



RURAL HOUSEHOLD CONSUMPTION OF MILK AND PRODUCTS IN NIGERIA

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ABSTRACT

Good nutrition is increasingly perceived as an investment in human capital that yields returns today as well as in the future. Carbohydrates constitute the majority of prepared food items consumed in most rural households in Nigeria, however milk and milk products provide essential nutrients for normal growth and for the maintenance of good health, and would help make up for the nutrients that many citizens miss through their diets that are composed largely of carbohydrates. This study therefore examines milk consumption pattern and its determinants among rural households in Nigeria. A well-structured questionnaire was used to obtain information on socioeconomic characteristics, consumption expenditure and other relevant variables using multistage random sampling technique. Data were analyzed using descriptive statistics and two-stage heckman model to account for selection bias. The result shows that age of household head, household size, household head income and household expenditure on animal protein commonly and significantly influence consumption decision and consumption expenditure level of milk and milk products. More so, ownership of house, Credit accessibility and Spouse occupation-trading significantly and uniquely influence consumption decision; while years of formal education of household head, expenditure on non-food items and Household head occupation-farming significantly determine consumption expenditure level of milk and milk products of the respondents. The study suggested nutrition-health education and birth control among the rural households; and development of dairy sub-sector.

Keywords: milk consumption, nutrition, Ondo state, heckman model.

INTRODUCTION

Livestock accounts for a third of Nigeria's agricultural GDP, providing income, employment, food, farm energy, manure, fuel, and transport. It is also a major source of government revenue. Traditional livestock production in Nigeria is varied and complex. Livestock, especially ruminants, is the most efficient user of uncultivated land and can contribute substantially to crop production. About ninety six percent (96%) of all cattle in Nigeria are in the hands of the pastoral Fulani. This pastoral herd is the most important source of domestic milk.

Total milk production, an animal product, increased by 5.7 percent to 1.4 million tons in 2007. The government initiated several programs to increase domestic milk production and intensified marketing of fresh milk consumption. The pilot Dairy Development Program continued in Kaduna with the formation of the Milk Producers' Association. Another contributing factor was the encouragement of milk consumption through the primary school feeding and health programs introduced in many schools across the country (CBN Annual Report 2008).

Nutrition is perhaps the most important problem facing the poor people in the World today. In spite of the progress made in improving nutrient availability in the last decade, a large proportion of poor households in developing countries still have inadequate access to sufficient food (Abdulai and Aubert, 2004). Although per capita daily calorie intake in developing countries has increased substantially in the last decade, the number of undernourished people is still around 923 Million and the recent food price increases has also triggered an increase

in hunger Worldwide (FAO, 2008). Good nutrition is increasingly perceived as an investment in human capital that yields returns today as well as in the future, while bad nutrition is a treat to the nation. The global loss of social productivity in 1990 is caused by four overlapping types of malnutrition via: stunting and disorders related to iodine iron and vitamin A deficiency. This amounted to almost 46 million years of productive disability. Good life nutrition raises returns on investment in education and health care (Ezekwe, 2008).

A healthy nation is a wealthy nation. Nutrition has a great impact on every nation's growth especially as we can see in Nigeria situation. Inadequate consumption of protein and energy as well as deficiencies in key micronutrient such as iodine, vitamin A and iron are also key factors in the morbidity and mortality of children and adults. Mal-nourished children also have lifetime disabilities and weakened immune systems (Ezekwe, 2008).

Moreover, malnutrition is associated with disease and poor health, which places a further burden on household as well as health care systems. Disease affects a person's development from a very early age. Gastro-enteritis, respiratory infections and malaria are the most prevalent and serious conditions that can affect development in the first three years of life. In fact, these affect children's development by reducing their dietary intake; causing a loss of nutrients; or increasing nutrient demand as a result of fever.

Malnutrition also plays a significant role in morbidity among adults. The link between morbidity from chronic disease and mortality, on the one side, and a high body mass index (BMI), on the other has been recognized



and analyzed in developed countries primarily for the purpose of determining life insurance risk. A study on Nigerian men and women has shown mortality rates, among chronically energy deficient people who are mildly, moderately and severely underweight to be 40, 140 and 150 percent greater than rates among non-chronically energy deficient people.

A lack of micronutrients also contributes significantly to the burden of disease. Iron deficiency is associated with malaria, intestinal parasitic infections and chronic infections. Chronic iodine deficiency causes goiter in adults and Children and also affects mental health. Vitamin A deficiency significantly increases the risk of severe illness and death from common childhood infections, particularly diarrhoeal diseases and measles. In areas where vitamin A deficiency exists, children are on average 50 percent more likely to suffer from acute measles. A UN report states that improvement in vitamin A status reduces mortality among children aged one to five.

