ISSN: 2408-5405 (Print)
ISSN: 2635-3806 (Online)

NIGERIAN PSYCHOLOGICAL RESEARCH

Published by the Nigerian Psychological Association

Determinants of Household Utilization of Cooking Gas in Ibadan, Nigeria

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Abstract

Household consumption is a composition of valuables especially items which serve to measure perceived standard of living. Cooking gas is choice of consumption and global standard for healthy living. Against this backdrop, the study examined determinants of utilization intention of cooking gas among households in Ibadan. This study is hinged on Rational Choice Theory (RCT) and adopted survey exploratory design. Unit of analysis consisted of household classified into middle income and low income. Sample size was 600 and statistically determined. Data were collected and analysed quantitatively using close-ended questionnaire, descriptive and inferential parametric statistic. Study sample was selected using multistage sampling technique which consisted of purposive, random ballot, systematic and accidental. Demographically, 89.2% adopted cooking gas and mean age was 39.5. Determinants of utilization was classified by household-income, size, proximity and class. Mean scores were obtained for income (m=1.5); household-size (m=2.4); proximity (1.9); and class (m=2.6). There was possible occurrence of income, household size, proximity and class as determinant of cooking gas intention concurrently, income (R^2 =.78); household-size (R^2 =.50); proximity (R^2 =.67); and class (R^2 =.70) predicted household intention and utilization of cooking gas. Household intention of utilization of cooking-gas in Ibadan was majorly constrained by income despite overwhelming adoption of consumption choice. It is recommended that state policy intention should leverage household consumption of cooking gas for affordability.

Keywords: ***Cooking gas, household intention, income, proximity, affordability***

Received: 7th February, 2022
Revised: 14th July, 2022
Accepted: 15th August, 2022

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Introduction

Cooking gas is one of the household consumptions and constitutes household expenditure. The adoption of liquified petroleum gas (LPG) for household use is recognition of the contribution the natural resources made to safety environment and health (Adeyemi & Adereleye, 2016; Amoah, 2019). According to World Health Organisation (2019), cooking gas for household use not only ameliorates problem of global warming associated with fuel wood combustion and pressure of deforestation, it offers opportunity to healthy living which prevent health risk associated with fuel wood smokes. Africa was major area of focus in the global health agenda of WHO which intensified campaign for use of cooking gas (Bamiro & Ogunjobi, 2015; Batchelor, Brown, Scott & Leary, 2019). The latter part of the 20th century marked significant awareness of the importance of cooking gas. During this period, less than two quarter of Nigerian households had adopted the cooking method which offered healthy living (Bisu, Kuhe & Iortyer, 2016; Buba, Abdu, Adamu, Jibir & Usman, 2017). By the turn of the 21st century three quarter of Nigeria households had migrated to adoption and utilization of cooking gas (Danlami, Applanaidu & Islam, 2017). According to annual report of the World Bank, Africa in focus, adoption of cooking gas had reached nearly every household in Africa; Nigeria occupied leading country which offered easy accessibility and utilization (World Bank, 2019). The report also attributed that there was significant reduction in health risk associated with household cooking activity. The global health organization has been in the frontline campaign to promote household health in Africa through adoption of modern cooking fuel which preserves healthy living (WHO, 2019). Nigeria as member nation adopted roadmap to rollout cooking gas for every household through the initiative of safe environment and household healthy living (Suleiman, 2019). This was the policy promoted since inception of democratic dispensation at the turn of 21st century (Oyedepo, 2014).

