Expenditure Pattern, Poverty and Impact of Tobacco Expenditure on the Consumption of Essential Household Commodities in Nigeria: A Rural/Urban Context

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

Original Research Article

ABSTRACT

Smoking impacts the living standards of households in addition to its damaging consequences on the health status of households that use tobacco. Given a fixed household budget, the consumption of essential household commodities are affected by their decision to smoke or not, especially in low-income households. In this study, we carried out the analysis of household expenditure pattern, poverty levels and the impact of tobacco expenditure on household consumption of essential commodities using the Nigerian Harmonised National Living Standard Survey, 2010. We employed the Quadratic Almost Ideal Demand System (QUAIDS) under separable consumer utility and two-stage budgeting frameworks to establish if tobacco use causes substitution effect on other goods that are more beneficial to household welfare. The results show that the mean per capita household expenditure is higher among non-poor households compared to poor households. In contrast, a significantly higher mean per capita expenditure on alcoholic beverages, tobacco and narcotics was observed among extremely poor households suggesting complementarity between tobacco and alcohol. Also, extremely poor smoking households appear

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to spend more on medical care than non-smokers within the same poverty classification. Overall, poverty incidence was 68% and our model estimation showed that tobacco consumption is not separable from household consumption of some goods so that changes in tobacco expenditure affects spending on these commodities.

1. INTRODUCTION

Tobacco use does not only cause severe health problems, it aggravates the living conditions of economically less viable smoking households by reducing the total income available to them as a result of tobacco expenditure [1]. These adverse effects of tobacco use have both short and long-term dimensions with respect to reduction in disposable income and the future risks of morbidity and mortality [2]. While the overall impact of smoking expenditure on high income countries have limited effect on the living standards of smokers [3], the same is not the case in developing countries where the level of poverty is generally a concern. In a study by the World Bank Research Development Group (2008), over 1.4 billion people, or one quarter of the population of middle and low-income countries live below $1.25 a day [4].

Moreover, overcrowding living conditions, inadequate nutritional intake, tobacco use and poor sanitation are the major problems associated with urban slums and rural settings in developing countries. These living conditions are seen to aggravate the susceptibility to significantly higher disease burden [5]. Worse still, the economically less viable population are often uncovered by public health systems and affordable risk-sharing mechanisms (especially in the informal sector in the case of Nigeria) and as such these individuals depend heavily on out-of-pocket expenditures, which further drive many households into poverty [6].

Smoking is observed to be higher among the poor in developing countries from various research evidences [2]. Generally, about 84% of smokers live in low and middle income countries [7]. This coupled with the addictive nature of smoking makes the association between poverty and tobacco use a serious consideration for policy makers in low income countries since smoking expenditures represent a large proportion of household expenditure budget in these countries [8]. In most cases, poor smoking households relinquish the consumption of essential goods in order to consume tobacco with respect to the constraint placed by their meagre budget [1,3,9]. In essence, if tobacco expenditure causes poor smoking households to forgo the consumption of commodities that better their welfare, then smoking reduces the living standards of these households with more impact on children and women in a family setting which leads to intra-household resource distribution bias [9,10]. Also, quitting or reduction in tobacco use will redirect household expenditure towards basic necessities and hence improve the standard of living of individuals in the households where there are smokers [11,12]. According to Busch et al. [8], when a smoker quits smoking, it in addition to a long-term health benefit, frees up financial resources that benefits the entire household due to savings from cigarette consumption.

In Nigeria, the level of poverty has increased steadily since 1980 and even worse with the current fall in the price of crude oil in the world market and the drastic decline in the value of Naira to Dollar, a situation that has almost hit the economy of the country to a standstill. The poverty incidence as at 2010 was as high as 69%, estimated at about 112.47 million people living in poverty[1] [13]. Even so, poverty is felt more by children, youths and women compared to the male adult population [13], which again is a reflection of intra-households resource distribution deficiencies. Given the rising level of poverty in Nigeria, the effect of tobacco use in terms of impoverishment from hospitalisation costs as a result of tobacco-related diseases and higher opportunity cost associated with smoking expenditure will also increase.

Therefore with high smoking intensity among smokers [14] and increasing prevalence of tobacco use in Nigeria coupled with the deepening poverty level in the country, in

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[1] *A United Nations report in 2016 estimated the poverty incidence in Nigeria to be 64% (over 80 million people living below poverty line out of approximately 175 people). The report indicated that 37% of children under age five are stunted and 10% of the total population of 6-23 months infants have access to adequate nutritional intake based on the recommended infant and young children feeding practices. (see: http://dailypost.ng/2016/09/05/nigeria-one-poorest-countries-world-80m-living-poverty-line-un-report/)*

addition to other poverty alleviating programmes, attention can also be devoted to how a reduction in tobacco use can help economically deprived households to channel the fraction of their income used for smoking expenditures on other household necessities (clothing, food, education, insurance, health etc.) [15]. The revenue generated from increase in excise tax on tobacco products will also help the government in terms of lessening the effect of the fall in crude oil price.

Several studies have investigated the effect of tobacco expenditure on household expenditure on other basic necessities. Efronymson et al. [16] used data collected in Bangladesh to ascertain the effect of tobacco expenditure on the welfare of the poor population. They investigated the extent of tobacco expenditures in Bangladesh and looked at the potential investment on food and other items that are essential to the welfare of smoking households. This study showed that expenditure on smoking, especially cigarette, increased the burden of poverty among the study population [16]. Joy de Beyer et al. [17] studied poverty and tobacco use in the United States. Their study makes a case for a reduction in tobacco expenditure that causes an improvement in health and nutrition of the population living marginally below the poverty line.

A study conducted in Australia by Siahpush et al. [11] examined the differentials in the expenditure on restaurant food, health insurance, alcohol and gambling with respect to the smoking status of the survey population. The result in this study reflected a higher odds of expenditure on food and health insurance by non-smokers compared to smokers [11]. Also, Busch et al. [8] estimated a consumer demand system which included cigarette, food, alcohol, housing, apparel, transportation and medical care. Essentially, they reported that food expenditures increased as cigarette prices increased. They controlled for socio-demographic variables as well as possible heterogeneity and obtained evidence that suggests that tobacco and food are substitutes.

Some studies have also examined the risk of catastrophic health care expenditure and the potential risk of impoverishment as a result of borrowing and selling of assets to pay for medical bills. An example of such studies is the one conducted by Bonu et al. [15], where smokers were observed to have a higher exposure to distress borrowing, selling of assets and impoverishment form hospitalization costs. As such, smoking expenditures poses more threat on the standard of living of low-income households [1,16,18].

John et al. [2] quantified the impact of tobacco use and related medical expenditure on poverty in India. In their study, tobacco expenditure and associated medical expenditure attributable to smoking were deducted from household monthly consumption expenditure. They argued that this gave an appropriate value for household disposable income and were able to estimate the true level of poverty in India. They reported that accounting for direct expenditure on tobacco increases rural and urban poverty rates by 1.5% and 0.73%, respectively. This according to them affects approximately 15 million Indians altogether.

The effect of tobacco expenditure on households' expenditure on other essential commodities have been studied using numerous methodologies. While some of the studies primarily adopted non-parametric descriptive methodologies to investigate this relation, other studies adopted econometric models that enable the authors to achieve their respective study objectives. T-wu et al. [19] used cross-tabulations and regression analysis to investigate the differences in household expenditure with respect to whether a member of a household smoke or not. Their approach provided a simplistic analysis of smoking, living standard and poverty in China [19]. In another study carried out in China, the authors [20] estimated the impact of two tobacco-related expenditures on household poverty. They used a regression model of medical expenditure to ascertain this effect. Efroymson et al. [16] also conducted descriptive analyses of tobacco use and poverty by basically reviewing available statistics in Bangladesh. Joy De Beyer et al. [17] conducted a similar analysis in the United States. The relationship between tobacco use and child anthropometry in Bangladesh was studied by Best et al. [21]. The approach in this study was analytic and non-parametric like the ones described above.

Furthermore, some studies as mentioned earlier, adopted econometric models to investigate the empirical effect of tobacco expenditure on household living standards. Wang et al. [1] employed a Fractional logit model to examine the impact of tobacco expenditure on household consumption patterns in rural China. This model enable the authors to estimate this relationship while accounting for all the possible values of tobacco expenditure in the unit interval. In this model, it is easier to set the model so that values

on different expenditure intervals are considered, after adequate transformations.