Omoyele (2011) said milk and milk products provide 15 essential nutrients for normal growth and for the maintenance of good health, would help make up for the nutrients that many citizens miss through their diets that are composed largely of carbohydrates, and that increased milk consumption would be necessary as Nigeria strives to attain the Millennium Development Goals.

As reported by Olarinde and Kuponiyi (2005), carbohydrates constituted the majority of prepared food items bought and consumed outside the households studied in Oyo state. The average amount spent on prepared and purchased carbohydrate food was N4, 337.33 per household while protein food outside the home stood at N540 per month. This amounted to an average of N1469 worth of food per household member per month. It also amounted to a monthly diet of 79 percent carbohydrate, 17 percent protein, and 4 percent vitamin per month.

Comparing this with a related study of farming households in Oyo State, Nigeria, Adio (2000) found that energy intake was about 97 percent carbohydrate (from plant and animal products) and about 28 percent protein (from plant and animal products), this implies a shortfall of 18 percent and 11 percent in carbohydrate and protein intake respectively. Oluwatayo (2008) in a recent survey of inequality and welfare status of some households in rural Nigeria, revealed households had a diet made up largely of starchy foods with very little proteins and vitamins. Also, a greater share of the respondents (51.7 percent) ate twice a day, a little over one-third (34.2 percent) of the households ate three times a day, while 10 percent of the respondents only ate once a day.

Following literatures on food consumption pattern and nutrition security, there is a dearth of study on the milk consumption habit and its determinants among rural households in Nigeria. Hence, the study aims at filling this gap by providing milk consumption pattern and its determinants among rural households in Nigeria.

This rest of this paper is organized into two sections, materials and methods issues are addressed in section two, and section three presents and discusses the results from the analysis with the conclusion.

MATERIALS AND METHODS

The empirical setting for the study consists of rural communities in Ondo state of Nigeria. Three-stage random sampling technique was used to select the sample respondents for the analysis. Two local government areas were randomly selected in the first stage; two villages were selected from each local government area in the second stage, and random selection of respondent households from the selected communities proportionate to size was done in the third stage. Thus, a total of 121 households were randomly sampled. These respondents were either household heads or those who had good idea of the household food purchases and consumption pattern.

Descriptive statistics of mean, standard deviation, frequency and percentage were employed to describe socioeconomic and other relevant variables considered in this study. To identify factors determining consumption decision and expenditure level of milk and milk product, Heckman two-stage selection model was used to account for selection bias that could arise from large proportion of zero consumption within the study period. That is, reported zero consumption could come as a result of non-frequent consumption or never consumption of milk. The non-frequent consumption reported as zero constitutes selection bias which needs to be accounted for. The model consists of a two-step estimating procedure. In the first stage, a 'consumption decision equation', attempts to capture factors affecting consumption decision. The second stage provides heckit analysis that determines the level of consumption. The probability of making consumption decision was modelled by Maximum Likelihood Probit, from which the inverse Mill's ratios will be estimated. The specifications for Heckman's two-stage models were estimated as follows:

Stage one

consumption decision equation (probit regression)

$$z_i^* = \omega_i \gamma + u_i \text{ and } z_i = 1 \text{ if } z_i^* > 0 \text{ and } z_i = 0 \text{ if } z_i^* \leq 0$$

$z_i = 1$, if a household consume milk or any of its products and $z_i = 0$ otherwise

ω_i = vector of explanatory variables

γ = vector of the coefficient estimates

u_i = error term

w_1 = marital status of household head (Hh_hMst) (Married = 1, 0 = otherwise)

w_2 = household's head age (Hh_hAge) (Years)

w_3 = square of age of household head (Hh_hAgesquare) (Years)



w_4 = years of education of household's head (Hh_hYeduc) (Years of formal schooling)

w_5 = gender of household's head (Hh_Gender) (male = 1, 0 = otherwise)

w_6 = household size (Hh_size) (Head count)

w_7 = household nativity (Hh_Nativity) (1 = Native, 0 = otherwise)

w_8 = household religion (Hh_Religion) (1 = Christianity, 0 = otherwise)

w_9 = expenditure on food away from home (Hh_expfafh) (₦)

w_{10} = household expenditure on non-food items (Hh_expnfi) (₦)

