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DEMAND FOR WHITE MEATS AMONG WORKING HOUSEHOLDS OF A TERTIARY INSTITUTION IN NIGERIA

Oluwakemi Adeola Obayelu¹, Peter Damilare Odetola²

Abstract

White meat is associated with lower cholesterol level, reduction in cardiovascular diseases and more protein content than red meat. Owing to a paucity of empirical studies on its demand in Nigeria, this study assessed household demand for selected white meats among the staff of University of Ibadan. Elasticities of demand were estimated with Quadratic Almost Ideal Demand System (QUAIDS). Chicken, turkey and snail meats were necessity goods, while fish, duck, rabbit, guinea fowl and quail meats were luxury goods. All the white meat types were normal goods with the exception of snail and duck meats that were considered as inferior goods. The selected white meats were mainly gross complements but a few were substitutes. Own- and cross- prices, age, gender, educational attainment and household size explained demand for white meat among the working households. Price reduction and income policies that would increase the purchasing power of the working households are viable policy thrusts to enhance their demand for white meats.

Key words: White meat, budget share, expenditure, demand elasticities, QUAIDS.

JEL³: D12, D19, Q18

Introduction

Meat is a highly nutritious portion of human food and contains sundry important nutrients that are not easily obtainable in the accurate measures from other protein sources (Geiker et al., 2021). Meat can be classified as red or white meat based on the kinds of animal and conditions of production. Red meat is mainly derived from beef, mutton and pork. It is a rich source of important amounts of proteins, thiamine, zinc, riboflavin, iron and vitamins B₆ and B₁₂ (Juarez et al., 2021). However, it is dense in saturated fatty acids, which have negative health consequences on man (Godfray et al., 2018). Moreover, a high level of consumption of red meat is the main predisposing risk factor for increased occurrences of colorectal cancer, gout, diabetes

1 Oluwakemi Adeola Obayelu, Ph.D., University of Ibadan, Department of Agricultural Economics, 200284 Ibadan, Nigeria, Phone: +234 806 016 01 18, E-mail: jkemmyade@yahoo.co.uk

2 Peter Damilare Odetola, M.Sc., University of Ibadan, Department of Agricultural Economics, 200284 Ibadan, Nigeria, Phone: +234 813 669 67 46, E-mail: opeter805@gmail.com

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mellitus type 2 and heart diseases (Pan et al., 2012; Feskens et al., 2013; Wang et al., 2016; Etemadi et al., 2017; Li et al., 2018; Geiker et al., 2021). Thus, there is an increased campaign to cut the high level of consumption of red meat in developed countries (Lupoli et al., 2021).

Furthermore, the amount of carnitine in red meats is four times higher than that of white meats, and the latter is therefore considered a healthier substitute to red meat consumption (Spence et al., 2021). White meat contains lower saturated fat and calorie compositions than red meat and its consumption could thus lower the levels of blood cholesterol and lessen the threat of cardiovascular diseases, diabetes and some cancers (Cosgrove et al., 2005; Bergeron et al., 2019). White meat is also considered as a functional food that provides bioactive substances like conjugated linoleic acid, vitamins and antioxidants, with favourable effects on human health (Petracci, Cavani, 2012). Owing to a growing interest in healthy eating, preference for white meat has increased among meat consumers (Guine et al., 2021).

White meat includes the meat from domestic birds and some animals such as turkey, chicken, rabbit, duck, geese, quail, guinea fowl, or game meat from non-domesticated animals such as antelopes, glasscutters and turtles. Rabbit meat is nearly white, palatable, and high in quality protein content, while low in fat content (Odinwa et al., 2016). It also has lesser fat and cholesterol but more calcium and phosphorus than beef, chicken and pork (Nistor et al., 2013). Land snails are invertebrate animals, with soft bodies (meat) that are rich in protein and water (Adeyeye, Afolabi, 2004). The predominant species of snail found in sub-Saharan Africa are the *Achatina achatina*, *Achatina fulica* and *Archachatina marginata* (Apata et al., 2015; Nkansah et al., 2021). Fish is an aquatic animal that is rich in proteins and fats. It is a rich source of protein for poor people due to its availability in their diets (Balami et al., 2019). Higher protein-fat ratio at fish protein than red meats, provides a stable composition of essential amino acids with high digestibility (85-95%), (Lozano, Hardisson, 2003; Pal et al., 2018). Fish is the cheapest source of protein in Nigeria and its demand is about four times the level of its production in Nigeria (Liverpool Tasie et al., 2021; Obayelu et al., 2022).