The Fractional Logit model use the logistic regression as a link function, similar to binary logit model. However, it has been argued that this model do not account for endogenous explanatory variables and unobserved heterogeneous effects which are serious econometric issues. In Papke and Wooldridge [22], this limitation can be solved under strict and weak exogeneity assumptions using panel data techniques. Wooldridge [23], proposed the two-step control function technique in dealing with endogeneity concerns.

More so, the estimation of the effect of tobacco expenditure on household expenditure pattern should take into consideration the analysis of zero expenditure on tobacco which could either be a result of budget constraint or sheer abstention. Zero expenditure could arise as a result of infrequent purchase especially when using a cross-sectional survey [24]. This dichotomy is necessary because it has implication on econometric specifications, with zeros as a result of abstention requiring some transformations in the tobit specifications [24]. There is preference heterogeneity between non-smoking households and smoking households if zero expenditure occurs as a result of sheer abstention and vice versa [9]. The implication of this is that non-smokers derive no utility from smoking so that they are unlikely to use tobacco even if it is free. Essentially for the estimates to be unbiased and consistent, the preferences of households must be different [24]. Vermeulen [24] proposes a test of null hypothesis to ascertain if households demand depend on a binary variable 'd' that can either take value one or zero, depending on whether the household spent on tobacco or not. He defined the binary variable as a conditioning indicator which ensures that preference homogeneity is rejected if significant in the demand for other commodities. In the analysis of household preferences, it is a possibility that smokers and non-smokers have identical conditional choices over other goods in which case the null hypothesis is not rejected [24]. Also, the null hypothesis test described above is useful in checking for consumer separability[2] of the binary

indicator from the consumption of other commodities [24].

Furthermore, Vermeulen [24] argued that 'q' (the consumption vector of other n commodities) is separable from the binary indicator 'd'. When this assumption holds, then if a member of a non-smoking household decides to initiate smoking, there is an income effect. However, smoking initiation causes the same effect as an increase in price in consumer theory. Assuming that the households have a separable utility function and tobacco consumption is in 'q', in the analysis of a compensated demand function (Hicksian Demand), tobacco expenditure causes a substitution effect since consumers substitute away from the consumption of other commodities in order to initiate or increase smoking with the income level unchanged. The implication of separable utility function is that the marginal rate of substitution between any two goods in x^j is unaffected by the consumption level of any commodity not in x^j [25,26]. If a household has separabe preferences then the demand for a good in the household' consumption bundle depends on the expenditure allocated to all goods in the consumption set [25,26]. In this case, smoking initiation and increase in smoking intensity causes consumers to reduce expenditure on other basic household necessities in order to free up resources to smoke.

Vermeulen [24] tested this proposition using the Belgian household budget survey of 1987-1988. He adopted the Quadratic Almost Ideal Demand System from the works of Banks et al. [27] and estimated Engel curves derived from an eleven-good conditional demand system. He tested if null hypothesis of zeros generated by corner solutions could be rejected. The specified Quadratic Almost Ideal Demand System include household demographic characteristics, conditioning expenditure on tobacco ($P_t t$) and observed preference heterogeneity of smokers and non-smokers. The F-statistics table showed that seven out the eleven goods estimated had values above the critical value of 2.6. With this he was able to reject consumer separability which automatically rejects the null hypothesis of zeros generated from corner solutions.

John, Pu and Grieve [9,12,28] estimated a system of quadratic conditional Engel curves to

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[2] *Consumer separability according to Vermeulen (2003), indicates that some commodities may not be an argument in the utility function of some consumers so much that the binary indicator distinguishes between smoking and non-smoking households. This assumption is plausible because not all the households will smoke even if tobacco is free.*

However, it is also empirically plausible that price affects smoking initiation.

investigate the crowding-out effect of tobacco and alcohol expenditure on household expenditure pattern following the work of Vermeulen [24]. This framework supported consistent estimates of the effects of tobacco spending on household expenditure pattern after controlling for households socio-demographic characteristics and unobservable heterogeneity. However, in avoiding endogeneity bias with respect to the regressors in the estimated Quadratic Almost Ideal Demand Equation, John [9] tested for endogeneity using Wu-Hauseman test [29] for all the explanatory variables and found tobacco expenditure and total household expenditure to be endogenous for almost all the observations. He then used an instrumental variable (adult sex ratio) following the work of Keen [30] as a proxy for tobacco expenditure. Since in most countries males smoke more than females according to literature, households' adult sex ratio is expected to correlate with household tobacco expenditure but not do correlate with the error term. John [9] avoided contemporaneous correlation (correlation of response variable to the stochastic disturbance term) and therefore estimated the Quadratic Almost Ideal Demand System using Three-stage Least Squares (3SLS) method. Grieve [28] followed the same procedure but allowed the instrumental variable to correlate with the disturbance term.

In this study, we examine the expenditure pattern, poverty level and investigate if tobacco spending causes households to substitute away from the consumption of essential household commodities in other to smoke. Essentially, this study adds to existing studies by examining if tobacco spending has a substitution effect[3] on other household necessities under a separable consumer utility framework.

2. METHODOLOGY

This study adopted the Quadratic Almost Ideal Demand System developed by Banks et al. [27]. In addition, we assume that households have a separable utility function. The implication of this assumption is that the marginal rate of substitution[4] between any two goods in x^j (the consumption set) is unaffected by the

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[3] *A substitution effect in this case will mean that tobacco expenditures causes the same effects as an increase in the prices of commodities in modern economic theory.*
[4] *The marginal rate of substitution shows how much a consumption of one good has to change in response to an increase in consumption of another good holding utility constant.*

consumption level of any commodity not in x^j [25,26]. If a household has separable preferences then the demand for a good in the household consumption bundle depends on the expenditure allocated to all goods in the consumption set [25,26]. Essentially, any crowding out effects of tobacco spending would mean that it causes substitution effect, given a separable utility function and with respect to smoking initiation and smoking intensity.

2.1 Separable Utility Function

A utility function is separable if it can be written in the form:

$$U = U(U_1(x^1), U_2(x^2), \dots U_n(x^n)) \qquad (1)$$

where $x^1, \dots x^n$ form a partition of the available goods in the household consumption set. Given the prices of all the commodities in the consumption set, $(p_1, \dots p_n)$, the household maximizes its utility subject to the budget constraint thus:

$$\text{Max } U = U(U_1(x^1), U_2(x^2), \dots U_n(x^n)a) \quad \text{s.t}$$
$$\sum_{i=0}^{n} p_i x_i = E \qquad (2)$$

where E represents total household expenditure and a represents a vector of household characteristics. Solving for the maximizing quantities in equation (2), we derive the Marshallian demand curves as follows:

$$x_1 = h^i(p_1, \dots p_n,; a) = h^i(P, E, a) \qquad (i = 1, \dots, n) \qquad (3)$$

In theory, the separable utility function specified in equation (1) ensures that there is two-stage budgeting: the household first decides how much to spend on tobacco consumption and then allocate the remaining expenditure on other commodities in the consumption set. Recall the properties of a separable utility function, the consumption of other household basic necessities is affected when the total expenditure on tobacco increases and when a member of a non-smoking household decides to smoke. Therefore, assuming tobacco is the nth commodity and given that n-1 commodities form the consumption set of the household at prices $(p_1, \dots p_n)$. It is standard that the household has no control over the market prices and that household income is fixed. Given the addictive nature of smoking behaviuor, the household exercises two-stage budgeting so that total

expenditure on other commodities excluding expenditure on tobacco is given as:

$$M = E - p_t t \tag{4}$$

where $p_t t$ is total tobacco spending. The utility maximization problem is thus:

Max $U = U(U_1(x^1), U_2(x^2), \dots U_n(x^n)a)$ s.t
$\sum_{i=0}^{n-1} p_i x_i = M \tag{5}$

In equation 5, we recall consumer separability (preference heterogeneity) where tobacco consumption is not in the utility function of some households and the utility function of such households is not affected by any commodities (tobacco) not in its consumption set x_i. However, for smoking households tobacco expenditure causes them to substitute away from the consumption of other commodities. From equation 5, we derive the utility maximizing consumption set x_i as follows:

$$x_i = c^{i,n}(p_1, \dots, p_{n-1}, M, x_n; a) \quad such\ that\ i \neq n \tag{6}$$

$c^{i,n}$ represents the conditional demand function for consumption set x_i conditional on household tobacco expenditure as a result of the two-stage budgeting operated by households. The application of a separable utility function is ideal because It supports the assumption of consumer separability as developed in Vermeulen [24] since the utility maximizing quantities in the budget set of non-smokers is not affected by tobacco expenditure. Also, tobacco smokers and non-smokers are faced with equation (5) so that we can support the assumption that zeroes do not generate from corner solutions.

