51*	-0.562 (-1.19) *.57*	-.108	-.038	-.011	-.093	-.031	-.009
FOOSHORT	-0.162 (-0.35) *.85*	-0.0448 (-0.10) *.95*	-.023	-.010	-.003	-.006	-.002	-.0008
INFO	-1.136* (-2.39) *.32*	-0.989* (-2.02) *.37*	-.170	-.071	-.022	-.152	-.059	-.017
FETCHMORE30MIN		0.695 (1.31) *2.00*					.048	.015
WATERDISEASE		0.810 (1.52) *2.24*					.056	.017
WATERCRISIS		1.208* (2.15) *3.34*					.089	.029
N	99	99						
Log likelihood	-120.026	-117.619						
Akaike Inf. Crit.	256.053	255.239						

Standard errors in parentheses: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; LR chi2 (7): 36.74; Prob > chi2 =0.0000;

Table 4. Tobit standard models (3), and (4) for median of polytomous variable (LOGPAYMED), marginal effects and error standard in parenthesis.

			Marginal effects	
	(3)	(4)	(3)	(4)
DOLLARSDAY	0.113***	0.117***	.0166	.0188
	(3.44)	(3.62)		
PRIMARY	-0.479	-0.429	-.074	-.072
	(-1.58)	(-1.46)		
FOOSHORT	0.0499	0.0981	.007	.015
	(0.17)	(0.34)		
INFO	-0.564	-0.429	-.083	-.069
	(-1.92)	(-1.48)		
FETCHMORE30MIN		0.751*		.102
		(2.33)		
WATERDISEASE		0.678*		.096
		(2.08)		
WATERCRISIS		0.764*		.105
		(2.31)		
_cons	1.410***	0.578		
	(4.63)	(1.33)		
sigma				
_cons	1.167***	1.125***		
	(11.64)	(11.65)		
N	99	99		
Log likelihood	-146.944	-143.414		
Akaike Inf. Crit.	305.888	304.829		

Standard errors in parentheses: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; LR chi2 (7): 25.30; Prob > chi2 =0.0007