Determinants of Safe Water Consumption among Households in Numan Local Government Area, Adamawa State

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ABSTRACT

The importance of water to man and economic growth is a yet to be exhausted in academic literature. Water can be defined as a colorless, tasteless and finite substance. A healthy population will produce a healthy workforce. A healthy work force will therefore positively contribute to the gross domestic product (GDP)in a country. It is against this backdrop, this study underscores the determinants of household water consumption and also, to examine the relationship between factors that determine household water consumption in Numan Local Government Area (LGA)of Adamawa State, Nigeria. The study sourced data using primary method of data collection through administering structured questionnaire, interview and focus group discussion. Data collected was analyzed using Ordinary Least square (OLS) model and descriptive statistics like bar charts. The study anchored on the Absolute income hypothesis introduced by Keynes. Determinants considered in the model includes income, age, expenditure on water, family size and education. The OLS result show the coefficient of income being -0.000739 suggests that a 1 unit increase in Income will lead to a 0.000739 units decrease in average quantity of water consumed, and it is statistically significant in explaining average quantity of water consumed at 5% level of significance. The coefficient of age being -1.634210 suggests that 1 unit increase in age will lead to a 1.634210 units decrease in average quantity of water consumed for the family. The coefficient of family size being 15.44506 suggests that a 1 unit increase in family size will lead to a 15.44 units increase in average quantity of water consumed. The results from the study reveal that occupation of households in the study area showing that most households are business men and women (42.7%),famers(35.4%) and civil servants(8.3%). The study concludes that water-borne disease is a major cause of death in Numan (LGA) and most LGAs in Adamawa state. The study recommends an increase in budgetary allocation to the water ministry by the state government. Furthermore, the study also, recommends sensitization to households in Numan Local Government Area and Adamawa State at large by government and stakeholders on the need to consume clean water and avoid vandalizing water infrastructures in the state.

INTRODUCTION

Water is very important to humans, plant and animals. Water is also useful in achieving economic growth and sustainable development. According to Atiman, Adewusi and Zummo (2022), Up to 60% of human body is water and about 70% of the earth's surface is water. Kagu and Maidugu(2001) are of the view that water plays a crucial role in promoting health, hence a life wire. Akram (2020) also agree that safe drinking water is one of the basic human needs and poor drinking water is directly associated with various waterborne diseases.

The growing population and urbanization have become obstacles for adequate access and availability of water to households in developing countries including Nigeria. According to Juryilla(2015), access to water become complicated due to lack of household data on consumption levels which will assist government plan for water provision in both urban and rural areas.

According to World Water Council (2000) cited in Umar(2012.) , affirmed that water crisis is prevalent in urban areas. Oruonye(2008) also, posited that water problems rise from two major factors: First is distribution of water in time and space in relation to the needs of people. Second, is the failure of planning and management of the water resources to ensure temporal and spatial convergence between demand for and supply of water.

Also, Sule (2003) opined that by year 2030 , there will be 50 % increase in demand for domestic water and that more than half of the world population especially the poor nations will face severe water shortage.

The need to achieve adequate provision of portable water supply has been recognized by governments and development agencies all over the world. This is attributed to its importance in so many aspects of human life like health, dignity, economic growth and development.

The importance of water to man also led to the inclusion of a specific water-related target in the Millennium Development Goals (MDGs) and the sustainable Development goals (SDGs) Atiman, Adewusi and Zummo (2022).Investigation by WHO(2005) cited in Global Development Network (2013) revealed that 1.8 million people die globally every year as a result of diseases caused by unclean water and poor sanitation. There is urgent need to address water shortage and unclean water consumption among households in every community and city. What is obtained in most developing countries is persistent shortage in water supply to meet increasing demand for water leading to sanitation crisis and increase death rate from unclean water consumption (Boniface, 2021). It is against the backdrop, this study is carried out to achieve the following objectives:

1. Examine the determinants of household water consumption.
2. Examine the relationship between determinants of water and water consumption.

The demand for clean water is fast increasing at a rate greater than the world's population growth. According to Boniface, Joshua and Bala (2020), as population and urbanization increase, the challenges faced by public authorities in developing economies to provide clean water also increase in scope; The provision of basic utilities such as electricity supply, good and well planned urban road networks hinder the provision of portable water to households; Another hindrance is lack of political will from the part of government of most developing countries.

Nura et al., (2020) in a study titled Water Consumption Determinants in Rimin Kebe Area, Ungogo Local Government Area , Kano State, Nigeria. The study investigated the major determinants of water consumption in the study area using questionnaires. The study found family size, income level, and time travel to water source to be positively significant. The study also found that 34% of residents in the study area trekked more than one hour to source of water and 70% had little or no western education.