2.2 Quadratic Almost Ideal Demand System

Under the separable utility framework, we estimate expenditure shares using the Quadratic Almost Ideal Demand System (QUAIDS). Banks et al. [27] provided useful extensions to the Almost Ideal Demand System proposed by Deaton and Muelbauer [31]. The QUAIDS model establishes adequate framework for analysis of household reported expenditure and welfare in a way that is consistent with consumer theory. It provides an approximate analysis of the Engel relationship when using an individual level data since commodity share equations are quadratic in the logarithm of total expenditure. The proposition of this model was consequent upon a non-parametric analysis of consumer expenditure [27]. Banks et al. [27] were able to establish that Engel curves require quadratic terms in the logarithm of expenditure to avoid distortions as a result of falling to account for Engel curvatures. According to Poi [32], the QUAIDS is specified with expenditure shares as the dependent variables thus:

$$\omega_i \equiv \frac{p_i q_i}{E} \tag{7}$$

where p_i and q_i are the price and quantity of commodity i consumed by the household, and E is the is the total expenditure on all goods in the demand system. This specification ensures that M is:

$$\sum_{i=1}^{k} \omega_i = 1 \tag{8}$$

In equation (8), k represents the number of commodities in the demand system. The Quadratic Almost Ideal Demand System is derived from the indirect utility function underlining the Price-Independent Generalised Logarithm (PIGLOG) by Muellbaur [33]. The utility function is specified thus:

$$ln\,V(p, E) = \left[\left\{ \frac{(lnE - lna(p))}{b(p)} \right\}^{-1} + \lambda(p) \right]^{-1} \tag{9}$$

In the indirect utility function specified in (9), the budget shares in equation (7) is linear in log of total expenditure 'E' and $a(p)$ is homogenous of degree one in 'p', $b(p)$ and $\lambda(p)$ are homogenous of degree zero in 'p'. We therefore have the following restrictions:

$$\begin{aligned}
lna(p) &= \alpha_0 + \sum_i \alpha_i\, ln(p_i) \\
&+ \frac{1}{2} \sum_i \sum_j Y_{ij} ln(p_i) ln(p_j)
\end{aligned} \tag{10}$$

$b(p)$ is the Cobb-Douglas price aggregator, given as:

$$b(p) = \prod_{i=1}^{n} p_i^{\beta_i} \tag{11}$$
$$\lambda(p) = \sum_{i=0}^{n} ln(p_i) \tag{12}$$

The adding-up condition[5] specified in equation (8) is satisfied if the following holds.

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[5] *This restriction is not testable, but it is theoretically plausible in that it presupposes that the addition of all the quantities*

$$\sum_{i=1}^{k} \alpha_i = 1, \sum_{i=1}^{k} \beta_i = 0, \sum_{i=1}^{k} \lambda_i$$
$$= 0 \; and \; \sum_{i=1}^{k} \gamma_i = 0 \; \forall i \quad (13)$$

Since consumer demand functions are homogenous of degree zero in income (expenditure) and price and given the consistent preferences (Slutsky asymmetry) in consumer theory, we have:

$$\sum_{j=1}^{n} \gamma_{ji} = 0 \quad \forall i \quad (14)$$

$$\gamma_{ij} = \gamma_{ji} \quad \forall i \neq j \quad (15)$$

Having indicated the restrictions, Roy's identity is applied to equation (9) to derive the expenditure share equation in QUAIDS.

$$\omega_i = \alpha_i + \sum_{j=1}^{k} \gamma_{ij} \ln p_j + \beta_i \ln \left\{ \frac{E}{a(p)} \right\}$$
$$+ \frac{\lambda_i}{b(p)} \left[\left\{ \frac{E}{a(p)} \right\} \right]^2 \quad (16)$$

Following Banks et al. [27], we allow household tobacco expenditure $p_t t$ to influence preferences through the intercept in equation (16).

$$\alpha_i = \rho_{i0} + \sum_{J=1}^{S} \rho_{ij} a_j \quad (17)$$

where a_j represents jth demographic variables[6] 'S'. According to Pollak and Wales [34], this approach is adopted to include the demographic variables because of its simplicity

2.3 Empirical Model

As indicated in equation (17) above, household socio-demographic characteristics, tobacco spending and a variable'd' intended to capture consumer heterogeneous preferences influence the share equation through the intercept. We recall the two-stage budgeting in equation 1 such that we are able to estimate the following regression:

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consumed by a household is equal to reported expenditure at market prices.
[6] This variables are entered in the household expenditure share equation and are generally regarded as taste shifters.

$$\omega_i = (\alpha_{1i} + \alpha_{2i} d + \alpha_{3i} p_t t + \varrho_i a)$$
$$+ (\beta_{1i} + \beta_{2i} d) \ln M$$
$$+ (\varphi_{1i} + \varphi_{2i} d)(\ln M)^2 \quad (18)$$

where ω_i (defined in equation 8 above) represents the budget share of other commodities excluding tobacco expenditure. Parameter 'a' captures a vector of household demographics which includes household size, gender, age, geographical location, literacy/education, religion, and occupation of household head, and sector. Also, $p_t t$ and M are tobacco expenditure and total household expenditure less tobacco spending, respectively. If equation (18) is estimated without instrumenting[7] (using another variable in the data that is highly correlated with the variable it instruments) one of the explanatory variables, the ordinary least square estimate will be bias. Therefore, it is appropriate to establish if there is endogeneity bias using the Wu-Hausman specification test [35-37].

Furthermore, instrumental variables should necessarily not be uncorrelated with the stochastic disturbance term but should be strong enough to correlate with the covariate of interest [38,39]. However, if a weak instrumental variable is used, the instrumental variable estimator may produce estimates that are more inconsistent than the OLS estimator and this loss of efficiency can be substantial [38]. Previous studies [9,12,24,28,30] used the adult sex ratio 'R_i' to instrument tobacco expenditure $p_t t$ with the following restrictions are satisfied:

$$Cov \, (\, p_t t \, , R_i) \neq 0 \quad (19)$$

$$Cov \, (R_i, e_i) = 0 \quad (20)$$

Alternatively, an instrumental variable was constructed using Lewbel's estimator [40]. This estimator uses the second (variance) and third (skewness) moments of variables as instruments. Lewbel showed that if E_i is an element of matrix E, then $s_1 = (M_i - \overline{M}_i)(p_t t - \overline{p_t t})$ is a legitimate instrumental variable [40,41]. However, the Wu-Hausman specification test showed that tobacco expenditure, adult sex ratio

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[7]An instrumental variable must be correlated with the problem variable and at the same time, it must not suffer from measurement or correlate with any unobservable variables influencing the dependent variable. Otherwise, the OLS estimate will be biased towards zero. Formally, when there is measurement error or endogeneity problem, the instrumental variable is unbiased in large samples but may be otherwise in small samples.

and the constructed instrument were highly correlated but none of these variables was correlated to M, not even tobacco expenditure because all the categories of expenditures were independently reported. Therefore, we estimated Equation (18) using a Seemingly Unrelated Regression (SUR) framework without having to instrument tobacco expenditure and found the results to be consistent. The result of the endogeneity test is not reported in this paper.

2.4 Data

The data for this study was drawn from the Harmonised Nigerian Living Standard Survey (HNLSS) conducted in 2009/2010 by the National Bureau of Statistics. The HNLSS survey collected broad information on demography, health and fertility behavior, Education and skill training, employment and time-use, household income, consumption and expenditure on a broad category of commodities [13]. This survey adopted the Enumerated Areas demarcated by the National Population Commission during 2006 Housing and Population Census. The sampling frame of the survey included all the 774 local government areas in the 36 states in Nigeria and the Federal Capital Territory (FCT). A two-stage sampling design was used to systematically select 100 households in each local government from the primary sampling units (PSUs) for part A of the survey and 50 households were systematically selected from each local government in part B. Part A contained a welfare component while part B elicited information on household consumption and expenditure. Altogether, 77,400 households were enrolled for the study. The B component (the consumption approach) of the survey included 38,700 households that are nationally representative. This section of the survey was used for this study since it provided information on the expenditure of the households in Nigeria.

