Environmental Challenge and Water Access in Africa:
Empirical Evidences based on Nigeria's Households Survey[1]

By

Evans S. OSABUOHIEN, *Ph.D*
Dept. of Economics & Development Studies, Covenant University, Ota, Ogun State, Nigeria/ Alexander von Humboldt Postdoctoral Research Fellow, Hamburg, Germany

Uchenna R. EFOBI (*Ph.D candidate*)
School of Business, Covenant University, Ota, Ogun State, Nigeria
efobi99@yahoo.co.uk; uche.efobi@covenantuniversity.edu.ng

Ms Ciliaka M. W. GITAU (*Ph.D candidate*)
School of Economics, University of Nairobi, Nairobi, Kenya

Abstract

One of the environmental challenges is the effect on water availability and water-related diseases accounts for 80 percent of sicknesses in developing countries. Despite this, there has remained increasing research on poverty reduction, with little emphasis on water access particularly in Africa. Using micro-level data from survey conducted by the World Bank and National Bureau of Statistics, covering over 5,000 households and 27,000 household members across the 36 States of Nigeria, the study formulates an econometric model. The results from logistic regression analysis show that the main determinants of households access to water include: age of the household members, the marital status, the sector where the household member works, the type of employment, the number of working hours, access to informal means of financial credit and the income level of the household, among others. Some recommendations on how to boost water access of households are made in the study.

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1 Introduction

The issue of water access is pervasive in developing countries particularly those in Africa where access to improved water and sanitation is limited. The African continent has remained at the lower echelon with regards to access to water, as majority of her populace do not have access to safe water. Statistics show that between 1995 and 2008, about 44 percent of SSA's population are said to be 'extreme water poor' (lack of access to water) compared to other regions like Europe and Central Asia (ECA) and Latin America and Caribbean (LAC) with only 6 and 9 percent, respectively (World Bank, 2012a). World Bank (2012b) has also iterated that Climate change has led to more droughts and floods as well as faster depletion of groundwater in Africa.

There has been increase research on how poverty can be reduced; however, modicum emphasis has focussed on water poverty which includes the access, cost and utilisation of water by households (Cullia and O'Regan, 2004). This is imperative as most disease outbreaks (e.g. cholera, diarrhoea etc) are related to water pollution which is a function of the environment. Water-related diseases such as Diarrhoea, Cholera, Typhoid, Malaria and Hepatitis accounts for about 80 percent of illnesses in developing countries (United Nations, 2003; Acey, 2006). In particular, diarrhoea, a disease caused by unclean water results to about 60 percent of global infant mortality (United Nations, 2003). The above is essential given the uniqueness of water -it has no close substitute. Its usage cuts across many spheres of human existence (World Bank, 2012b). It is also useful in influencing the health of people and the ecosystems in a given locality (Grey and Sadoff, 2006).

In Nigeria, there has been increase in the rate of urbanisation and access to improved water sources in urban areas have declined to 67 percent from 80 percent between 1990 and 2004. For the rural areas, access to improved water sources also declined to 31 percent from its previous value of 33 percent within the same period (WHO, 2004). Many Nigerians especially women and children trek long distances to fetch water on a daily basis, which has made Nigeria one of the water 'flashpoints' in the world (United Nations Children's Fund-UNICEF, 2005). This study posits that this gory scenario can be resolved by identifying basic household characteristics that affects water access. Thus, this study explores the determinants of water access in Nigeria using General Household Survey by the National Bureau of Statistics in Nigeria-NBS with partnership from World Bank-WB. The remainder of the paper are as follows: introduction; some background facts; modelling household water access; discussion of the data; presentation of results and discussions; and the conclusion.