Wojdalski, et al (2013) conducted a study on Determinants of Water Consumption in Dairy Industry .The objective of the study was to analyze the correlation between water production factors ,equipment and water consumption. Results from the study found water consumption to be high in dairy plants. Results also showed that water consumption was most highly correlated with installed capacity of electrical devices. Fattahi, Alipourfard and Habibi (2013) also analyzed determinants of mineral water consumption in

Tehran. the objective of the study was to investigate the relationship between independent variables like age, education and household numbers and water consumption. Results from the dstudy showed that there is a direct relationship between mineral water consumption and educational level of consumers and found an inverse relationship between number of household and amount of mineral water consumption. Akram (2020) conducted a study titled Consumption of Safe Drinking Water in Pakistan .The study was to analyze the household preferences for drinking water sources and the adoption of household water treatment (HWT) in Pakistan. The study used the household survey data. The study found that people living in rural areas , those with older household heads, and large family size are less likely to use water from bottle or filtered water. The study also found higher income and women who enjoy higher level of empowerment are more likely to adopt water purifying methods at home. Whittington, Lauria and Mu (1989), in a study of water vending in Onitsha, Nigeria, observed that most households obtain their water supplies from well-organized water vending system that is operated by the private sector. In this city, on annual basis, households pay water vendors over twice the cost of piped water.

A similar study carried out by Whittington *et al.,*(1989) in Kaduna and Katsina, Nigeria shows that vendors charge as much as 20 times the unit rate of the respective State Water Agencies. In general, the poorest families pay more per month than some of the richest who can afford a connection to their compound or house. The amount, for a very limited volume of supply from private water vendors, can be four to ten times that of one month's continuous tap supply from public utility.

Joseph and Adelegan (2001) conducted a research on the investment appraisal of the privatization of water supply in Nigeria. The study employs the use of secondary data from 1999 first quarterly report of the National Water Rehabilitation Project which is IBRD funded. The study model investment into the rehabilitation project and also simulates the cost recovery pattern and profitability index with the attendant service delivery. The work sample covers ten Nigerian urban and sanitation centers.

Since water is a commodity in the natural monopoly market, its consumption depends on income all things being equal.Consumption accounts for a significant proportion of national income; hence, it is a vital ingredient to promote economic growth. Given the above, this study is anchored on the Absolute income hypothesis

LITERATURE REVIEW

The Absolute Income Hypothesis:

Keynes introduced Absolute Income Hypothesis (AIH) from the general Theory. He stated that consumption is a function of income . If income rises, consumption will also rise but not necessarily at the same rate. Absolute Income Hypothesis was further refined during the 1960s and 1970s notably by American economist James Tobin. The AIH is described using four pillars namely; Marginal propensity to consume (Mpc), Marginal Propensity to Save, and Average propensity to Consume (Apc) and Average Propensity to Save

The Concept of Water: Water is a unique commodity that is not only a physical good, but also a cultural and social resource with great economic and political significance which is essential to man, animals and plants (Balance &Tayloy, 2005). This has a long history from the beginning of human civilization people have settled close to water sources along rivers (river Nile that gave birth to the Neolithic Revolution), besides lakes or natural springs. Indeed, where people live some water sources are normally available for drinking, domestic use and possibly for watering animals (Hofkes, 1981).

Water demand refers to the demand for water to satisfy human needs. Household or domestic water demand refers to demand for water to satisfy needs like cooking, drinking, washing, bathing and general

sanitation.

Determinants of water consumption

There are several factors that determine water consumption. According to oyerinde and Jacobs (2022) several socio-economic, demographic and climatic factors influence the demand for residential and municipal water. Bradley (2004), also agree that a mix of socio-economic variables of the target population should be considered as determinants . This study therefore, will discuss determinants of water consumption as follows;

1. Price :Price of a commodity like water is expressed in two ways. i.e. Current price and future price. Price of water is the amount of money an individual is able to pay for a commodity including water. Price for water may sometimes be subsidized. According to Jurylla(2015), because water is a public good, most water authorities often charge price that does not reflect the full value of water . According to Whittington(2009), the contention among economist is whether price of water should reflect the full value.