Consumption of poultry meat is growing all over the world including chicken, duck, quail and turkey (Farak et al., 2021). In a 100 g serving, while chicken, turkey and duck provides 27.3 g, 28.5 g and 20.3 g of protein, respectively, and 13.6 g, 7.39 g and 22.85 g of fats, respectively (Mazmanyany, 2021). However, the high level of cholesterol in duck meat and broiler chickens often limits their consumption (Suhaemi, Hidayat, 2020). In contrast, quail meat has less fat and cholesterol due low fat accumulation between its thin skin tissues (Farak et al., 2021). It also contains

mellitus type 2 and heart diseases (Pan et al., 2012; Feskens et al., 2013; Wang et al., 2016; Etemadi et al., 2017; Li et al., 2018; Geiker et al., 2021). Thus, there is an increased campaign to cut the high level of consumption of red meat in developed countries (Lupoli et al., 2021).

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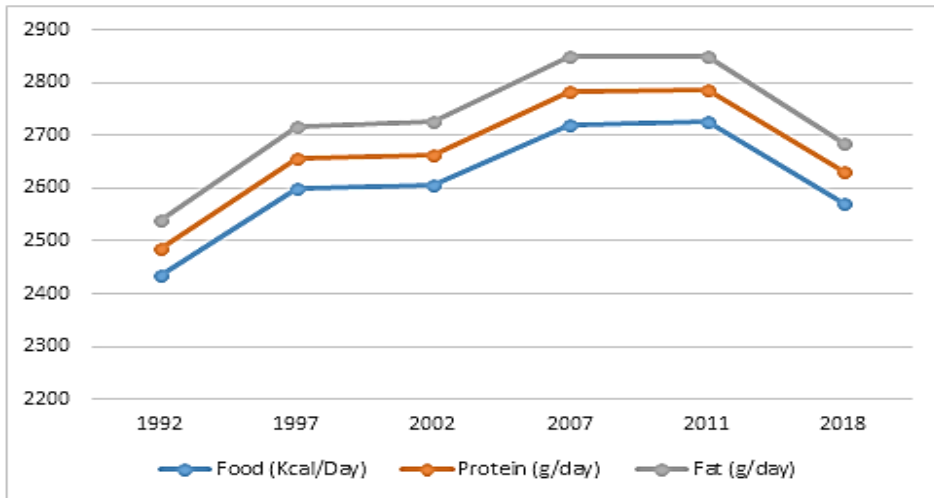
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more calcium, magnesium, phosphorus, protein and sodium than red meat (except pork) but less fat (Rahimi et al., 2011; Kralik et al., 2017).

Meat has remained an important component of Nigeria's agricultural sector and sources of animal protein that enable human growth and development. It is also an integral part of diets of majority of Nigeria population (Ogundari, 2012). However, as at 2019, the prevalence of protein deficit and malnutrition was still widespread in Nigeria (Protein Challenge, 2020). Demand for meat type is often determined by the consumer preferences, while the variations in the consumers' preferences hold on the facts that animals differ in terms of amount of protein availability, price, taste and aroma (Olaleye, 2013; Adeniyi et al., 2013; Dashdorj et al., 2015). Ogunwole et al. (2014) asserted that white meat such as broiler meat was most preferred than other meats because of its affordability relative to the price of red meat in Nigeria.

Figure 1. Trends in per capita food, protein and fat consumption in Nigeria



Source: FAOSTAT, 2021.