2 Water Access in Nigeria

Figure 2.1 presents some information on improved water access for Nigeria from 2004 to 2008. From the Figure, the percentage of people that can access improved water is not only low for the period presented but it exhibited some decline. For instance, between 2005 and 2008, the percentage of Nigerians that have access to improved water declined from 40.2 percent to 37.2 percent.
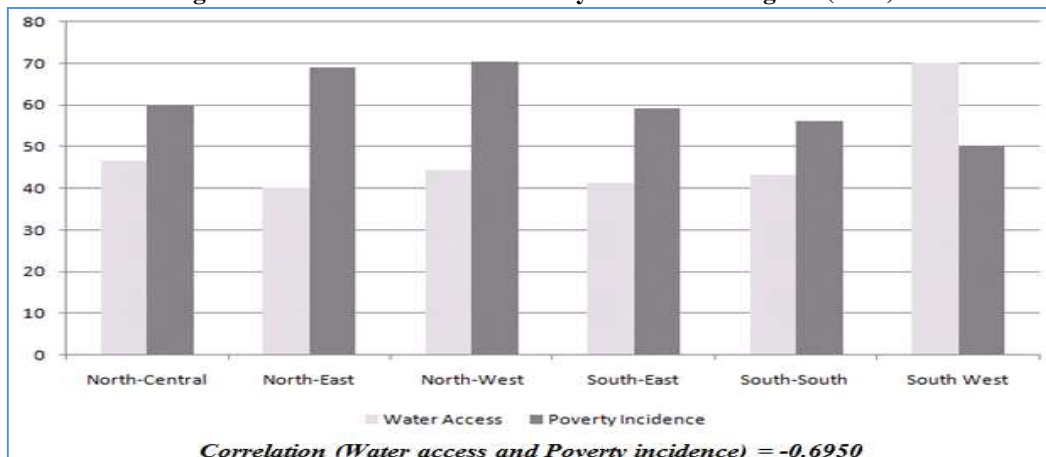
Figure 2.1 Improved and Un-improved Water Access in Nigeria (2004-2008)
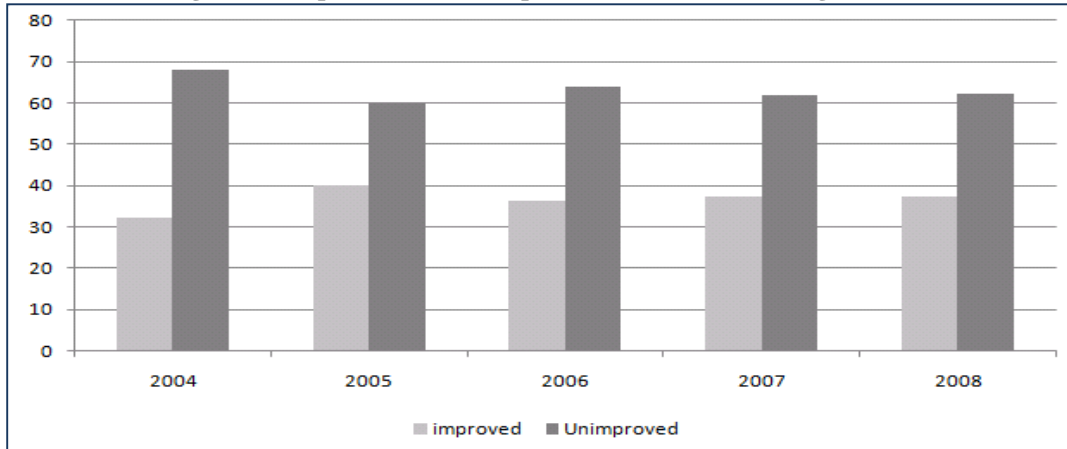
Figure 2.2 presents' data on water access and poverty incidence across the six geo-political zones of Nigeria. The Figure reveals that the geo-political zones with the lower poverty incidence have more access to water. For instance, in the North-East and North-West geo-political zones, about 69.1 percent and 70.4 percent of people living in these regions, live below one US Dollar per day and the same geo-political zones record 40.3 percent and 44.3 percent of poor access to water. The South-West geo-political zone is a testimony in the contrary as it records 50.1 percent poverty level and 70.2 percent access to water. Thus, wide disparities exist in the access to improved water access across the geo-political zones as the North-East zone accounts for less than 50 percent and the North-East geo-political zone having the lowest access.

Figure 2.2: Water Access and Poverty Incidence in Nigeria (2009)

Correlation (Water access and Poverty incidence) = -0.6950

Access to water is one thing; the quality of the water source is another. In this light, this study investigates insight on the issue of improved water access. The concept of improved water access as defined by the WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation (JMP) is the drinking-water source that is protected from outside contamination and particularly faecal matters (WHO/UNICEF, 2008). These sources include: piped water, public tap/standpipe, tube-well/borehole, and protected dug well.