w_{11} = land ownership (Land-own) (owner = 1, 0 = otherwise)

w_{12} = house ownership (House-own) (owner = 1, 0 = otherwise)

w_{13} = access to any form of credit (Accredit) (access = 1, 0 = otherwise)

w_{14} = membership of social organisation (Mmsocorg) (membership = 1, 0 = otherwise)

w_{15} = dependency ratio (Depr) (non-working member/household size)

w_{16} = household income (Hh_income) (₦)

w_{17} = primary occupation of the household's spouse (Hh_sOccup) (trading = 1, 0 = otherwise)

w_{18} = primary occupation of the household's head (Hh_hOccup) (farming = 1, 0 = otherwise)

w_{19} = household consumption expenditure on animal protein (₦)

Stage two

Involves the estimation of an ordinary least square regression of sub sample of households that actually consume milk and milk products group, given as:

$$y_i = x_i\beta + \lambda\beta_\lambda + \varepsilon_i \text{ if } z_i^* > 0$$

y_i = expenditure on milk and milk products

x_i = vector of the explanatory variables (these are the same with selection equation)

However, the coefficient on the inverse Mill's ratio (λ) will indicate if there is selection bias. If the coefficient is statistically significant, then we know that there was selection bias. However, it is somewhat hard to say much if the coefficient is not significant. We can say that there is no selection bias as we have formulated the selection equation. However, this is assuming that we have the selection equation correct.

RESULTS AND DISCUSSIONS

Summary statistics of socio-economic characteristics of the rural household

This section shows and discusses summary statistics of selected socio-economic characteristics as shown in Table-1. On the average, household size of the sample was 6.14, with dependency ratio of 51%, which shows that a half of household members were not working. About 37% of the households were headed by women and on the average of age of 50 years. The average years of formal schooling was estimated at seven (7) years. This implies that an average rural household head could read and write. The average weekly per capita expenditure on food-away-from-home was very low, less than 2% of the weekly expenditure on at-home-food expenditure. This shows that food commodities are actually demanded for home consumption and the conservative communal eating habit that characterized the rural households. The per capita weekly household expenditure on non-food items was about one thousand naira and 11% of weekly expenditure on food. The frequently purchased non-food items expenditure was about 68% of the expenditure on non-food items in the rural households, while the infrequent is about 32%. Total monthly household income, on the average, was about eight thousand naira per capita. About 74% of the sampled households owned land and 39% of the households did not have their own house. On the average, the value of the household productive assets was about nine hundred thousand naira. More so, the result shows that about 68% of the households did not have access to any form of credit, while about 87% belonged to one social organization or another. Farming was the major occupation of household heads of about 38% of the sample while trading (45%) was the major occupation of household spouses. Expectedly, 63% of the sampled households were native of their communities.

**Table-1.** Summary statistics of socio-economic characteristic of rural households.

Variables (unit)	Mean value/ dominant indicator	Standard deviation
Household size (head count)	6.14050	0.29230
Dependency ratio (%)	0.51784	0.02234
Gender of household head (male = 1; female = 0)	0.62810	0.04412
Age of household head (years)	49.81818	1.62640
Education of household head (years of schooling)	7.05785	0.51040
Household expenditure on food-away-from -home (₹)	151.3584	23.52667
Household expenditure on non-food items (₹)	1003.408	74.15412
Household expenditure on frequently non food items (₹)	680.6026	53.86583
Household expenditure on infrequently non food items (₹)	313.5047	41.26813
Monthly household head income (per capita)	8169.951	1028.403
Land ownership (own land = 1; otherwise = 0)	0.73554	0.04026
House ownership (own house = 1; otherwise = 0)	0.61157	0.04449
Productive assets of household (₹)	920347.9	136347
Access to credit (yes = 1, no = 0)	0.32231	0.04266
Membership of social organization (member = 1; otherwise = 0)	0.86777	0.03092
Major occupation of household head	38.46 % into farming	-
Major occupation of household spouse	45.45 % into trading	-----
Nativity of household (native = 1; otherwise = 0)	0.63636	0.04391

Source: computed from survey data

Across the sample as shown in Table-2, meat and fresh fish (33% each) have the highest expenditure shares of all the food commodities in animal protein basket, making 66% of the total expenditure on animal protein in the sample, closely followed is dry fish of 11%. Therefore, fish and meat share make 77% of total expenditure on animal protein in the sampled households. Expenditure share on milk (powdered and condensed) is 13% while egg (10%) has the least.