The dwindling trend in per capita food, protein and fat in Nigeria (Figure 1.) suggests an exacerbating food and nutrition security in Nigeria. A typical household in Nigerian spends almost three-fifths (58.9%) of their income on food due to food price hikes implying that Nigerians are poor and spend over half of their income on food (Egwuma et al., 2019). Vulnerable households have shifted their limited household food budgets to cassava flour and other cheaper and less nutritious diets (WFP, 2022). A recent study observed unaffordability of healthy diets in Nigerian and that affordability was dependent on food prices and income (Mekonnen et al., 2021). Inability of households to afford healthy diets is therefore an indicator of poor purchasing power and the necessity for increased incomes (FAO, 2020). The

poor economic access to safe and adequate food is a signal to a decline in food and nutrition security in the country.

Although studies on household demand for food in Nigeria abound (Obayelu et al., 2009; Alimi, 2013; Udoh et al., 2013; Fashogbon, Oni, 2013; Otunaiya et al., 2015; Shittu et al., 2015; Obayelu et al., 2019; Sowunmi et al., 2020; Salman et al., 2021), there are limited studies on household demand for meat in Nigeria (Yusuf, 2012; Ogundari, 2012; Adetunji, Rauf, 2012; Emokaro, Dibiah, 2014; Aborisade, Carpio, 2017). However, there is a paucity of information on demand for white meat in Nigeria. This could be partly owing to inadequacies in available data on white meat consumption in terms of breadth, depth and scope. This study therefore seeks to provide empirical information on demand elasticities for white meat in Nigeria.

Study is run based on these hypotheses: H_{01} = difference between price and quadratic expenditure on white meats is zero; and H_{02} = difference between demand for white meats and household socioeconomic characteristics is zero.

Material and Methods

The study used a three-stage sampling procedure to collect information from 300 workers among the staff of University of Ibadan, Nigeria in 2019. At the first stage, 8 out of 15 faculties and 4 units from the school registry were randomly selected. At the second stage, two departments from each of the selected faculties and units were also randomly selected. The third stage was the random selection of 15 workers from each of the selected departments and units. The selected faculties were: Education, Arts, Science, Social Science Technology, and Veterinary Medicine. In addition, pilot survey was carried out to pre-test 10 staff from two randomly selected faculties. Kish formulae used to select the sample size was:

$$n = Z\alpha^2 pq / e^2$$

Where,

p = probability of success;

q = probability of failure;

$Z\alpha$ = abscissa of the normal curve that splits an area α at the tails;

e = desired precision level; and

n = number of total units.

($P = 1-q$; $P = 0.81$; $q = 1-0.81 = 0.19$; $e = 0.05$; $Z = 1.96$)

Adetunji, Rauf (2012) collected data from 240 respondents. However, this study collected a sample size of 300 households for a higher level of precision. The study used information obtained from memory recall of a working member of the households on a 30-day consumption of white meat. This was to capture the variations in white meat consumption within a month. Data collected include households' socioeconomic characteristics and white meat expenditure, as well as prices of white meats per kilogram.

The Quadratic Almost Ideal Demand System (QUAIDS) model was used to estimate the budget shares, expenditures and price elasticities of white meat categories following Obayelu et al. (2022). Using the indirect utility function, the model was derived from a generalization of the PIGLOG preference and it is presented as (Equation 1.):

$$\ln V = \left\{ \left[\frac{\ln m - \ln a(p)}{b(p)} \right]^{-1} + \lambda(p) \right\}^{-1} \quad (1)$$

Where,

m is the total expenditure;

$[\ln m - \ln a(p)]$ is the indirect utility function of the PIGLOG demand system, while $a(p)$, $b(p)$ and $\lambda(p)$ are homogeneous functions of vector prices, p . While $a(p)$ is homogenous of degree one in prices, $b(p)$ and $\lambda(p)$ are homogenous of degree zero. Hence, $\ln a(p)$ takes the trans-log form (Equation 2.):

$$\ln a(p) = \alpha_0 + \sum_{i=1}^j \alpha_i \ln P_i + \frac{1}{2} \sum_{i=1}^j \sum_{j=1}^j \gamma_{ij} \ln P_j \quad (2)$$

while $b(p)$ and $\lambda(p)$ are the Cobb-Douglas price aggregators given as (Equations 3. and 4.):

$$b(p) = \prod_{i=1}^j P_i^{\beta_i} \quad (3)$$

$$\lambda(p) = \sum_{i=1}^k \lambda_i \ln P_i \quad ; \quad \text{Where, } \sum_{i=1}^k \lambda_i = 0 \quad (4)$$

Where $i = 1, \dots, k$ is the number of white meat types in the model.