For the purpose of this study and to measure the poverty and tobacco use relation, we used household per capita expenditure to categories households into non-poor, moderately poor and extremely poor. Households with annual per capita expenditures that is greater or equal to two-third of the weighted mean per capital expenditure (WMPCE) was categorized as non-poor. A household is categorized as moderately poor if the households' annual per capita expenditure is less than two-third and greater than one-third of WMPCE while households with annual per capita expenditure less than one-third

of the weighted mean per capital expenditure is categorized as extremely poor [13]. All household expenditure were deflated using Consumer Price Index in line with equation (16) so as to avoid biased estimates as a result of regional and seasonal variations in prices of commodities.

3. RESULTS

Table 1 shows the socio-demographic characteristics of the households with respect to their poverty classifications. About 68% of the households reported annual expenditures that is below two-third of the weighted mean per capital expenditure and therefore were categorised as poor. Poor households are fairly distributed across the six geo-political zones with the highest number of non-poor households residing in the South-West region. Also, more households with no formal education fell within the poor group.

The socio-demographic characteristics of non-smokers and smokers are described in Table 2. The prevalence of smoking was generally low, but more smokers (82.8% of total smoking households) live in rural centres compared to urban. Tobacco use is the highest in South East and South-South zones compared to other zones of the country. The table shows ratio 6:1 between male and female smokers in Nigeria and smoking also increased with age after which it fell among respondents aged 65 and above. Like the result in Table 1, more households with no formal education fell within poor households and smoked more. Essentially, poverty level and smoking reduced as household attains higher level of education. Interestingly, smoking was the highest among married monogamous households in comparison to other marital status classifications.

In Table 3, the share of food in households' total annual expenditure is above 45% for all poverty classifications except for non-poor rural households (37.25). For food expenditure categories, rice in all forms, bananas and tubers and vegetables have the highest shares. Extremely poor rural households had the highest share of alcoholic beverage (0.62%) in their total annual expenditure, followed by moderately poor rural households (0.55%). Also, the share of tobacco and narcotics in total household budget is the largest in poorer households, especially in extremely poor households (0.05%). Generally, the share of expenditure on tobacco and narcotics is low, but still represents a significant

Table 1. Socio-demographic characteristics and poverty status (HNLSS, 2010)

Socio-demographic characteristics	Non poor		Moderately poor		Extremely poor		Total	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Zone								
North Central	674	612	752	261	2903	465	4329	1338
North East	656	231	768	134	2956	221	4380	586
North West	1182	564	1417	245	4286	500	6885	1309
South East	1053	590	839	194	1706	159	3598	943
South-South	1440	754	824	213	1811	245	4075	1212
South West	724	2672	556	735	895	532	2175	3939
Gender								
Female	1175	1208	814	365	1429	302	3418	1875
Male	4554	4215	4342	1417	13128	1820	22024	7452
Age								
<25	594	419	367	94	595	65	1556	578
26-35	1344	1334	1160	318	2904	331	5408	1983
36-45	1059	1139	993	405	3792	564	5844	2108
46-55	942	990	935	362	3193	499	5070	1851
56-65	887	752	868	285	2296	376	4051	1413
>65	903	789	833	318	1777	287	3513	1394
Highest educational level								
None	2457	1241	2752	617	8429	858	13638	2716
College degree	257	660	130	129	209	114	596	903
Post-secondary	423	807	303	215	791	249	1517	1271
Primary	1447	1192	1240	424	3324	485	6011	2101
Secondary	1145	1523	731	397	1804	416	3680	2336
Marital status								
Divorced/Separated	295	323	163	68	275	58	733	449
Living together	54	29	39	13	61	10	154	52
Married monogamous	4486	4241	4219	1426	12991	1815	21696	7482
Married polygamous	35	56	51	19	117	26	203	101
Widowed	859	774	684	256	1112	213	2655	1243

portion of total annual household expenditure in moderately and extremely poor households. The share of total annual non-food expenditure lower in moderately and extremely poor households are slightly higher (41.59%) in non-poor households.

Table 4 below presents the total annual household expenditure composition by smoking behavior. The share of household budgets spent on rice in all forms, other cereals and fruits are higher among non-smoking households compared to households with at least one smoker. However, the total share of expenditure on health is significantly higher in rural smoking households (24%) against the 17% share of expenditure on health in rural non-smoking households. Similarly, the table shows that tobacco consuming households spent more on alcoholic beverages than non-smokers for both urban and rural settlements. This reflects on the reduced share of essential household commodities in the budget of tobacco users compared to households with no smokers.

We compare the average household yearly expenditure pattern with respect to whether a member of a household smoke or not in Table 5.

Evidence indicates that tobacco use negatively affected the mean household expenditure on majority of the food categories irrespective of household poverty status. Particularly, we for instance consider the average household expenditure on milk, cheese and egg because of its importance in the nutritional intake of children under age ten. In this case, non-smoking household spent more on these products on the average than a smoking household. However, the mean household expenditure on alcoholic beverages is very high for households that use tobacco compared to what it is in non-smoking households in both urban and rural locations. Fundamentally, it is interesting that rural smoking households have the highest average expenditure on health care. The possible implication of joint demand (complementarity) of tobacco and alcohol and the significantly high medical care expenditure among smoking households is elaborated upon in the discussion section of this paper.

For convenience, we aggregated food expenditure exclusively from other commodities that we considered as essential household goods in the Nigerian context and tested for consumer

separability in Table 6. The Chi Square statistics showed that the parameters of the model is jointly significant and as such we are able to establish that zero tobacco expenditure generates from abstention and not from corner solutions. Therefore we accept that there is consumer preference heterogeneity among smokers and non-smokers in our study. Having established this, we proceed to estimate the Quadratic Almost Ideal Demand System for the households given their poverty classifications and their location (urban/rural).

In Table 7 we present the Conditional Engel Curves, conditional on tobacco expenditure ''d'' with respect to household poverty status. The conditioning parameter (whether a household smokes or not) does not only have an income effect, it also has substitution effect on all the commodities in the budget of moderately poor households except education where parameter ''d'' is significant. This implies that tobacco consumption is not separable from the consumption of other commodities in the

consumption set of moderately poor households. In extremely poor households, only the consumption of food is separable from tobacco expenditure and for non-poor households food and health are not impacted by tobacco use. Generally, the effect of tobacco expenditure on consumption of other essential commodities is similar across all poverty categories. In terms of the overall effect of tobacco expenditure in rural and urban locations as indicated in Table 8, smoking affects the share of expenditure allocated to all the commodities in rural settlements except health and electricity. Also, tobacco expenditure did not crowd out transportation in urban locations. The intercept values reflects the influence of household demographic characteristics as specified in the estimated equation and are significant for almost all the commodities. The parameters of the quadratic term on the logarithm of total expenditure excluding tobacco expenditure is also significant for majority of the estimated budget shares with respect to poverty status and household locations.

Table 2. Socio-demographic characteristics and smoking status (HNLSS, 2010)

Sociodemograpghic characteristics	Non smoker		Smoker		Total	
	Rural	Urban	Rural	Urban	Rural	Urban
Zone						
North Central	4272	1335	57	3	4329	1338
North East	4355	583	25	3	4380	586
North West	6870	1305	15	4	6885	1309
South East	3438	913	160	30	3598	943
South South	3977	1193	98	19	4075	1212
South West	2112	3911	63	28	2175	3939
Gender						
Female	3364	1858	54	17	3418	1875
Male	21660	7382	364	70	22024	7452
Age						
<25	1536	571	20	7	1556	578
26 - 35	5330	1965	78	18	5408	1983
36 - 45	5770	2086	74	22	5844	2108
46 - 55	4985	1840	85	11	5070	1851
56 - 65	3969	1395	82	18	4051	1413
>65	3434	1383	79	11	3513	1394
Highest educational level						
None	13443	2696	195	20	13638	2716
College degree	591	899	5	4	596	903
Post-secondary	1490	1260	27	11	1517	1271
Primary	5882	2071	129	30	6011	2101
Secondary	3618	2314	62	22	3680	2336
Marital status						
Divorced/Separated	713	446	20	3	733	449
Living together	151	51	3	1	154	52
Married monogamous	21374	7415	322	67	21696	7482
Married polygamous	198	98	5	3	203	101
Widowed	2587	1230	68	13	2655	1243

Table 3. Total annual expenditure pattern by poverty status (HNLSS, 2010)