Figure 2.3: Access to Improved Water Source across Geo-political Zones in Nigeria (2009)
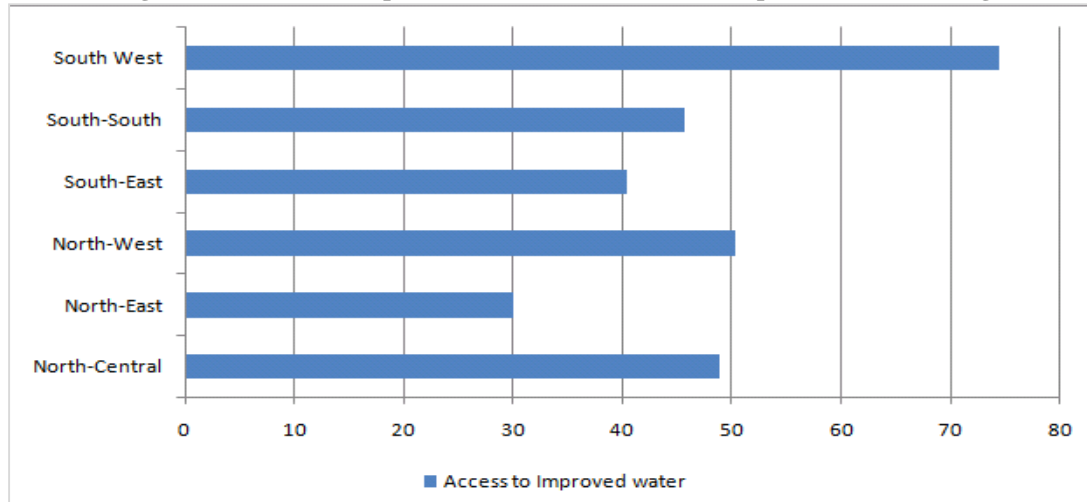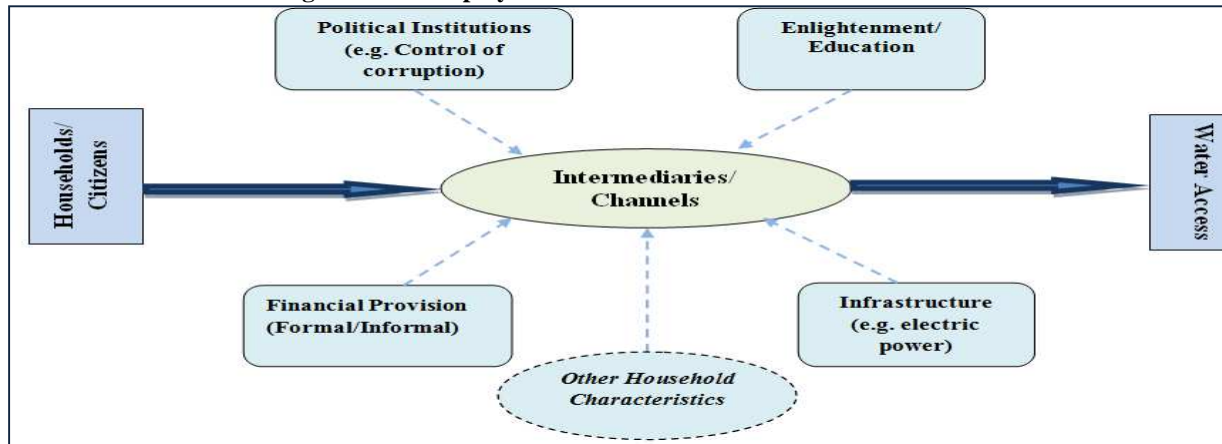
Figure 2.3 reports the proportion of people in the geo-political zones of Nigeria that have access to improved water supply. From the Figure, South-West geo-political zone of Nigeria, 'takes the toll' as 74.6 percent of people living within this region are able to access improved water supply. This is unlike the North-East geo-political zone, where barely 29 percent of the people can access improved water supply. The main issue emanating from the background facts is that access to water is rather low whereas the incidence of poverty high. This study explores this situation in relation to investigating the basic determinants of water at the households.

3.1   Analytical Framework on Household's Water Access

The framework illustrating the linkage between household and access to water is illustrated in Figure 3.1. The Figure underpins that the households/citizens of a country can have access to water based on the interplay with some intermediary factors/channels. These channels include: the nature of institutional framework, the extent of enlightenment/awareness, provision of financial resource and availability of infrastructures. This framework can be situated within the tenet of the sustainable livelihoods thesis that explains how sustainable livelihoods (including access to water) can be achieved through the utilisation of some livelihood resources such as: natural, economic, human and social capitals that are combined in the pursuit of different livelihood and households coping mechanism (Kemp-Benedict *et al*, 2010). A related concept is the utility maximising framework that is based on the ability of households to maximise their utility with respect to consumption of goods and services.