Roy's identity or Shephards Lemma is applied to the model to give the budget shares equation (Equation 5.):

$$\omega_i = \alpha_i + \sum_{j=1}^k \gamma_j \ln P_j + \beta_i \ln \left[\frac{m}{a(p)} \right] + \frac{\lambda_i}{b(p)} \left\{ \ln \left[\frac{m}{a(p)} \right] \right\}^2 \quad (5)$$

In order to check varying preferences and heterogeneity across the households, socio-economic variables (z) were introduced into the model (Equation 5.), using a linear demographic translating method following Pollak, Wales (1981) to give (Equation 6.):

$$\omega_i = \alpha_i + \sum_{j=1}^k \gamma_j \ln P_j + \beta_i \ln \left[\frac{m}{a(p)} \right] + \frac{\lambda_i}{b(p)} \left\{ \ln \left[\frac{m}{a(p)} \right] \right\}^2 + \sum_{s=1}^L \delta_s Z_s + u_i \quad (6)$$

Where,

$Z_s = (Z_1, \dots, Z_L)$ is a set of socio-economic variables;

w_i = budget share allotted to white meat type i ;

P_i = unit price of white meat type i ;

m = per capital expenditures on all meat types;

α_i = average budget share of white meat type i without price and income effects;

β = parameter for determining luxury or necessity white meat;

γ_{ij} = parameter for cross-price elasticities

δ_j = coefficients of socioeconomic variables; and

μ_i = error term.

The budget share for white meat type i is defined as (Equation 7.):

$$\omega_i = \frac{p_i q_i}{m} \quad (7)$$

Where,

w_i = budget share for white meat type i ;

p_i = unit price of white meat type i (NGN/kg);

q_i = quantity of white meat type i (kg); and

m = total white meat expenditure (in NGN – Nigerian Naira).

The expenditure and the Marshallian (uncompensated) price elasticities are given as (Equations 8. and 9.):

$$e_i = \mu_i / \omega_i + 1 \quad (8)$$

$$e_j^u = \mu / \omega_i - \delta_j \quad (9)$$

δ_j = Kronecker delta (1 if $i = j$ and 0 if otherwise). Application of Slutsky equation gives the Hicksian (compensated) price elasticities as (Equation 10.):

$$e_j^c = e_j^u + e_i \omega_j \quad (10)$$

Results with Discussion

Chicken constituted a highest mean expenditure (46,434.67 NGN) and budget share (40.4%) of household expenditure, while quail had the least (1,755.33 NGN and share of 1.5%, respectively), (Table 1.). This finding buttressed the findings of Arowolo et al. (2021) that chicken had the largest meat budget share, while quail, rabbit and guinea fowl meat were the least. As at 2019, Nigeria had the second largest population of chicken in Africa (about 180 million birds) but Nigerians consumed about 1.9 kg of chicken meat per capita annually (NEA, 2020).

Table 1. Budget Share of White Meat Categories

White Meat Groups	Mean expenditure (in NGN)	Budget Share
Fish	16,048.02	0.139594
Chicken	46,434.67	0.403913
Turkey	13,327.01	0.115925
Snail	12,688.33	0.110370
Duck	7,807.67	0.067915
Rabbit	14,060.10	0.122301
Guinea Fowl	2,841.01	0.024713
Quail	1,755.33	0.015269

Source: Authors' computation based on primary data collection, 2019.

Determinants of demand for selected white meats

The budget shares of all the selected white meats increased with their respective own-prices (Table 2.). The coefficients of the per capita expenditure and the squared per capita expenditure were significant for all the white meat types implying that they had non-linear demand curves. Thus, backing the rejection of the null hypothesis that the

quadratic expenditure term was not different from zero and the fitness of the QUAIDS model (Obayelu et al., 2021). Similarly, the negative coefficients of squared per capita expenditure for chicken, turkey and snail suggested they were necessity goods and had decreasing demand curves in the long-run. However, the positive coefficients of fish, duck, rabbit, guinea fowl and quails suggested these meats were luxury commodities that people tend to consume more of them at higher prices.