N	Non poor				Moderately poor				Extremely poor			
	Urban		Rural		Urban		Rural		Urban		Rural	
	5423		5729		1782		5156		2122		14557	
	Exp	Share %	Exp (₦)	Share %	Exp (₦)	Share %	Exp (₦)	Share %	Exp (₦)	Share %	Exp (₦)	Share %
Rice in all forms	115,079,140.50	5.89	90,026,906.95	4.86	27,785,445.68	7.51	56,134,851.75	6.18	21,841,607.39	7.01	101,106,349.60	6.13
Maize grain and flours	19,828,484.66	1.01	10,765,825.43	0.58	4,595,619.93	1.24	7,423,570.98	0.82	3,707,650.58	1.19	10,938,913.28	0.66
Other cereals	20,710,182.46	1.06	13,621,934.43	0.73	5,441,659.08	1.47	11,025,560.68	1.21	5,039,179.19	1.62	20,545,418.05	1.25
Bread and the like	53,407,623.74	2.73	33,517,704.29	1.81	9,526,139.60	2.58	19,808,806.87	2.18	7,640,782.69	2.45	36,634,474.89	2.22
Bananas & tubers	149,042,580.52	7.63	86,174,461.35	4.65	31,409,355.51	8.49	52,634,363.14	5.79	24,827,162.30	7.97	91,736,891.69	5.56
Poultry	18,592,680.63	0.95	8,642,559.02	0.47	2,087,184.92	0.56	2,814,897.00	0.31	1,078,153.32	0.35	3,610,836.16	0.22
Meats	85,664,602.44	4.38	69,511,882.38	3.75	17,813,296.24	4.82	46,255,844.45	5.09	16,404,959.85	5.27	93,990,933.60	5.70
Fish & seafood	76,258,797.86	3.90	78,077,222.36	4.21	19,780,782.82	5.35	52,736,574.78	5.81	17,139,073.64	5.50	107,061,559.84	6.49
Milk, cheese & eggs	21,580,930.38	1.10	13,839,572.99	0.75	3,713,623.79	1.00	8,214,686.08	0.90	2,570,057.85	0.83	15,550,506.91	0.94
Oils, fats & oil-rich nuts	58,017,263.21	2.97	55,069,430.84	2.97	14,215,987.74	3.84	39,623,934.08	4.36	14,108,185.86	4.53	83,823,013.24	5.08
Fruits	11,196,178.67	0.57	8,531,473.77	0.46	2,098,597.81	0.57	5,543,846.78	0.61	2,053,679.33	0.66	9,355,275.69	0.57
Vegetables excludes pulses (beans & peas)	88,966,628.60	4.55	76,486,095.10	4.13	23,145,937.84	6.26	60,159,938.27	6.62	21,200,435.40	6.81	125,365,160.04	7.60
Pulses (beans & peas)	76,600,711.63	3.92	64,681,782.02	3.49	19,811,851.90	5.36	49,298,072.51	5.43	19,139,666.72	6.15	101,069,067.07	6.13
Sugar, jam, honey, chocolate & confectionary	12,117,429.50	0.62	13,053,138.93	0.70	3,348,354.16	0.91	11,147,819.11	1.23	3,109,768.96	1.00	22,175,446.28	1.34
Non-alcoholic beverages	34,886,235.86	1.79	22,696,027.07	1.22	5,490,959.84	1.48	13,914,257.76	1.53	4,203,071.00	1.35	20,888,472.56	1.27
Alcoholic beverages	7,635,299.91	0.39	9,172,291.08	0.49	1,454,190.04	0.39	5,038,033.17	0.55	1,037,446.25	0.33	10,209,519.32	0.62
Food consumed in restaurants & canteens	24,887,585.97	1.27	8,469,130.00	0.46	3,747,043.95	1.01	4,747,718.43	0.52	2,074,490.94	0.67	6,702,982.23	0.41
Food items not mentioned above	18,327,130.25	0.94	28,243,054.10	1.52	5,289,702.00	1.43	20,935,970.04	2.30	6,338,524.75	2.04	50,496,943.87	3.06
Total food expenditure	892,799,486.80	45.69	690,580,492.08	37.25	200,755,732.86	54.27	467,458,745.90	51.46	173,513,896.01	55.71	911,261,764.33	55.25
Total monetary value of education	54,502,160.31	2.79	30,670,355.88	1.65	12,075,656.63	3.26	15,736,710.36	1.73	9,447,431.75	3.03	32,032,350.57	1.94
Total monetary value of health	192,625,635.54	9.86	385,000,117.28	20.77	39,139,600.95	10.58	174,386,334.78	19.20	25,455,163.96	8.17	206,645,854.59	12.53
Total non-food consumption expenditure excluding education and health	812,578,545.08	41.59	744,986,183.65	40.19	117,355,549.87	31.73	248,030,022.38	27.30	101,993,119.38	32.75	491,961,613.81	29.83
Total household food and non-food consumption expenditure less tobacco and narcotics	1,953,689,199.49	99.99	1,853,351,818.30	99.98	369,867,168.45	99.99	908,154,252.34	99.97	311,416,084.07	99.99	1,648,510,347.46	99.95
Tobacco and narcotics	232,967.52	0.01	467,069.85	0.03	44,683.96	0.01	296,469.19	0.03	33,527.80	0.01	774,613.58	0.05
Electricity	32,119,588.05	1.64	10,038,827.99	0.54	8,677,232.58	2.35	6,733,116.49	0.74	7,531,570.08	2.42	13,686,781.01	0.83
Gas	1,805,107.56	0.09	44,102.68	0.00	132,647.64	0.04	-	0.00	85,196.36	0.03	-	0.00
Kerosene	12,945,699.54	0.66	10,402,665.12	0.56	4,260,053.60	1.15	9,950,159.71	1.10	4,560,472.24	1.46	25,431,477.03	1.54

N	Non poor				Moderately poor				Extremely poor			
	Urban		Rural		Urban		Rural		Urban		Rural	
	5423		5729		1782		5156		2122		14557	
	Exp	Share %	Exp (₦)	Share %	Exp (₦)	Share %	Exp (₦)	Share %	Exp (₦)	Share %	Exp (₦)	Share %
Petrol	21,448,889.75	1.10	9,144,617.50	0.49	2,644,365.05	0.71	4,944,011.87	0.54	1,807,519.67	0.58	7,035,516.90	0.43
Diesel	279,629.01	0.01	101,013.97	0.01	45,619.61	0.01	99,978.52	0.01	36,897.51	0.01	162,994.44	0.01
Clothing	47,232,557.52	2.42	41,221,916.53	2.22	11,255,327.68	3.04	31,731,728.77	3.49	9,517,418.43	3.06	67,846,002.93	4.11
Transportation	50,467,251.02	2.58	26,839,352.96	1.45	7,514,511.96	2.03	17,681,056.46	1.95	6,046,950.74	1.94	30,947,019.97	1.88
Recreation and culture	9,810,955.89	0.50	7,862,879.31	0.42	2,046,660.40	0.55	5,115,503.47	0.56	1,575,317.22	0.51	8,726,126.40	0.53
Communication	52,160,225.28	2.67	24,584,223.50	1.33	10,306,129.76	2.79	13,830,935.63	1.52	6,697,213.11	2.15	23,406,928.22	1.42
Total household expenditure	1,953,933,328.70	100	1,853,814,116.55	100	369,914,999.53	100	908,449,616.15	100	311,450,329.61	100	1,649,285,524.85	100

Table 4. Total annual expenditure pattern by smoking habit (HNLSS)