Interestingly, more than three quarter households in Nigeria now utilize cooking gas and era of fuel wood as cooking method is gradually fading into extinction (Bisu et al., 2016; Danlami et al., 2017). Reports held that adoption of cooking gas cuts across urban and rural household and there are now retail gas spots that can be found every nook and cranny of Nigerian communities. This presupposes that urban and rural households, access and utilize cooking gas in whatever quantity, size and methods desired. According to report credited to Federal Government of Nigeria, availability and accessing LPG is priority and this policy of government is pursued logically to offer maximum satisfaction to citizens (National Population Commission, 2019). It is shown in existing studies that Nigerian households have fully adopted cooking gas as better alternative to healthy living (Bamiro & Ogunjobi, 2015; Megbowon, Mukarumbwa, Ojo & Olalekan, 2018; Ministry of Budget and National Planning, 2017; Ministry of Petroleum Resources, 2017). The writers in the foregoing argued that LPG is a way of life for many individuals not only because of accessibility and availability; cooking gas is also dominant culture for both middle and low-income households. The current socio-economic dispensation offers opportunities to Nigerian households to migrate from fuel wood source to cooking gas which made life suitable (Ministry of Petroleum Resources, 2017).

However beautiful the adoption of the new source, there are challenges that stare in the face. Studies have shown that capacity to sustain continuity is a major concern for households (Kumar, 2017; Malakar, 2018). The writers in this case expressed fear that household income inequality placed boundary of continuity and adoption of the new source. There is boundary of utilization in inflationary dispensation which pushed household income below ostensible goods (World Bank, 2019). Cooking gas is household commodity with substitute value despite consideration of healthy living it offers over other sources. Besides income, adoption of fuel gas is influenced by other factors. Literature works have shown that peer group, occupation difference, status group, resident location, belief system and family size contributed to utilization intention (Buba et al., 2017; Bisu et al., 2016).

Indeed, some scholars identified complete cycle of adoption and utilization of product (Joshi & Bohara, 2017; Kayode, Akhavan & Ford, 2015). These writers demonstrated that product service passes through phase of adoption, utilization, maximization and extinction. Essentially, new product service could reach extinction due to stiff competition and close substitute or price gap that likely shrinks demand (International Atomic Energy Agency (IAEA), 2005). Cooking gas is wide coverage in the Nigerian households and offers numerous benefits for users. The adoption covers both urban and rural users. Yet sustainability of adoption, utilization and maximization for households is not widely known. Similarly, leveraging the significance of income inequality, social factors influencing adoption of product service and product life cycle in the existing literature, it is possible to crosscheck relevance of scholarly works in the case of the current study. Interestingly, household utilization of cooking gas adds to vista of existing literature. This is the gap in literature.

Against the backdrop of the above, the study specifically examines determinants of utilization of cooking gas among households. Determinant factors in this study cover household intention, adoption, utilization, maximization and extinction. The study measures the variables using descriptive and inferential statistics.

Literature Review

Household cooking is a large consumer of energy which account for three-quarter of Nigeria's household energy (National Bureau of Statistics, 2011). Energy for domestic cooking in Nigeria primarily comes from burning traditional fuels such as wood, dung, coal, and other biomass variants that are inefficient and hazardous to the user while polluting and degrading the environment (of Petroleum Resources, 2017). Nigeria, as signatory to the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, developed the National Gas Policy (NGP) which, among other things, targets the promotion of liquefied petroleum gas (LPG) as a sustainable substitute for traditional fuels used for domestic cooking (Ministry of Petroleum Resources, 2017). LPG provides higher energy efficiency than traditional fuels, and it is cleaner and more ozone-layer friendly (Suleiman, 2019). Nevertheless, the total contribution of clean fuels such as LPG, electricity, natural gas, and biogas to domestic energy in Nigeria is less than 3% (Buba et al., 2017).