Male-headed households were more likely to consume more turkey and snail but less quails than their female counterparts. In the same vein, households with highly educated working members would likely allocate more of their meat budget to chicken and snail but less on fish, quail, rabbit, duck meat and turkey. Large households tended to allocate more of their meat budget to chicken, turkey, rabbit, duck meat but less to fish, snail and quail. This finding was not consistent with the finding of Omonona et al. (2009) that household size was inversely related to demand for fish in Nigeria. Furthermore, working households with elderly heads allocated higher proportions of their meat budget to chicken and guinea fowl but less to fish and turkey. This revealed preference of elderly heads showed their increasing demand for healthier meats with less cholesterol at a higher income level.

Table 2. Determinants of household demand for white meat

Variables	Fish	Chicken	Turkey	Snail	Duck	Rabbit	Guinea Fowl	Quails
Constant	0.3202*** (0.0702)	1.6748*** (0.0475)	0.6451*** (0.0580)	-1.7314*** (0.0371)	-0.0016 (0.0306)	0.0767*** (0.0289)	0.0127*** (0.0034)	0.0035*** (0.0006)
Price Coefficients								
LnPrice of Fish	0.7054*** (0.0270)							
LnPrice of Chicken	-0.2525*** (0.0168)	0.5572*** (0.0170)						
LnPrice of Turkey	-0.1014*** (0.0149)	0.0395*** (0.0090)	0.1689*** (0.0093)					
LnPrice of Snail	-0.3553*** (0.0264)	-0.2999*** (0.0138)	-0.0994*** (0.0182)	0.7851*** (0.0203)				
LnPrice of Duck	0.0018 (0.0070)	-0.0226*** (0.0044)	-0.0019 (0.0027)	-0.0059 (0.0092)	0.0326*** (0.0015)			
LnPrice of Rabbit	0.0009 (0.0065)	-0.0199*** (0.0040)	-0.0050* (0.0027)	-0.0214** (0.0087)	-0.0042*** (0.0012)	0.0498*** (0.0020)		
LnPrice of Guinea Fowl	0.0009*** (0.0007)	-0.0013*** (0.0005)	-0.0006** (0.0003)	-0.0026*** (0.0010)	0.0001 (0.0002)	-0.0002 (0.0002)	0.0037*** (0.0002)	
LnPrice of Quails	0.0002 (0.0001)	-0.0006*** (0.0001)	-0.0002*** (0.0000)	-0.0006*** (0.0002)	0.0000 (0.0000)	-8.17E-05*** (0.0002)	0.0000 (0.00002)	0.0012*** (0.0001)
Expenditure and Expenditure Squared								
LnEXP	0.1667*** (0.0106)	0.1123*** (0.0063)	0.0336*** (0.0089)	-0.3248*** (0.0054)	0.0151** (0.0046)	0.0093** (0.0043)	0.0011** (0.00048)	0.0003*** (0.0001)
Ln EXPD ²	0.0190*** (0.0006)	-0.0049*** (0.0005)	-0.0025*** (0.0006)	-0.0131*** (0.0005)	0.0007** (0.0003)	0.0007** (0.0003)	0.0001*** (0.0000)	0.0000*** (4.69E-06)
Household Characteristics								
Gender of Household head	-0.0008 (0.0006)	-0.0005 (0.0005)	0.0022*** (0.0003)	-0.0013*** (0.0004)	-0.0002 (0.0002)	0.0006*** (0.0001)	-0.00005 (0.00001)	-6.34E-06*** (2.40E-06)
Years of Formal Education	-0.0001** (5.83E-05)	0.0002*** (0.00005)	-0.0003*** (0.00003)	0.0002*** (3.41E-05)	-6.36E-05*** (0.00001)	0.00001 (0.00001)	-1.04E-06 (1.51E-06)	-4.00E-07* (2.43E-07)
Household size	-0.0006** (0.0002)	0.0004** (0.0002)	0.0002* (0.0001)	-0.0003* (0.0001)	0.0001** (0.0001)	0.00001 (0.0001)	-6.15E-06 (5.84E-06)	-1.52E-06* (9.46E-07)
Age of Household head	0.0005*** (-0.0006)	-0.0004*** (0.0004)	-0.0001*** (0.0002)	4.46E-05 (-0.0003)	0.00001 (0.0001)	3.63E-06 (0.00001)	2.24E-06* (-6.15E-06)	7.08E-07*** (-1.52E-06)