N	Smoker				Non smoker			
	Urban		Rural		Urban		Rural	
	87		418		9240		25024	
	Exp(₦)	Share (%)	Exp (₦)	Share (%)	Exp(₦)	Share	Exp(₦)	Share
Rice in all forms	1,207,713.78	4.86	3,348,089.28	4.65	163,498,479.78	6.26	243,920,019.02	5.62
Maize grain and flours	138,481.18	0.56	613,819.85	0.85	27,993,273.98	1.07	28,514,489.83	0.66
Other cereals	101,776.41	0.41	647,209.98	0.90	31,089,244.32	1.19	44,545,703.19	1.03
Bread and the like	589,951.35	2.37	1,504,920.98	2.09	69,984,594.68	2.68	88,456,065.07	2.04
Bananas & tubers	1,692,102.11	6.81	3,631,114.87	5.04	203,586,996.23	7.80	226,914,601.31	5.23
Poultry	180,836.87	0.73	501,998.04	0.70	21,577,182.00	0.83	14,566,294.14	0.34
Meats	896,318.68	3.61	3,624,950.82	5.04	118,986,539.85	4.56	206,133,709.60	4.75
Fish & seafood	1,329,602.39	5.35	4,653,953.96	6.47	111,849,051.92	4.28	233,221,403.02	5.37
Milk, cheese & eggs	200,388.79	0.81	683,503.08	0.95	27,664,223.24	1.06	36,921,262.89	0.85
Oils, fats & oil-rich nuts	573,646.59	2.31	1,824,039.17	2.53	85,767,790.22	3.29	176,692,338.99	4.07
Fruits	114,438.86	0.46	371,543.89	0.52	15,234,016.94	0.58	23,059,052.35	0.53
Vegetables excludes pulses (beans & peas)	958,112.29	3.85	3,402,814.10	4.73	132,354,889.55	5.07	258,608,379.31	5.96
Pulses (beans & peas)	961,212.91	3.87	3,423,246.36	4.76	114,591,017.34	4.39	211,625,675.24	4.88
Sugar, jam, honey, chocolate & confectionary	143,541.04	0.58	402,724.24	0.56	18,432,011.58	0.71	45,973,680.07	1.06
Non-alcoholic beverages	424,189.21	1.71	1,296,953.01	1.80	44,156,077.50	1.69	56,201,804.38	1.30
Alcoholic beverages	678,601.78	2.73	2,156,346.24	3.00	9,448,334.43	0.36	22,263,497.34	0.51
Food consumed in restaurants & canteens	546,578.87	2.20	714,702.01	0.99	30,162,542.00	1.16	19,205,128.65	0.44
Food items not mentioned above	175,581.83	0.71	873,995.36	1.21	29,779,775.16	1.14	98,801,972.64	2.28
Total food expenditure	10,913,074.95	43.90	33,675,925.26	46.78	1,256,156,040.72	48.12	2,035,625,077.05	46.91
Total monetary value of education	522,310.28	2.10	1,447,990.57	2.01	75,502,938.41	2.89	76,991,426.24	1.77
Total monetary value of health	2,238,480.78	9.00	17,401,957.78	24.18	254,981,919.67	9.77	748,630,348.88	17.25

N	Smoker				Non smoker			
	Urban		Rural		Urban		Rural	
	87		418		9240		25024	
	Exp(₦)	Share (%)	Exp (₦)	Share (%)	Exp(₦)	Share	Exp(₦)	Share
Total non-food consumption expenditure excluding education and health	11,146,696.21	44.84	19,742,663.28	27.43	1,020,780,518.11	39.10	1,465,235,156.56	33.76
Total household food and non-food consumption expenditure less tobacco and narcotics	24,533,389.76	98.69	70,447,506.57	97.87	2,610,439,062.25	100.00	4,339,568,911.53	100.00
Tobacco and narcotics	311,179.28	1.25	1,538,152.62	2.14	-	0.00	-	0.00
Electricity	223,877.93	0.90	756,149.20	1.05	48,104,512.79	1.84	29,702,576.28	0.68
Gas	-	0.00	-	0.00	2,022,951.55	0.08	44,102.68	0.00
Kerosene	197,403.27	0.79	652,730.28	0.91	21,568,822.11	0.83	45,131,571.58	1.04
Petrol	173,997.28	0.70	720,273.08	1.00	25,726,777.19	0.99	20,403,873.19	0.47
Diesel	-	0.00	-	0.00	362,146.13	0.01	363,986.93	0.01
Clothing	388,605.11	1.56	2,582,690.14	3.59	67,616,698.51	2.59	138,216,958.09	3.19
Transportation	529,149.57	2.13	1,680,396.80	2.33	63,499,564.15	2.43	73,787,032.59	1.70
Recreation and culture	128,569.85	0.52	694,305.37	0.96	13,304,363.65	0.51	21,010,203.80	0.48
Communication	737,903.03	2.97	1,221,825.67	1.70	68,425,665.12	2.62	60,600,261.67	1.40
Total household expenditure	24,859,595.60	100	71,980,346.02	100	2,610,439,062.25	100	4,339,568,911.53	100

Table 5. Average annual expenditure pattern by smoking habit (HNLSS, 2010)

N	Smoker				Non smoker			
	Urban		Rural		Urban		Rural	
	87		418		9240		25024	
	Exp (₦)	Share%	Exp (₦)	Share%	Exp (₦)	Share%	Exp (₦)	Share%
Rice in all forms	13,881.77	4.86	8,009.78	4.65	17,694.64	6.26	9,747.44	5.62
Maize grain and flours	1,591.74	0.56	1,468.47	0.85	3,029.58	1.07	1,139.49	0.66
Other cereals	1,169.84	0.41	1,548.35	0.90	3,364.64	1.19	1,780.12	1.03
Bread and the like	6,781.05	2.37	3,600.29	2.09	7,574.09	2.68	3,534.85	2.04
Bananas & tubers	19,449.45	6.81	8,686.88	5.04	22,033.22	7.80	9,067.88	5.23
Poultry	2,078.58	0.73	1,200.95	0.70	2,335.19	0.83	582.09	0.34
Meats	10,302.51	3.61	8,672.13	5.04	12,877.33	4.56	8,237.44	4.75
Fish & seafood	15,282.79	5.35	11,133.86	6.47	12,104.88	4.28	9,319.91	5.37
Milk, cheese & eggs	2,303.32	0.81	1,635.17	0.95	2,993.96	1.06	1,475.43	0.85
Oils, fats & oil-rich nuts	6,593.64	2.31	4,363.73	2.53	9,282.23	3.29	7,060.92	4.07
Fruits	1,315.39	0.46	888.86	0.52	1,648.70	0.58	921.48	0.53
Vegetables excludes pulses (beans & peas)	11,012.78	3.85	8,140.70	4.73	14,324.12	5.07	10,334.41	5.96
Pulses (beans & peas)	11,048.42	3.87	8,189.58	4.76	12,401.63	4.39	8,456.91	4.88
Sugar, jam, honey, chocolate & confectionary	1,649.90	0.58	963.46	0.56	1,994.81	0.71	1,837.18	1.06
Non-alcoholic beverages	4,875.74	1.71	3,102.76	1.80	4,778.80	1.69	2,245.92	1.30

N	Smoker				Non smoker			
	Urban		Rural		Urban		Rural	
	87		418		9240		25024	
	Exp (₦)	Share%	Exp (₦)	Share%	Exp (₦)	Share%	Exp (₦)	Share%
Alcoholic beverages	7,800.02	2.73	5,158.72	3.00	1,022.55	0.36	889.69	0.51
Food consumed in restaurants & canteens	6,282.52	2.20	1,709.81	0.99	3,264.34	1.16	767.47	0.44
Food items not mentioned above	2,018.18	0.71	2,090.90	1.21	3,222.92	1.14	3,948.29	2.28
Total food expenditure	125,437.64	43.90	80,564.41	46.78	135,947.62	48.12	81,346.91	46.91
Total monetary value of education	6,003.57	2.10	3,464.09	2.01	8,171.31	2.89	3,076.70	1.77
Total monetary value of health	25,729.66	9.00	41,631.48	24.18	27,595.45	9.77	29,916.49	17.25
Total non-food consumption expenditure excluding education and health	128,122.94	44.84	47,231.25	27.43	110,474.08	39.10	58,553.20	33.76
Total household food and non-food consumption expenditure less tobacco and narcotics	281,992.99	98.69	168,534.70	97.87	282,515.05	100.00	173,416.28	100.00
Tobacco and narcotics	3,576.77	1.25	3,679.79	2.14	-	0.00	-	0.00
Electricity	2,573.31	0.90	1,808.97	1.05	5,206.12	1.84	1,186.96	0.68
Gas	-	0.00	-	0.00	218.93	0.08	1.76	0.00
Kerosene	2,269.00	0.79	1,561.56	0.91	2,334.29	0.83	1,803.53	1.04
Petrol	1,999.97	0.70	1,723.14	1.00	2,784.28	0.99	815.37	0.47
Diesel	-	0.00	-	0.00	39.19	0.01	14.55	0.01
Clothing	4,466.73	1.56	6,178.68	3.59	7,317.82	2.59	5,523.38	3.19
Transportation	6,082.18	2.13	4,020.09	2.33	6,872.25	2.43	2,948.65	1.70
Recreation and culture	1,477.81	0.52	1,661.02	0.96	1,439.87	0.51	839.60	0.48
Communication	8,481.64	2.97	2,923.03	1.70	7,405.38	2.62	2,421.69	1.40
Total household expenditure	285,742.48	100	172,201.78	100	282,515.05	100	173,416.28	100