2. Distance: Another factor that affects household water consumption is physical distance from source of water. According to Hikma(2012), distance involved in fetching water is inversely related to capital consumption of water. This means the farther the distance from the source of water, the lower will be the quantity of water consumption. One disadvantage of longer distance to fetch water is that the time which could have been used for other productive activity like schooling or trade will be used to fetch water. The World Health Organization Joint Monitoring Program on water and sanitation states that access to drinking water means that the source of water is less than 1 kilometer away from its place of use and that is possible to reliably to obtain at least 20 litres per member of a household per day

3. Income Level: income level is another factor in household water consumption. Purchase of steady clean and portable water requires a certain level of income. In developing countries, the percentage of low income earners is usually high. Consumption of bottle water for drinking and access to connection from a public utility requires relative income. For this rea son, high income earners consume more clean water than low income earners. Acoording to Schleich and Hillenbrand (2008), in developing world, income elasticity variables are prevalent for water determinants.

METHODS

The Study Area

Numan Local Government Area is among the 21 local government area in Adamawa State which was carved out from Gongola state.The predominant ethnic group in numan are the Bwatiye (Bachama) led by a first class king known as Hama Bachama who is the paramount ruler of the Bachama kingdom.

The dry season in numan is oppressively hot and partially cloudy while the wet season is also, oppressively hot and overcast. The average annual temperature fluctuates between 15^0 C – 37^0C. The major occupation in numan is farming and fishing.

Sources of Data / Analytical Technique

Data for the study was sourced from both primary and secondary sources. This means the method for data collection was both quantitative and qualitative. The instrument for the quantitative data collection used structured questionnaires divided into different sections in line with the research objectives and the qualitative aspect involved the use of Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs)

Model

This study employed the ordinary least square regression model. The model is given below as DW= β Ed+ βAg+ βHz+ βinc+ βex+ βocp + U_t............... .(1)

Where : DW= Demand for water

Ed= Education

Ag = Age

Hz = house size/ family size

Inc= Income

ex= expenditure

Ocp= Occupation

RESULTS AND DISCUSSION

Dependent Variable: AVQWCD

Method: Least Squares

Date: 12/10/23 Time: 08:58

Sample: 1 395

Included observations: 395

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	615.1560	83.87867	7.333878	0.0000
INC	-0.000739	0.000368	-2.007551	0.0454
EXP01	0.001074	0.002456	0.437141	0.6623
AGE	-1.634210	1.355463	-1.205647	0.2287
FMS	15.44506	10.59513	1.457751	0.1457
R-squared	0.637831	Mean dependent var		563.6886
Adjusted R-squared	0.007757	S.D. dependent var		380.2548
S.E. of regression	378.7771	Akaike info criterion		14.72435
Sum squared resid	55954110	Schwarz criterion		14.77472
Log likelihood	-2903.059	Hannan-Quinn criter.		14.74431
F-statistic	1.770067	Durbin-Watson stat		1.891733
Prob(F-statistic)	0.134065			

The result of the Ordinary Least Squares (OLS) regression analysis revels that income and age have negative relationship with average quantity of water consumed. On the other hand, expenditure and family size have positive relationship with the dependent variable – average quantity of water consumed.

The coefficient of income being -0.000739 suggests that a 1 unit increase in Income will lead to a 0.000739 units decrease in average quantity of water consumed, and it is statistically significant in explaining average quantity of water consumed at 5% level of significance.

The coefficient of Expenditure being 0.001074 suggests that a positive relationship exists between expenditure and average quantity of water consumed. The coefficient being 0.001074 suggests that a 1 unit increase in expenditure will leads to a 0.001074 units increase in average quantity of water consumed, however, it is not statistically significant in explaining average water consumed.

The coefficient of age being -1.634210 suggests that 1 unit increase in age will lead to a 1.634210 units decrease in average quantity of water consumed for the family. The coefficient of family size being 15.44506 suggests that a 1 unit increase in family size will lead to a 15.44 units increase in average quantity of water consumed.

The R^2 of the model being 0.63 suggests that 63% of the variation in average quantity of water consumed is explained by the variable modelled. The remaining 37% of variation is explained by all other variable not captured in the model. The Durbin Watson statistic being 1.89 is close to 2, and it suggests the absence of serial correlation among the residuals of the model.