The government responsiveness in the form of institutional factors will also influence water access even at the household level. As illustrated in Figure 3.1, the institutional factors include control of corruption, regulatory quality, among others. Development outcomes in Africa have been said to be hampered by poor institutions (Fosu, 2008; Osabuohien and Efobi, 2011). This has been the bane of Africa's poor economic performance particularly in Nigeria (Osabuohien and Ike, 2011). Thus, establishment of measures to enhance the households' welfare outcome with water access will be difficult to attain in the face of weak institutional infrastructure.

Figure 3.1: Interplay between Households and Water Access

Leflaive (2012) noted that government responsiveness in green technologies (e.g. groundwater technologies) can enhance water availability. In similar fashion, Mudzonga (2012) concludes that in the Chivi region of Zimbabwe, the development and strengthening of institutional mechanism to support farmers' adaptation to environmental challenge will reduce the resultant impact from the environment. The relevance of strong institutional framework cannot be over emphasised because institutional development has been noted to be contributory to a country's long term development (Catrinescu *et al*, 2008). This includes establishing the 'rules of the game' or framework in which constraints of economic agents can be ascertained for the overall good of the society.

International Monetary Fund-IMF (2003) observes that institutions as a concept can be demystified in relation to the overall good of the society. Institutions that will promote growth and development of the society are such that will promote private property rights protection and those that will uphold the rule of law, reduction of corruption and enhance equality in accessing social goods. These will enhance water access as the public interest is been upheld rather than the good of the political elites (*cabals*). This is especially in the case of Nigeria, where funds allocated for development projects are siphoned by some public agents, which explains the poor infrastructural development in the country.

The role of private sector in participating in the provision of infrastructure such as water provision, distribution and utilisation can enhance households' access to water. Also, the participation of the government in infrastructural development will reduce the sunk cost of private sector participation in water provision. The reduction of the sunk cost will make cost of accessing water cheaper and provision of water readily available. All these will translate to improved water access.

3.2   The Econometric Model

Taking this further this study assumes that holding other exogenous variables constant, access to water can be influenced by many other factors peculiar to the household member. This is because the demand for water will be explained by their quest to access water with the aim of increasing their utility function, other things being equal.

The utility derived by the household member from the consumption of water is defined as j, and the stochastic process that generates the demand (consumption) of a household member is given as:

$$U_j = U(H_h, e_h) \qquad (1)$$

Where U_j is the utility derived from the consumption of water, which in turn will affect the demand for water. H_h are the observable characteristics of the household member and e_h is a mean-zero disturbance term.

Given that water access can be influenced by the extent of demand for water and the household member characteristics (such as age, sex, marital status, education and employment status), where other exogenous factors are held constant, then the demand function for water by the household member can be written as:

$$WA_h = U_j + H_h + e_h \qquad (2)$$

Assuming there are two options available to a household: 'j' high water access and 'k' low water access. The household being a rational economic agent will prefer option 'j'. However, this may not be the case at all times as demand will be relative based on the extent of other household characteristics (HH). These include the size of the household, location of the household, household poverty, and religion of the household. Therefore,

$$U_j = f(HH). \qquad (3)$$

Incorporating this in equation (2), we will have the functional expression as:

$$WA_h = H_h + HH + e_h \qquad (4)$$

Therefore a household 'i' will choose option 'j' instead of 'k' when the demand of the household for water is high:

$$WA_{ij} > WA_{ik}, k \neq j \qquad (5)$$

However, the concept of water access can be decomposed for measurable discreet choice. In this case, water access is measured as the number of minutes spent for the household to collect water inclusive of waiting time. The study builds on the WHO/UNICEF (2008) definition of low water access as when a household spends 30 minutes and above to get water. In contrast, a household is said to have high water access when the time to get water is less than 30 minutes. Thus, this study categorises the time spent into two major categories to better explain access to water (i.e. WA = 1 when time spent to access water is more than 30 minutes and 0 when less than 30 minutes).