Table 6. χ^2 Test for Consumer Separability (HNLSS, 2010)

Items	Poverty status			Sector		Total
	Non poor	Moderately poor	Extremely poor	Rural	Urban	
Food	3,909.46	539.62	1,642.14	3,365.70	903.37	3,909.46
Education	400.78	152.43	221.55	165.91	147.63	400.78
Health	3,093.53	894.80	1,896.38	3,862.47	353.39	3,093.53
Electricity	179.19	24.39	77.85	70.49	69.86	179.19
Domestic fuel	5,312.43	939.37	1,797.57	3,793.72	1,623.00	5,312.43
Petrol	471.31	72.46	213.66	225.13	193.58	471.31
Diesel	14.04	2.88	15.01	8.01	5.06	14.04
Transportation	268.64	22.21	99.10	175.25	102.19	268.64
Communication	833.93	62.48	293.98	347.09	253.89	833.93

Notes: Values in each column are the Chi-square statistics from a Wald Test for the joint significance of the model parameters associated with the binary variable d. All statistics are highly significant at p-values less than 0.01

Table 7. Quaids results by poverty status

	Food		Education		Health		Electricity		Domestic fuel		Petrol		Diesel		Transportation		Communication	
	Estimate	S.E	Estimate	S.E	Estimate	S.E	Estimate	S.E	Estimate	S.E	Estimate	S.E	Estimate	S.E	Estimate	S.E	Estimate	S.E
Non poor																		
Intercept	-7.4996***	0.1562	-0.1515***	0.046	-1.2242***	0.1393	-0.3376***	0.0293	0.5033***	0.0169	-0.0791***	0.018	-0.0006	0.0017	-0.4808***	0.0319	-0.5867***	0.0276
d	3.3527**	1.5673	0.2513	0.462	3.8565***	1.3978	-0.2468	0.2941	0.0273	0.1697	0.0861	0.1809	0.0006	0.0175	-0.3576	0.3204	-0.3639	0.2773
P_tt	2.52E-06***	9.73E-07	-2.20E-07	2.87E-07	-3.3E-06***	8.68E-07	-2.10E-07	1.83E-07	-2.60E-08	1.05E-07	1.53E-07	1.12E-07	0	1.09E-08	1.88E-07	1.99E-07	3.02E-08	1.72E-07
ln M	1.3874***	0.026	0.0200***	0.0077	0.1533***	0.0232	0.0566***	0.0049	-0.0708***	0.0028	0.0105***	0.003	4.72E-05	0.0003	0.0829***	0.0053	0.096***	0.0046
d ln M	-0.5163**	0.2627	-0.0434	0.0775	-0.6988***	0.2343	0.0428	0.0493	-0.0062	0.0284	-0.0141	0.0303	-4.72E-05	0.0029	0.0648	0.0537	0.0617	0.0465
ln M^2	-0.0595***	0.0011	-0.0005	0.0003	-0.0035***	0.001	-0.0023***	0.0002	0.0025***	0.0001	-0.0003**	0.0001	5.23E-07	1.21E-05	-0.0034***	0.0002	-0.0038***	0.0002
d ln M^2	0.0194*	0.011	0.0019	0.0032	0.0316***	0.0098	-0.0018	0.0021	0.0003	0.0012	0.0006	0.0013	-5.22E-07	0.0001	-0.0029	0.0022	-0.0026	0.0019
Moderately poor																		
Intercept	-5.1788***	0.575	-0.0406	0.166	2.0201***	0.5411	-0.4645***	0.1114	0.3454***	0.0523	-0.1290**	0.0649	-0.0032	0.0073	-0.2287*	0.1187	-0.5099***	0.1027
d	-3.0369	6.3124	3.1934*	1.8225	5.6487	5.9396	-0.0007	1.2234	-0.336	0.5743	-0.4019	0.7126	0.0032	0.08	-1.9901	1.3034	-0.9668	1.1279
P_tt	-9.60E-07	5.37E-06	-1.80E-06	1.55E-06	7.83E-07	5.05E-06	-4.30E-07	1.04E-06	-3.30E-07	4.88E-07	-1.20E-07	6.06E-07	0	6.80E-08	2.48E-07	1.11E-06	-5.97E-07	9.59E-07
ln M	1.0403***	0.0963	-0.0037	0.0278	-0.4254***	0.0907	0.0785***	0.0187	-0.0447***	0.0088	0.0188*	0.0109	0.0005	0.0012	0.0445**	0.0199	0.0846***	0.0172
d ln M	0.5928	1.0544	-0.5502*	0.3044	-0.9894	0.9922	-0.0037	0.2044	0.0531	0.0959	0.0673	0.119	-0.0005	0.0134	0.3331	0.2177	0.1516	0.1884
ln M^2	-0.0467***	0.004	0.0007	0.0012	0.0222***	0.0038	-0.0032***	0.0008	0.0014***	0.0004	-0.0006	0.0005	-1.61E-05	5.11E-05	-0.002**	0.0008	-0.0034***	0.0007
d ln M^2	-0.0281	0.044	0.0236*	0.0127	0.043	0.0414	0.0003	0.0085	-0.0021	0.004	-0.0028	0.005	1.61E-05	0.0006	-0.0138	0.0091	-0.0059	0.0079
Extremely poor																		
Intercept	-12.7328***	0.3391	0.4863***	0.0938	3.4104***	0.26	-0.2171***	0.0622	0.4881***	0.0464	0.1328***	0.0316	0.0066*	0.0036	-0.5261***	0.0685	-0.0911	0.0571
d	12.4981***	3.5807	-0.6686	0.9901	-0.2075	2.7459	-0.3618	0.6567	0.0719	0.4895	-0.3122	0.3339	-0.0066	0.0381	-0.2743	0.7233	0.2996	0.6029
P_tt	1.76E-06	1.12E-06	-8.80E-08	3.11E-07	-2.3E-06***	8.61E-07	-2.50E-07	2.06E-07	-3.20E-08	1.54E-07	1.39E-07	1.05E-07	0	1.20E-08	5.08E-08	2.27E-07	-1.76E-07	1.89E-07
ln M	2.2984***	0.0593	-0.0921***	0.0164	-0.6637***	0.0455	0.0362***	0.0109	-0.0673***	0.0081	-0.0260***	0.0055	-0.0012***	0.0006	0.0924***	0.012	0.011	0.01
d ln M	-2.1090***	0.6252	0.1204	0.1729	0.0346	0.4794	0.0571	0.1147	-0.0139	0.0855	0.0557	0.0583	0.0012	0.0067	0.0473	0.1263	-0.0573	0.1053
ln M^2	-0.0991***	0.0026	0.0044***	0.0007	0.0325***	0.002	-0.0014***	0.0005	0.0023***	0.0004	0.0013***	0.0002	5.818E-05**	2.76E-05	-0.003904***	0.0005	-0.0002	0.0004
d ln M^2	0.0884***	0.0273	-0.0054	0.0075	-0.0013	0.0209	-0.0022	0.005	0.0006	0.0037	-0.0025	0.0025	-5.82E-05	0.0003	-0.002	0.0055	0.0028	0.0046

Note: *, ** and *** represent statistical significance at 10%, 5% and 1% respectively

Table 8. Quaids results by sector (HNLSS, 2010)