DESCRIPTIVE STATISTICS

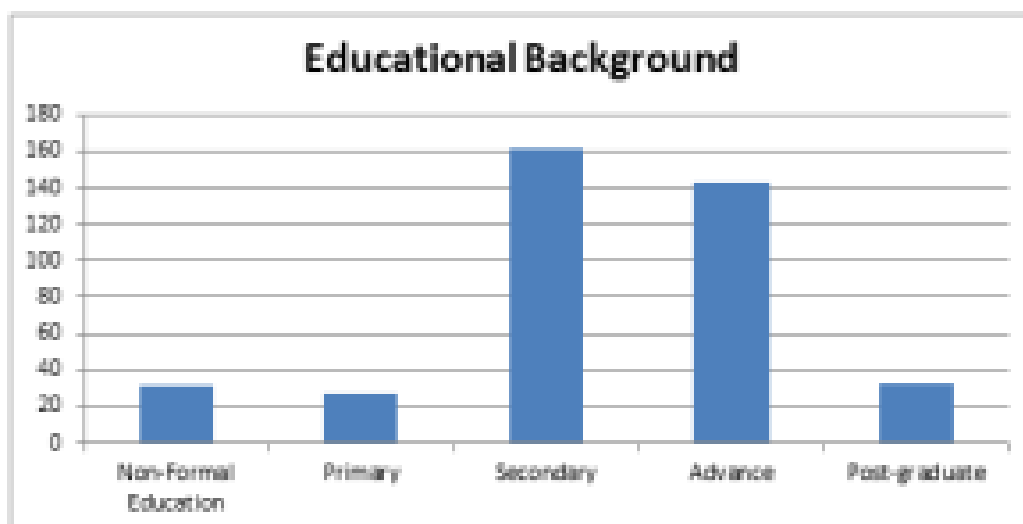**Figure 4.1:Education level of Respondents**

Figure 4.1 shows the educational qualification of respondents in the study area. The diagram reveals that most households obtained secondary education followed by those with diploma qualification. Some households also hold postgraduate qualification while others obtained primary education and a few had no formal education .However, findings from the study revealed that education does not significantly affect average daily water consumption by households.
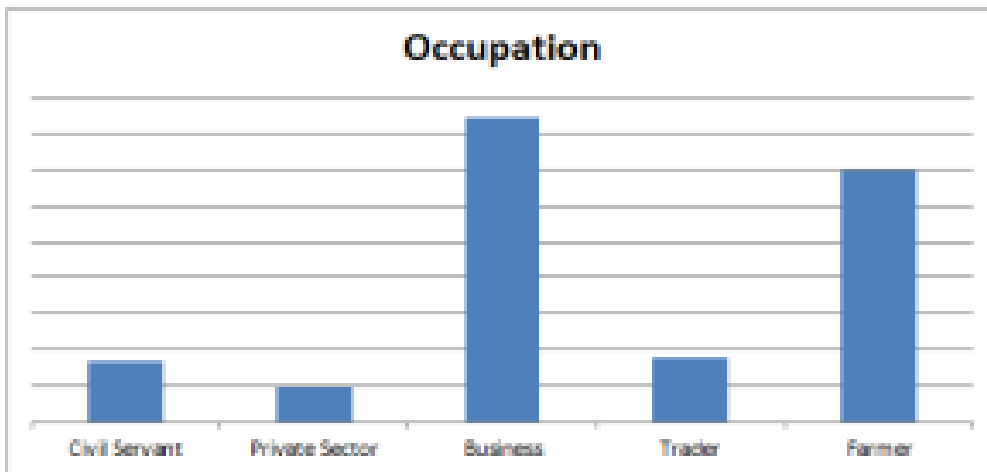
Figure 4.2: Occupation of Respondents

Table 4.2 shows majority of respondents in the study area are mostly business men and women while some are farmers and civil servants. Least among respondents are private sector workers. Furthermore, findings from the study reveal that occupation have no positive significance on average daily water consumption among households in the study area.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

This study was conducted using both primary and secondary data. The research was able to highlight the importance of water to man in relation to economic growth and sustainable development. The research was also, the study tried to examine determinants of water in relation to household water use for domestic purposes s like drinking, cooking, washing, bathing and sanitation.

Findings of the study reveal that households consume more water for drinking and bathing during the hot seasons and less during wet/ rainy seasons.

The research concludes that water demand exceeds water supply in the study area. The findings of the research show that a positive relationship exist between expenditure of households on water and the average quantity of water consumption daily. Findings from the study also, show that income is statistically significant in average quantity of daily water consumption at 5% significance level.The research concludes that the Adamawa State water board which is the agency saddled with the responsibility of water supply to residents in Numan LGA. The water system in Numan LGA is public sector oriented, controlled and management by Adamawa State Water Board. Findings from the research show that the machineries used by the water board are outdated and erratic power hinders its operation in meeting the water needs of the residents. Given the above, the research concludes that these factors. This caused residents to rely for water supply from other sources like water vendors, private boreholes, effort from children and family members who trek long distance and carry water in jerry cans ,buckets and containers.

Finally, the study recommends an increase in budgetary allocation to the water ministry. Furthermore, and sensitization to households in Numan Local Government Area and Adamawa State at large on the need to consume clean water and avoid vandalizing water infrastructures in the state.

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