Source: Authors' computation based on primary data collection, 2019.

Figures in parentheses are standard errors

Expenditure Elasticities

A white meat type is an inferior good if its expenditure elasticity is less than unity (<1) but a normal good if it is greater than one (> 1). All the white meat types had positive elasticities (indicating that they were normal goods) with the exception of snail and duck that were considered an inferior good (Table 3.). This suggested that as their income increased, the households would buy more of the white meats but less of snail and duck that were considered to be low in quality and cheaper in price (inferior). The discrimination against the consumption of snail and ducks might be due to taboos and myths attached to their production and consumption in Nigeria (Oguntunji, 2014; Ekwochi et al., 2016).

Table 3. Expenditure Elasticities of White Meat

White Meat Categories	Expenditures Elasticities
Fish	1.3795
Chicken	1.2594
Turkey	1.4450
Snail	-1.7220
Duck	0.9839
Rabbit	1.2352
Guinea Fowl	1.3256
Quail	1.2182

Source: Authors' computation based on primary data collection, 2019.

Compensated and Uncompensated Elasticities

A substantial difference between uncompensated and compensated own-price elasticities is observed due to effect of income. The compensated is lower than the uncompensated price elasticity, implying that the price responsiveness of different white meat groups is dependent on income.

The uncompensated own-price elasticities of white meats were price inelastic in absolute term except for fish (1.0030) and turkey (1.0320). This was partially consistent with the finding of Aborisade, Carpio (2017) that uncompensated own price elasticity of chicken and fish were price inelastic. In absolute terms, turkey (1.0320) accounted for the largest uncompensated own-price elasticities, while duck had the least (0.2190). This suggested that turkey was the most responsive to price changes, while duck was the least. Contrary to expectation, all the uncompensated own-price elasticities, except chicken, were positively signed suggesting that their demands were inconsistent with the demand theory. The negative own-price elasticity of chicken (-0.2612) implied that its demand curve was downward sloping and fulfilling the law of demand. The finding was also consistent with the finding

by Omonona et al. (2009) that chicken had a negative own-price uncompensated elasticity for chicken.

The compensated own-price elasticities on the other hand reveal that most of the white meat categories are price inelastic. It can be deduced that the compensated own-price elasticities for chicken, snail, duck, rabbit, guinea fowl and quail were price elastic. This suggested that a percent increase in the prices of these white meats will increase their respective quantities demanded; unlike fish and turkey whose unit increase in their quantities will lead to more quantities demanded due to the effect of income (purchasing power). This finding was not consistent with the finding by Omonona et al. (2009) and Aborisade, Carpio (2017), who reported the own-price for chicken and fish to be price inelastic.

Most cross-price elasticities were negative implying gross compliments, while others were positive (substitutes). White meats are gross complements if a unit increase in the price of a white meat type reduces the quantity demanded of another white meat type. Hicksian price elasticity is a better measure of the substitution effects between any two food categories because it measures only substitution effects. Chicken and turkey were gross compliments to all the white meats but were substitutes for each other, while snail was a substitute for chicken and turkey. Duck, rabbit, guinea fowls and quail were substitutes and fish and vice-versa. Overall, the results suggest that the selected white meats were mainly gross complements but a few are substitutes. However, cross-price elasticities were less than own-price elasticities in absolute terms.