Incorporating these in the logistic model, the ability to access water by the household, choosing alternative WA_{ij} is:

$$WA_{jk} = \sum_{m=1,n} \beta_i X_i + \mu_{ijk} \qquad (6)$$

Where, 'j' and 'k' are the two alternatives choices low water access (0) and high water access (1). 'm' is an index that represents 1 through 'n' variables and μ_{ijk} is the error term that is associated with the equation. X, are the sets of explanatory variables in the model.

Equation *(6)* can be rewritten to include the unobservable random variable of the difference in the two options. Thus, equation *(4)*:

$$y_t^* = WA_{ij} - WA_{ik} = q_i + r_i = \sum_{m=1,n} \beta_i X_i + u_{ijk} \qquad (7)$$

Where $\beta_i = \beta_{ij} - \beta_{ik}, u_i = u_{ij} - u_{ik}$, and $X_i = 1$. The outcome from the decision making process is presented as:

$$y_t = \left(1 \; if \; U_{ij} > U_{ik} \; or \; r_i > -q_i \; or \; 0 \; otherwise \; \right) \qquad\qquad (8)$$

The logic behind these assertions is discussed as herein.

Characteristics of Household Members

The age of the household members can influence their level of experience (Deressa *et al*, 2010; Mudzonga, 2012). This can affect their ability to deal with environmental issues such like climate change and extreme weather conditions-drought (e.g. Gbetibouo, 2009). However, relating this to water access is not farfetched as older household members can use their experiences from past occurrences of low water access to improve on their current access to water.

With regards to the sex of the households' member, the male gender is generally expected to be more energetic, which can impact the time spent in getting water. Some studies have observed that in West Africa, women have fewer resources available to them and may be discriminated against from certain forms of benefit as this create a 'loss of face' for men (Maddison, 2007; Fenske, 2011). This implies that male households' member will have better access to water than their female counterpart. However, some other studies have observed that households' welfare tend to increase with female headed household than male headed household (Shaikh, 2007). This will be taken up in the empirical analysis.

The marital status of the households' member can affect their demand for water. A non married households' member may have much demand for water compared to a married households' member. By this, a married households' member will seek for ways of cushioning the effect from water outage. This implies that a married households' member will have better access to water.

The place of education and enlightenment in water access are essential as they will influence both the accessibility and usage of water. This is because as education of the households' increases their ability to seek for ways to mitigate water challenges also increases. Extant studies (e.g. Maddison, 2007) have observed that the education of the households' explains the households' action towards curbing environmental challenges. Mudzonga (2012) have also reiterated similar stance for Zimbabwean households', where the author found out that the education of the households' can positively and significantly influence their ability to adapt to environmental challenges. In similar light, De Jonge (2010) also found that farmers who have university education are more likely to respond to environmental changes than those with primary education. Empirically, the education status of the households' has been observed to enhance their mitigation of environmental challenges such as water accessibility.

The employment status of the households' member (whether employed in the agriculture or non agriculture sector) can influence their access to water. A households' member employed in the agricultural sector can improve their experience and mitigation strategies against environmental challenges such as low water access. Some studies (e.g. Hassan and Nhemachena, 2007) have reiterated that involvement of the households' in the agricultural sector can enhance their adaptation to environmental issues. This includes construction of wells, irrigative techniques and other source of water supply. On the same note, households' member with longer working hours may have lower water access. However, considering the time spent in fetching water, a households' that has longer working hours may seek for strategies to reduce the time spent in

fetching water since they lack the luxury of time. This conundrum will be resolved in the empirical analysis.

The Households' member access to finance cannot be over emphasised with regards to water accessibility. Put differently, the households' member ability to adapt to environmental challenges can be enhanced by financial provision. This has been emphasised with regards to climate change (e.g. Maddison, 2007; Deresa et al, 2009; Fosu-Mensah et al, 2010 and Fenske, 2011) because access to finance creates the 'financial muscle' to withstand environmental challenges. This study decomposes access to finance as formal and informal access. This is in relation to the cost of loan and protocols required to access finance. The lending rate in the formal financial sector is costly for most households' compared to the informal financial source. For instance, between 2000 and 2010, the lending rate in Nigeria's banks range from 16.90 to 24.77 percent (World Bank, 2012). The difference between formal and informal financial sources will impact on households' access to finance and subsequent utilisation of fund for dealing with environmental challenges such as water access. The credit from the informal institution such as: *esusu*, *adashi* and *ajo* are cheaper for the households. Some of these informal institutions do not require collateral from their members before they can access loans. Thus, we expect household with access to informal finance to be able to have more access to water.