Along each quartile from Table-2, fresh fish accounts for the highest share (33%) among all the food

commodities in animal protein in the poorest households, even higher than the sample average. Powdered milk account for the lowest share of 2.6%. Along the second quartile, meat has the highest share of about 40%, while in the third quartile fresh fish has the highest share (39%). Table-2 also reveals that fish (fresh and dry) has higher share in third quartile (45%) than second quartile (37%), while meat has higher share in second quartile (40%) than the third quartile (31%).

**Table-2.** Fish, meat, egg and milk group composition and share.

Food share	Income quartiles				
	All households	First	Second	Third	Fourth
Egg	0.10040 (0.08428)	0.11152 (0.08030)	0.10584 (0.10521)	0.10869 (0.07528)	0.07422 (0.06986)
Fresh fish	0.32582 (0.19693)	0.33240 (0.19540)	0.25511 (0.15908)	0.38793 (0.23015)	0.32822 (0.18150)
Dry fish	0.11426 (0.14764)	0.12960 (0.11396)	0.11520 (0.09364)	0.06579 (0.09414)	0.14921 (0.23867)
Meat	0.32903 (0.18704)	0.27306 (0.14657)	0.39695 (0.19501)	0.31009 (0.21612)	0.33457 (0.16731)
Condensed milk	0.10613 (0.10275)	0.12740 (0.08691)	0.09919 (0.12431)	0.09419 (0.10030)	0.10432 (0.09691)
Powdered milk	0.02435 (0.03985)	0.02602 (0.03377)	0.02771 (0.03877)	0.03331 (0.05374)	0.00945 (0.02417)

Source: computed from survey data

Note: standard deviation are quoted in parenthesis

Second and third quartiles have both egg and milk shares almost the same. Strikingly, richest households have the lowest share for egg in the sample; this can be attributed to their exposure and education about side effects of high consumption of it. Meat and fish (fresh and dry) have the highest share of the food commodities in animal protein basket of the richest households. Milk consumption for the richest households is also lower than the sample average. It can also be seen from Table-2 that dry fish share is highest in the richest households.

Across all the income quartile as shown in Table-2, all the food commodities in the animal protein basket are normal goods with seemingly quadratic relationship between expenditure shares and income level.

Results on milk and products consumption

The most serious zero consumption occurred in milk and milk product sub-group of animal protein group in the selected food items. Hence, it is important to improve estimation by considering a selection demand system. The Heckman two-stage model was estimated with a view to identifying factors that determine consumption decision and consumption level of milk and milk product in the study area.

It is interesting to note that 8 out of 20 coefficient estimates of the explanatory variables are statistically significant at various levels of significance in each of the two equations (consumption decision and consumption expenditure) of the model as shown in Table-2. More so, five (5) variables (Age of household head, square of Age of household head (life cycle), Household size, Household head income and Household expenditure on animal

protein) commonly and significantly influence consumption decision and consumption expenditure level of milk and milk products in the study area. As expected also, three (3) different variables significantly and separately influence consumption decision (that is, Ownership of house, Credit accessibility and Spouse occupation-trading) and consumption expenditure level (that is, Years of formal education of household head, Expenditure on non-food items and Household head occupation-farming) of milk and milk products of the respondents.

First stage

Specifically, the likelihood of making consumption decision of milk and milk products increases with age of household heads, *ceteris paribus* (Table-3). However, the relationship is not linear, as square of age of household head is negative and statistically significant. We can therefore infer from the foregoing that the likelihood of making consumption decision of milk and milk products in the study area increases with age of household head to a limit, after which it declines.

**Table-3.** Heckman selection model - two-step estimates results on milk and milk products consumption in the study area.