Table 4. Compensated and Uncompensated Price Elasticities

White Meat GroupS	Fish	Chicken	Turkey	Snail	Duck	Rabbit	Guinea Fowl	Quail
Marshallian/Uncompensated Elasticities								
Fish	1.0030	-1.6616	-0.5831	-0.1607	0.0214	-0.0251	2.08E-06	0.0004
Chicken	-0.6455	-0.2612	-0.0792	-0.1579	-0.0420	-0.0625	-0.0045	-0.0015
Turkey	-1.4874	-0.3870	1.0320	-0.4695	-0.0088	-0.0947	-0.0107	-0.0030
Snail	-2.7071	3.1629	0.9084	0.6223	-0.1685	-0.0245	-0.0084	-0.0044
Duck	0.0561	-0.8418	-0.0704	-0.2067	0.2190	-0.1568	0.0028	0.0011
Rabbit	-0.0437	-1.1565	-0.3187	-0.1237	-0.1201	0.5280	-0.0076	-0.0027
Guinea Fowl	0.2130	-1.2257	-0.4539	-0.1987	0.0414	-0.0959	0.3704	0.0090
Quail	0.1904	-1.1848	-0.3971	-0.2289	0.0453	-0.1118	0.0278	0.4253
Hicksian/Compensated Elasticities								
Fish	1.4594	-1.0662	-0.4826	-0.0198	0.0583	0.0193	0.0037	0.0016
Chicken	-0.2288	0.2824	0.0125	-0.0292	-0.0083	-0.0219	-0.0011	-0.0004
Turkey	-1.0093	0.2366	1.1373	-0.3218	0.0299	-0.0482	-0.0068	-0.0018
Snail	-3.2768	2.4197	0.7830	0.4463	-0.2146	-0.0800	-0.0130	-0.0059

White Meat GroupS	Fish	Chicken	Turkey	Snail	Duck	Rabbit	Guinea Fowl	Quail
Duck	0.3816	-0.4172	0.0013	-0.1061	0.2453	-0.1251	0.0054	0.0020
Rabbit	0.3650	-0.6234	-0.2287	0.0026	-0.0871	0.5678	-0.0043	-0.0017
Guinea Fowl	0.6515	-0.6536	-0.3573	-0.0633	0.0768	-0.0532	0.3740	0.0101
Quail	0.5934	-0.6590	-0.3083	-0.1044	0.0779	-0.0726	0.0311	0.4263

Source: Authors' computation based on primary data collection, 2019.

Conclusion

This study empirically estimated households' demand for white meat among staff of University of Ibadan. Results from the QUAIDS model for the demand analysis help to understand the socioeconomic determinants of white meat demand. Socio-economic variables affecting the demand for white meat include gender, age of the household head, years of formal education and household size. Furthermore, budget share of chicken was the highest. Demand for white meat was elastic to price changes except for snail and duck that were price inelastic. Fish, chicken, turkey, rabbit, guinea fowl and quail were normal goods while snail and duck were inferior white meats. Compensated own-price elasticities for all the white meat categories were price inelastic except for fish. A viable policy thrust should be channelled towards food price reduction through production assistance to white meat farmers and actors in the supply chains. Likewise, government should adopt income policies to increase the income of workers and thus increase household purchasing power. Owing to a limited fund, the study was based on microeconomic data collected from 300 working households, which limited its inferences on urban working households' demand for white meat in Nigeria. In addition, respondents' poor memory recall on actual white meat consumed in the last 30 days may lead to measurement error. Nevertheless, this study contributes to the growing literature on demand for healthy foods. Future studies could include data on consumption of insects and plant-based proteins (possible substitutes or compliments to white meat) in order to advance food policy thrusts that will enhance urban households' demand for healthy foods.

Appendix. Summary statistics for variables used in the efficiency analysis

Variables	Minimum	Maximum	Mean	Standard Deviation
Household Age	45.67	44.89	51.717	5.532
Household Age Square			2,688.057	621.5318
Female to Male Adult Ratio	0.333	3	1.524	0.933
Total Household Size	3	10	5.953	1.256
Distance to White meat Market	0	8	3.63	2.018
Years of working experience	8	26	12.013	3.429
Monthly Income	40,000	800,000	170,643.3	109,736.4

Source: Authors' computation based on primary data collection, 2019.

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