Households' Characteristics
In this case, the households' characteristics include the households' size, households' religion, households' poverty, residency of parents in households' and households' settlement location. Some studies observe that larger households' can divert their labour time to other activities (Mano and Nhemachena, 2006) apart from fetching water for the households'. However, others (e.g. Gbetibouo, 2009) have noted that larger households' can easily weather environmental challenges. The connotation from this is that larger households' will have more manpower to fetch water compared to smaller households'.

The religion of the households' is included from general knowledge that the demand for water may vary across religion based on their usage of water for worship. For instance, the Muslims use water for ablution. This is compared to other religion that may not require water for worship. However, religion can have an influence on households' access to water.

The residency of biological parent will influence the households' access to water because a household that has biological parent living in same household will enhance their level of experience to weather water challenge. This is because the presence of the biological parents in the home will bring to fore their experiences on how they have been able to solve similar issues. With this, the household will experience marginal impact from water challenge.

The amount spent on consumption of non-food items is considered as a measure of households' poverty level. The households' poverty level will influence their financial capacity to enhance their water accessibility. This implies that a poorer household even when they demand for high water access will be constrained because of finance.

The settlement of the households' also matter with respect to their access to water. The typical problem of the rural area is poor infrastructural facility. By this, households' dwelling in the rural area may suffer from low access to water compared to their counterparts in the urban areas.

In extant literature, the above has been controlled for based on the location of the households' (e.g. rural and urban dwellers). The reason being that infrastructural development in the settlement area of the households' will influence the extent to which such they can adjust to environmental challenges.

4. DATA

The data was sourced from General Household Survey by the National Bureau of Statistics in Nigeria-NBS with partnership from World Bank-WB (here after refer to as NWBGHS). The NWBGHS survey relates to agriculture activities along with other households' characteristics such as socio-demographic, education, employment/income activities, among others. The survey data spans the 36 states of Nigeria and 5,000 households. In all over 27,000 household members are covered in the data.

Table 4.1 presents a description of the data from the NWBGHS. From the survey, the households' with high water access constitute about 47.58 percent of the sample.

Table 4.1 Frequency Distribution of the Selected Variables

(A)		Percent
Water Access	High=1	47.58
	Low=0	52.42
Settlement of Household	Urban=1	28.57
	Rural=2	71.43
Sex	Male=1	50.17
	Female=2	49.83
Marital Status	Married=1	23.63
	Not Married=2	76.36
Religion of Household	Christianity=1	49.84
	Islam=2	49.18
	Traditional=3	0.95
	Others=4	0.03
Residency of Biological Father	Living in same Household=1	53.37
	Not Living in same Household=2	46.63
Employment Status	Agriculture=1	55.98
	Non Agriculture=2	44.03
The Employer	Self Employed=1	79.14
	Not Self Employed=2	20.87
Credit from Formal Financial Institution	Yes=1	3.66
	No=2	96.34
Credit from Informal Financial Institution	Yes=1	17.54
	No=2	82.46
(B)		Mean
Age	Age since last birthday	23.28
Working Hours	Number of Hours Worked in Past Seven Days	39.65
Consumption	How much was spent in the last seven days in purchases	294.14
Hsize	Household Size	4.13

Source: Authors' computation using NWBGHS (2011).

This is compared to 52.42 of the households' that have low water access. About 71.43 percent of the members of the households' are rural dwellers while 36.24 percent are urban dwellers. 50.17 percent of the respondents are male while 49.83 are female. On the average, there are about 4 persons leaving in the household.

The information in Table 4.1 reveal that majority of the respondents are not married (76.36 percent). Only 23.63 percent of the respondents are married. A large proportion of this group have their spouse leaving with them (95.64 percent). Many of the respondents belong to either Christian or Islam religion (49.84 and 49.18 percent respectively). A larger proportion has their biological parents leaving in the same household (53.37 percent).Majority of these respondents are employed in the agricultural sector (55.98 percent) and many of them are self employed. Only 20.87 percent of them are not self employed. This statistics include those employed in private and public enterprises such as ministries and government owned enterprises. Many of the respondents do not have access to financial credit-either formal or informal-and those that have access rely more on credit from informal institutions. This account for 17.54 percent of the respondents compared to 3.66 percent for credit from formal financial institution.