Nigeria is rich in natural resources and was estimated to have 198.7 trillion cubic feet (CF) of gas with a flare rate of 8.6% or 683 million standard cubic feet per day (SCFD) as at 2019 (World Bank, 2019). The potential demand for LPG, the monetary loss incurred by gas flaring, and the unfavorable health implications of using traditional fuels for domestic cooking are critical reasons for government intervention to replace traditional fuels with LPG in households (Kayode et al., 2015; WHO, 2019). However, the success of any policy and legal framework on household fuel transition depends largely on how it addresses the effective determinants of fuel choice (World Bank, 2019). The NGP and its policy tools, including the Domestic LPG Penetration Program (DLPGPP) focus on determinants items that can foster the transition to LPG by households nationwide (Ministry of Petroleum Resources, 2017). Scholarly works focused on the attributes of consumers' choice of household fuel such as income and demographic issues. Some studies identified aspects of affordability and accessibility of LPG for consumers, LPG choice, fuel transition, substitution and LPG adoption that help in assessing or supporting the domestic LPG adoption policy (Adeyemi & Adereleye, 2016; Amoah, 2019; Bamiro & Ogunjobi, 2015). There is coverage limitation in the existing literature which requires inclusion of the current study location to expand existing literature.

Conversely, the sociological significance of household intention or adoption of cooking gas is derived. Using the rational choice theory propounded by Coleman in 1975, there are social mechanisms which interplay to

modify choice of adoption. The theory states that individual is rational social being that consciously maximises gratification of benefits in the cycle of social interaction (Ritzer, 2016). Society is composed of social goods and this offers plural choice or alternative from which rational individual derives benefits. But rationality offers leverage to gauge gratification depending on placement in the pyramid of social class. The higher social class is placed the better gratification derived. Rational choice therefore operates consumption principle in the cycle of social goods which provides leverage to vary gratification depending on social class (Giddens, 2016). In this case, social goods like cooking gas is choice and there is gratification or rationality in the adoption. Household intention therefore differs depending on class position, demographic difference and geographic location.

Methodology

This study adopted exploratory survey design. Households in urban and semi urban location in Ibadan were surveyed using pilot study design. The survey consisted of 200 households identified; and 100 households were selected from each urban and semi urban location in Eleyele housing estate and Apete housing community respectively. Household-participants included permanent residents who had lived more than five years in the study location. Ibadan is a metropolitan city located in the South West Nigeria and lend credence to urban and rural population, socio-economic diversification and industrial estate. Sample size was 600 and this was statistically determined using Yamane formula given as $N/1+N(e^2)$. Size of households in the study location was estimated and given as 2450 (Oyo State Ministry of Housing, 2017), only 8.2% covering 200 households was accessed. Sampling procedure consisted of purposive, cluster, random ballot, systematic and accidental method. Study area was selected purposive since attributes of study objective were moderately fit. Study area was delineated into clusters of reachable households and marked by streets identification. There were 25 clusters each in Eleyele and Apete. Overall, 50 clusters were available. Random ballot was applied to select 9 clusters covering study area for manageable size. Households were systematically marked and picked for selection. Accidental method was applied to select at least 3 individuals from each household. Data were collected and analysed quantitatively using close ended questionnaire, descriptive and inferential parametric statistics. Data were input using computer aided software also known as statistical package for social sciences (SPSS version 23.0). Reliability of instrument was estimated using Cronbach estimate at 0.78 in test re-test method. Construct validity was applied.

Results and Discussion

Table 1: Regression Model Showing Household Intention on Adoption of Cooking Gas

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.524 [a]	.70	.016	.30315	.68	1.403	9	240	.187

a. Predictors: (Constant), income, family size, proximity, occupation and social class

The above Table is regression analysis of independent variables which consisted of income, family size, proximity, occupation and social class. The variables were defined as predictors and ed to cross check possibility to predict household intention. Regression estimate was derived at R=0.5 approximately. This implies that at least 50% possible chance or probability occurred when predictor variables and dependable

variable were merged. At the level of R square (R^2), the strength of regression or prediction occurred at 70%. This means that more than half or nearly three-quarter households in Ibadan leveraged income, family size, proximity, occupation and social class in adoption of cooking gas.