	Food		Education		Health		Electricity		Domestic fuel		Petrol		Diesel		Transportation		Communication	
	Estimate	S.E	Estimate	S.E	Estimate	S.E	Estimate	S.E	Estimate	S.E	Estimate	S.E	Estimate	S.E	Estimate	S.E	Estimate	S.E
Rural																		
Intercept	-8.9321***	0.1904	-0.0883*	0.0507	-0.2922*	0.1695	-0.2201***	0.0305	0.5301***	0.0213	-0.1201***	0.019	-0.0012	0.0019	-0.451***	0.0376	-0.4594***	0.0317
d	3.2981	2.0442	0.4733	0.5446	10.3067***	1.8197	-0.5650*	0.3274	0.0436	0.2292	0.308	0.2038	0.0012	0.0206	-0.6222	0.4034	-0.5083	0.3402
$P_t t$	2.68E-06***	1.02E-06	-2.10E-07	2.72E-07	-3.8E-06***	9.08E-07	-1.90E-07	1.63E-07	-3.70E-08	1.14E-07	1.37E-07	1.02E-07	0	1.03E-08	2.18E-07	2.01E-07	6.66E-08	1.70E-07
ln M	1.6434***	0.032	0.0115	0.0085	-0.0271	0.0285	0.0380***	0.0051	-0.0750***	0.0036	0.0186***	0.0032	0.0002	0.0003	0.0795***	0.0063	0.0764***	0.0053
d ln M	-0.5079	0.3459	-0.084	0.0922	-1.8034***	0.3079	0.0959*	0.0554	-0.0089	0.0388	-0.0536	0.0345	-0.0002	0.0035	0.1078	0.0683	0.087	0.0576
$\ln M^2$	-0.0709***	0.0013	-0.0002	0.0004	0.0052***	0.0012	-0.0016***	0.0002	0.0027***	0.0002	-0.0007***	0.0001	-4.63E-06	1.36E-05	-0.0033***	0.0003	-0.0031***	0.0002
$d \ln M^2$	0.0191	0.0146	0.0037	0.0039	0.0787***	0.013	-0.0040*	0.0023	0.0004	0.0016	0.0023	0.0015	4.63E-06	0.0001	-0.0046	0.0029	-0.0037	0.0024
Urban																		
Intercept	-5.3503***	0.3098	-0.6209***	0.1176	-1.5622***	0.2593	-0.4462***	0.0791	0.4579***	0.0297	-0.1530***	0.0493	-0.0007	0.0045	-0.6575***	0.0708	-0.9531***	0.0632
d	1.9014	3.4776	0.4757	1.3197	-4.2517	2.9106	0.1311	0.8882	-0.1727	0.3337	0.132	0.5529	0.0007	0.0503	1.3252*	0.7947	-0.6738	0.709
$P_t t$	4.18E-06	4.49E-06	-8.40E-07	1.70E-06	-8.5E-06**	3.76E-06	-3.30E-07	1.15E-06	2.42E-07	4.31E-07	2.70E-07	7.14E-07	0	6.49E-08	1.52E-07	1.03E-06	2.97E-08	9.15E-07
ln M	1.0141***	0.0502	0.0939***	0.019	0.2281***	0.042	0.0795***	0.0128	-0.0625***	0.0048	0.0203**	0.008	4.17E-05	0.0007	0.1117***	0.0115	0.1578***	0.0102
d ln M	-0.2769	0.5528	-0.0734	0.2098	0.6734	0.4627	-0.0261	0.1412	0.0243	0.053	-0.0153	0.0879	-4.17E-05	0.008	-0.1981	0.1263	0.1043	0.1127
$\ln M^2$	-0.0433***	0.002	-0.0033***	0.0008	-0.0076***	0.0017	-0.0034***	0.0005	0.0021***	0.0002	-0.0006*	0.0003	1.73E-06	2.94E-05	-0.0045***	0.0005	-0.0063***	0.0004
$d \ln M^2$	0.0097	0.0219	0.0028	0.0083	-0.0262	0.0184	0.0012	0.0056	-0.0009	0.0021	0.0004	0.0035	-1.73E-06	0.0003	0.0073	0.005	-0.004	0.0045
Total																		
Intercept	-7.4996***	0.1562	-0.1515***	0.046	-1.2242***	0.1393	-0.3376***	0.0293	0.5033***	0.0169	-0.0791***	0.018	-0.0006	0.0017	-0.4808***	0.0319	-0.5867***	0.0276
d	3.3527**	1.5673	0.2513	0.462	3.8565***	1.3978	-0.2468	0.2941	0.0273	0.1697	0.0861	0.1809	0.0006	0.0175	-0.3576	0.3204	-0.3639	0.2773
$P_t t$	2.52E-06***	9.73E-07	-2.20E-07	2.87E-07	-3.3E-06***	8.68E-07	-2.10E-07	1.83E-07	-2.60E-08	1.05E-07	1.53E-07	1.12E-07	0	1.09E-08	1.88E-07	1.99E-07	3.02E-08	1.72E-07
ln M	1.3874***	0.026	0.0200***	0.0077	0.1533***	0.0232	0.0566***	0.0049	-0.0708***	0.0028	0.0105***	0.003	4.72E-05	0.0003	0.0829***	0.0053	0.096***	0.0046
d ln M	-0.5163**	0.2627	-0.0434	0.0775	-0.6988***	0.2343	0.0428	0.0493	-0.0062	0.0284	-0.0141	0.0303	-4.72E-05	0.0029	0.0648	0.0537	0.0617	0.0465
$\ln M^2$	-0.0595***	0.0011	-0.0005	0.0003	-0.0035***	0.001	-0.0023***	0.0002	0.0025***	0.0001	-0.0003**	0.0001	5.23E-07	1.21E-05	-0.0034***	0.0002	-0.0038***	0.0002
$d \ln M^2$	0.0194*	0.011	0.0019	0.0032	0.0316***	0.0098	-0.0018	0.0021	0.0003	0.0012	0.0006	0.0013	-5.22E-07	0.0001	-0.0029	0.0022	-0.0026	0.0019

*Note: *, ** and *** represent statistical significance at 10%, 5% and 1% respectively*

4. DISCUSSION

We use the Harmonised National Living Standard Survey conducted in 2010 by the Nigerian National Bureau of Statistics to explore the expenditure pattern, poverty levels and the effect of tobacco expenditure on other household commodities. Generally, with respect to our classification of households into non-poor, moderately poor and extremely poor, the total poverty incidence in 2010 was approximately 68%. This is similar to the 69% (relative poverty measurement) poverty incidence reported in the 2010 poverty profile in Nigeria [13]. Essentially, our study showed evidencies that supports several other studies in terms of the impacts of a number of socio-demographic variables on poverty and tobacco use.

Household educational level impacts on their living standard and whether they smoke or not [19,42,43]. This result is logical in that educational attainment increases the awareness of the health consequences of smoking. Also, in Nigeria and around the world, educated individuals have the highest paying jobs so that the standard of living of households improves as they attains higher level of schooling. Pampel [44] comfirms this relation in his study of 14 Sub-saharan African countries. He carried out a Mulnomial regression analysis that showed that low status workers and less educated men smoked more. Furthermore, tobacco use is capable of worsening the financial stadings of households due to deterioration in health and a possible catastrophic expenditure associated with medical care. This effect in addition to the decrease in the disposable income available to smoking household as a result of smoking expenditures can be very significant in the short-run and long-run. Another evidence that supports this is the study carried out by Rijo et al. [2] in India where they concluded that approximately 15 million people were impoverished by tobacco use. Another household variable that affected smoking in the study is age. Tobacco use as evidenced in our result increased with age up a point when it then begins to fall.

National prevalence of tobacco use in Nigeria as shown in the result is quite low but several sub-population (out-of-school youths, slums and in motor parks) studies show significantly higher prevalence. Therefore, smoking prevalence is likely to be significantly higher if appropriate weight were attached to households with this facts in mind at the time of the survey but as we know the primary aim of the survey was to measure household living standards and not smoking prevalence. Nonetheless, studies have shown that tobacco use follow a similar pattern of effect on households irrespective of whether the share of tobacco expenditiure is high or low [9,12].

The share of total annual expenditureon food for all poverty classifications was above 45% except for non-poor rural households that had 37.25% of their budget spent on food. Generally, non-smoking households had higher average expenditure on most essential household commodities even when we carried out a rural/urban comparison. In contrast, smoking households spent more on the average on alcoholic beverages and medical care compared to non-smoking households. This provides an interesting finding in that it reveals that tobacco use and alcohol are likely complementary goods and therefore joinlty demanded in most cases. This finding alludes to the conclusions by Busch et al. [8] on the relationship between cigareette and alcohol. Busch et al. [8] estimated an own and cross elasticity of cigarette demand and concluded that some household essential commodities acts as subsitute goods to cigarette consumption with respect to household income constraint. Consequently, when a smoking household decides to smoke more cigarette, some essential goods are displaced from the consumption set of the household and vice versa. Also, the higher average spending on health care by smoking households could be suggestive of increase in morbidity as a result of tobacco use.

5. CONCLUSION AND POLICY RECOMMENDATION

The level of poverty keep rising year on year from available data, therefore the effort to alleviate the poor living standards of over 68% of households in Nigeria should be doubled. Tobacco use will continue to affect the health of smokers and further deepen their economic hardship. This study showed that smoking rate is higher among extremely poor households and consequently these households are likely to be trapped in poverty over a long term given that their health will also be expected to worsen. Therefore, the government can somewhat reduce poverty incidence by increasing the effort to control tobacco use.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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