The average working hours of the households' member was 39.65 hours during a week, which is somewhat less than the 40 hours of the International Labour Organisation (ILO)'s standard. The consumption pattern of the household measured as the amount of money spent on non-food items is about ₦294.14. Converting this to US dollar, it means that, on the average, the households spend about 1.96 US dollar per seven day, which is far below the international poverty line of 1 US dollar per day[2].

5.0   RESULTS AND DISCUSSIONS

The multinomial logistic regression model was used to identify factors that can influence access to water in Nigerian household. The results presented in this section contain the marginal effect and the elasticity of the continuous variables was used. The marginal effects of a variable x on an alternative m is the probability of an individual I to choose the alternative m in response to the changes in x.

The probability values of the Wald statistic in all the columns of Tables 5.1, confirm that the models have good-fit owing to the fact that they were all significant at both 1 percent. The results from the Table show that a female household member has less than 1 percent chance of having access to water. However, this result is not significant at the various columns of row 1. This implies that gender is not a significant factor in determining access to water in the households.

The statistics of the age variable as presented in all the columns of the Table 5.1 was not significant at its contemporaneous value. However, when the squared value was examined, the result shows that older household member have significant higher access to water. The elasticity associated with this variable range between 0.027 percent and 0.086 percent. This can be associated with the level of experience that comes with age, which has positive influence on weathering environmental challenges-in this case, water access. Therefore, older household member tend to be better experienced in dealing with environmental challenges. Similar finding was observed by Gbetibouo (2009) and Deressa *et al (*2010).

The marital status has significant capacity of explaining access to water in the households. The statistics from the Table reveal that the household member that is unmarried has a higher significant chance of accessing water. The effect of this is that being unmarried will improve the

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[2] Responses on amount spent on food items were scanty in the data; hence, amount spent on non-food items was used. The exchange rate used was 150 naira to a US dollar.

marginal likelihood of accessing water within the range of 4.1 and 4.3 percent. The household member who has never been married may not have other dependents leaving with them, that can assist in fetching water and by this; they tend to be more cautious in the usage of water. Taking this further, the sign of the household size also validates this assertion as the statistics reveal that the marginal chance of household with more members accessing water tend to be lower. The p value was not significant and it implies that the size of household cannot significantly explain water access.

Table 5.1   Marginal Effect from Logistic Regression (Dependent Variable-Water Access)

	1	2	3	4	5	6
Sex	0.0062	0.0047	0.0052	0.0042	0.0046	0.0049
	(0.5700)	(0.6750)	(0.6440)	(0.7060)	(0.7860)	(0.6660)
Age	-0.0244	-0.0242	-0.0271	-0.0250	-0.0059	-0.0238
	(0.2530)	(0.2610)	(0.2140)	(0.2490)	(0.8560)	(0.2710)
Age2	0.0077***	0.0077***	0.0086***	0.0076***	0.0027	0.0075***
	(0.0810)	(0.0840)	(0.0680)	(0.0880)	(0.6960)	(0.1060)
Marital Status	0.0423*	0.0423*	0.0406**	0.0410*	0.0417***	0.0428*
	(0.0060)	(0.0030)	(0.0120)	(0.0080)	(0.0760)	(0.0080)
Employment Status	-0.0433*	-0.0440*	-0.0435*	-0.0436*	0.0087	-0.0440*
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.6340)	(0.0000)
Employer	-0.0415*	-0.0424*	-0.0429*	-0.0450*	-0.0769*	-0.0426*
	(0.0040)	(0.0030)	(0.0030)	(0.0020)	(0.0000)	(0.0030)
Working Hours	-0.0008**	-0.0009*	-0.0009*	-0.0008**	0.0010**	-0.0009*
	(0.0150)	(0.0090)	(0.0080)	(0.0130)	(0.0510)	(0.0090)
Credit from Formal Financial Institution	-0.0470	-0.0476	-0.0468	-0.0487	-0.1220	-0.0473
	(0.3060)	(0.3030)	(0.3110)	(0.2940)	(0.1400)	(0.3060)
Credit from Informal Financial Institution	-0.0680*	-0.0683*	-0.0685*	-0.0669*	-0.0351	-0.0683*
	(0.0010)	(0.0020)	(0.0020)	(0.0020)	(0.2710)	(0.0020)
Household Settlement		-0.0045				
		(0.7380)				
Residency of Biological Father			-0.0064			
			(0.7030)			
Household Religion				-0.0665		
				(0.1600)		
Household Consumption					0.0110**	
					(0.0160)	
Household size						-0.0013
						(0.9080)
Pseudo R square	0.0052	0.0052	0.0054	0.0054	0.0078	0.0052
Wald	53.1700	53.2900	55.7500	55.3300	34.7100	53.1900
Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Obs	7659	7659	7652	7652	3344	7659

Note: The probability values are in parenthesis.
Superscripts [a], [b] and [c] denote significant at 1, 5, and 10 percent, respectively.
Source: Authors' computation.