Table 2: Regression Coefficients (a)

Model		R^2	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
			B	Std. Error	Beta	B	Std. Error
1	(Constant)		1.031	.150		6.885	.000
	income	.78	.042	.040	.069	1.049	.051
	Family size	.50	.007	.016	.032	.418	.676
	Proximity	.67	.007	.021	.026	.353	.724
	Social class	.70	.017	.014	.085	1.245	.042
	Occupation	.59	.010	.016	.041	.613	.541

a Dependent Variable: household adoption of cooking gas

Table 2 offers supplementary discussion of the regression model. The Table isolated estimates for each predictor in the model. At the level of R^2, estimates were listed for income (.78), family size (.50), proximity (.67), social class (.70) and occupation (.59). Each independent variable offers significant boundary of prediction. But income and social class not only showed higher boundary of prediction, the items were also significant in the standard error $p<.05$ and $p<.042$. This implies that gradients of income and occupation were directly proportional to household intention. Therefore, adoption of cooking gas among Ibadan household was majorly moderated by income and occupation, although family size, proximity and social class interplayed as intervening variables.

Table 3: Descriptive Statistics

Items	Mean	Std. Deviation	N
Household intention of cooking gas	1.0560	.30535	600
Income	1.4760	.50043	600
Family size	2.4440	1.47225	600
Proximity	1.8520	1.07458	600
Social class	2.6400	1.53094	600
Occupation	4.1320	1.24933	600

Table 3 shows descriptive analysis of variables. Mean statistic or estimates were derived for each variable. At the level of household intention, variable attributes were classified into two class which consisted of intended adoption and non-adoption. Numeric value 1 was assigned to adoption and value 2 was assigned to non-adoption. Mean estimate was 1 and this indicated that household intention was dominant and widespread in the study location. Measuring at the level of income, classification consisted of middle income and lower income. Besides, household income was further classified into adoption intention and lack of intention. Class value consisted of 1 for intention and 2 indicated lack of intention. Again, mean estimate was 1.5. This value occurred in the boundary of adoption intention. Households in Ibadan were keen to adopt cooking gas, however intention varied depending on the level of income. Family size was classified into large and small size given the value 1

for large and 2 for small. The boundary of mean estimate was 2.4. Also, possibility of adoption occurred in the classification of small size households. Imperatively, household retention of adoption was more possible for small size family especially in the period of price irregularities. At the level of proximity, mean estimate was 1.9 approximately. There was occurrence of possible household intention which related to proximity and cooking gas adoption. Like other variables, social class (mean=2.6) and occupation (mean=4.1) similar revealed possibility of cooking gas adoption.

Discussion and conclusion

There is close knit model derivation in this study and existing literature. The current study showed that household intention or cooking gas adoption can be explained at multilevel analysis using income, family size, occupation, proximity and social class in urban and semi urban location. It highlighted that adoption of cooking gas choice was not precluded from household decision which revolved around interplay of factors. These factors occurred as subjective classification or objective classification. In the case of subjective, it operated at the level of derived factors such that households' decision was influenced by demographic characteristics such as income, location of residence which derived proximity, class status, family size and occupation. Yet, household decision was also imposed as objective factor. This was associated with household income and continuity intension especially during period of prolonged instability which sometimes push price of gas utilities beyond low-income household. Previous literature identified household adoption of cooking gas and policy intention (Amoah, 2019; Adeyemi, P. A., & Adereleye, 2016; National Bureau of Statistics, 2011).

This study not only identified adoption intention, it also classified subjective and objective derivation of household adoption of cooking gas. There was adoption intention prevalent for Ibadan households in the utilisation of cooking gas. However, household intention was predicted by factors such as income, occupation, proximity, family size and class. But income was vulnerable to hinder household intention despite benefits associated with cooking gas.

Against this background, a recommendation is identified. State policy intervention in public utilities such as cooking gas in Ibadan like other location should leverage household income to vary supplies as precondition for widespread adoption especially the low income. This is indispensable as precondition to achieve unbroken chain of household intention and utilisation of cooking gas. The scenario contributes to safe environment.

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