Variables	First stage	Second stage
	Selection equation (Probit regression)	Outcome equation (OLS regression)
Household head marital status (1 = married; 0 = otherwise)	-0.751 (1.940)	-12.009 (76.528)
Age of household head (Years)	0.630** (0.323)	-20.164*** (6.307)
Square of age of household head (Years)	-0.004* (0.002)	0.182*** (0.055)
Years of schooling of household head (Years)	0.142 (0.135)	7.437** (3.660)
Gender of household head (1 = male; 0 = female)	-1.959 (1.389)	44.470 (37.438)
Household size (head count)	0.752** (0.387)	-14.177** (6.304)
Nativity of household head (1 = native; 0 = otherwise)	4.229 (2.863)	53.055 (34.590)
Household expenditure of food-away-from-home (Naira)	-0.001 (0.001)	0.004 (0.018)
Household expenditure on non-food items (Naira)	-0.0002 (0.000)	0.012** (0.006)
Household land ownership (1 = land owner; 0 = otherwise)	1.416 (2.066)	49.581 (44.832)
Household house ownership (1 = house owner; 0 = otherwise)	-6.964* (3.934)	-35.526 (47.404)
Household access to credit (1 = access; 0 = no access)	5.012** (2.431)	-71.565 (50.049)
Association membership (1 = member; 0 = otherwise)	-1.253 (2.006)	0.008 (52.145)
Dependency ratio	-2.390 (1.649)	6.105 (77.542)
Household income (Naira)	-0.0002*** (0.000)	0.002*** (0.001)
Household spouse occupation (1 = trading; 0 = otherwise)	6.416** (3.078)	-120.87 0 (74.760)
Household head occupation (1 = farming, 0 = otherwise)	2.657 (1.633)	-186.687*** (49.651)
Household expenditure on animal protein (Naira)	0.007** (0.003)	0.0761*** (0.0162)
Household expenditure on food (Naira)	0.000 (0.000)	----- -----
Constant	-24.879** (11.586)	442.655** (189.545)

Mills lambda 16.222 (62.112)

Rho 0.112

Sigma 144.214

Number of Observation 121

Wald chi2 (38) 121.320

Prob > chi2 0.0000

Note: Figure in parentheses are standard error

*, **, *** coefficients are significant at the 10%, 5%, and 1% level, respectively

Source: computed from survey data

Ownership of a house reduces the likelihood of making consumption decision of milk and milk products. This is expected, because in the rural setting, mature

households who are without children usually own houses. Access to credit reduces consumption decision of milk and milk products in the study area.



The likelihood of making consumption decision decreases with income of the respondents. This agrees with the result on the income profile of animal protein consumption expenditure composition and share of Table-3, which reveals that on the average, the milk and milk products consumption expenditure of the poorest households is higher than that of the sample average and the richest households. This can be attributed to the high likelihood that low income households are likely to be raising children.

Moreover, the study further reveals that the likelihood of milk and milk products consumption decision increases with increase in household consumption expenditure on animal protein. Having a spouse who is a trader increases likelihood of making consumption decision of milk and its products.

Second stage

On the other hand, the eventual consumption expenditure of milk and milk products reduces with age of the household head. This can be explained from the point that young households are likely to be raising children who consume milk and milk products. However, this is not a linear relationship as coefficient estimate of square of the age of household head is positive and statistically different from zero. This can be explained from point that older households take more milk and milk products primarily as a result of increase in income or having more grandchildren around them who consume milk and milk product.

Expectedly, consumption expenditure on milk and milk products increases with years of education of household head. However, expenditure on milk and its products reduces with household size. More so, consumption expenditure on milk and its products increases with consumption expenditure of the milk and its product. As expected too, increase in income of household head increases consumption expenditure level on milk and milk products. Having farming as the primary occupation of household heads negatively influences household consumption expenditure on milk and its products in the study area. Household consumption expenditure on milk and its products increases with household expenditure on animal protein.

As reported in Table-3, Wald chi2 statistics show that the decision variables fit the model at the 1% level of significance. It is also reported in Table-3, the estimated correlation across equation errors, ρ , and, the mill lambda. The mill lambda is found not to be significant, which implies that the two equation are independent (i.e., $\rho = 0$), and that the sample suffers no selection bias.

SUMMARY AND CONCLUSIONS

It is paramount, to reiterate the findings from consumption decision and consumption expenditure on milk and milk product's model, as Nigeria fine tunes her policy on dairy production, consumption and trade; and also joining other part of the world in celebrating world milk day for the first time in recognition of its nutritional

potency. This study has shown that 11 factors influence consumption decision and consumption expenditure, and among the eleven, five factors commonly influence both decision and eventual level of consumption expenditure. As expected too, three different factors influence decision but not eventual consumption expenditure level and another three factors influence consumption expenditure level but not decision on consumption of milk and milk products.

Awareness should be created on nutritional and health education among the rural people to promote animal protein consumption and milk in particular. This is because, findings from this study show that having a farmers as the household heads have a negative influence on animal protein consumption and milk and milk products in particular.

Birth control should be encouraged among the rural households as the findings show that increase in household size reduces animal protein consumption expenditure share and increases consumption of other food groups which have low qualities. Rural household heads should insist on their members going to school, and with the support of the government nine years basic education to make nutrition education compulsory. This is also coming from the findings of the study as years of education of household heads have a positive and significant influence on the consumption level of milk and milk products.

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