Statistics from the Table reveal that household member employed in the agricultural sector have better chance of weathering water chance of weathering water challenges. This is not far-fetched as they have the capacity to construct wells and create other channels to enhance their access to water. The coefficient from the Table reveals that they have about 4 percent significant chance of accessing water compared to household member employed in other sectors. From a similar standpoint, household members engaged in the agricultural sector are more familiar with ways of

coping with environmental challenges such as irrigation and other source of mechanised water provision. This depends on the extent of technology penetration as well as institutional framework to support them. However, other source of traditional means of accessing water such as digging of well and ponds is prevalent in the agricultural sector and this can explain the sign and the significant level of the variable.

The employer of the household members also has a significant role to play in their access to water. The results in Table 5.1 also inform that the household members who are self employed have better chance of accessing water by about 4 to 7 percent. In the routine, the peak periods especially for water demand are morning and evening. Those household members that are not self-employed will have to fetch water at these periods. And the queue may be longer compared to the non-peak periods (afternoon). The households' member that is self employed can take advantage of the non-peak periods to fetch water. At this period, the queue is lesser and the waiting time to fetch water is reduced. The statistics of the number of hours spent at work, reverberated the fact that longer working hour has a negative significant impact on the household access to water. This implies that higher hour worked by the household member will reduce their probability of accessing water by a marginal likelihood value of less than 1 percent.

The results in Table 5.1 reveal that households with more access to finance have a higher chance of reducing water challenges. This is in line with similar findings by Deresa *et al* (2009), Fosu-Mensah *et al* (2010) and Mudzonga (2012) that household accessibility to finance can enhance their coping mechanism with environmental challenges. An interesting outlook is also observed from the Table: the household accessibility to water varies with the source of credit. As evidenced by the sign and significance levels, access to finance was negative and not significant for credit from formal institution but significant for the informal financial source. The implication of this finding is that households that have access to finance from the formal financial institution will have a higher chance of accessing more water, but not as significant as those that utilise the informal financial institution. This is not to unexpected as the terms of accessing credit from formal financial institution is tedious and may not allow majority of households to significantly utilise such funds for water developmental purpose like the construction of boreholes. The policy relevance of this is that government intervention in enhancing the accessibility of finance from the formal financial institution (especially with regards to rising interest rate and burdensome conditions for loan access) will greatly impact the households' coping with environmental challenge, in this case access to water.

Other households' characteristics such as the religion of the household, the settlement area of the household and the biological father of the households head living in the same households are not significant in explaining the household access to water. The poverty level of the household-measured by household non-food consumption- had the expected positive sign and significant at 5 percent. This result implies that the probability of the household having access to water increases with their level of income. This follows the understanding that household with higher consumption pattern, have higher income level and will be able to access water because they have the financial wherewithal to reduce the burden of water challenges.

6   Summary of Findings and Conclusion

The study examined the factors determining the household access to water in Nigeria, holding other things constant. The micro-level data from the General Household Survey conducted by the National Bureau of Statistics of Nigeria in collaboration with World Bank was used.

The results from the empirical estimation reveal that the main determinants of household access to water are the individual household member characteristics such as the age of the household member, the marital status, the sector where the household member works, the type of employment, the number of working hours, access to informal means of financial credit and the income level of the household.

These findings will be useful for planners and policy makers especially in the construction of infrastructural facilities in Nigeria. The basic factors that should be considered should include the age of the populace and other household member characteristics as pointed out in the empirical findings. Infrastructural facilities should be developed in such a way that queuing time is reduced and household member who may not have much time during off peak hours can benefit from such infrastructure. This calls for more water access in the form of boreholes among others.

Despite the relevance of the findings of this study, some weakness avails: this partly has to do with the nature of data. Some basic household characteristics such as education level of the household member, the number of male to female in the household, expenditure on food was either completely missing in the data or was scanty. However, the reason for this goes beyond the capacity of this study. Therefore, future research using other dataset can take this up.

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