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DETERMINANTS OF HOUSEHOLD FISH CONSUMPTION IN ENUGU STATE, NIGERIA

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ABSTRACT
This study analysed the determinants of household fish consumption in Enugu state, Nigeria; using 467 households selected through a multi-stage sample procedure. Data was collected using questionnaire and analysed using descriptive statistics such as frequency, percentages, and mean, and a logit regression model. The study results showed that azu fridge (mackerel) with the highest mean score (MS = 4.24) was the most consumed fish species in the form of fresh fish (MS = 4.56). The majority (64%) of the respondents indicated that they prepared their fish through the boiling method. The results of the logit regression analysis revealed that age, gender, marital status, education, income, household size, location, access to the market, and fish cost were statistically significant at various levels of percentages. In light of the findings, it is recommended that the government should consider these fish consumption determinants in the formulation of fish distribution and marketing policies to encourage its consumption in the state.

Key words: fish, consumption, logit regression, determinants, households, Enugu State

INTRODUCTION
Around the world, peoples' dietary habits differ and this is determined by the type of food locally available. The ability of a person to sustain good health depends on the type and quality of food one consumes. For a wholesome and well-balanced diet, fish is a type of food and a crucial source of protein (FAO, 2008; Moya *et al.,* 2008; Beal *et al.,* 2017; Byrd *et al.*, 2018). It is categorized as white meat and supplies over 60% of the global protein demand (FAO, 2010; Pal *et al.,* 2018; Balami *et al.,* 2019; Obayelu and Odetola, 2022; Olaoye *et al.,* 2022). Fish has a palatable and tasty flavour, and when compared to other animal proteins, it is of high nutritional value, providing cheap, easily digestible, and low-cholesterol protein (FAO, 2010; Kumoro *et al.,* 2022). Fish oil, which contains Omega 3 fatty acids, essential in lowering cholesterol levels, cardiovascular disease, and eye problems, is one of the additional advantages of eating fish (Domingo *et al.,* 2006; Shashikanth and Somashekar, 2020). The edible fish tissue is appreciably more nutritional (80.9%) to consume than that of beef (51%) or poultry (broiler 64.7%) (Rath, 1993; Shashikanth and Somashekar, 2020). The greatest deficiency of the inadequate intake of dietary protein is stunting in children (Maulidiana and Sutjiati, 2021). This is an irreversible condition of chronic protein deficiency that can damage a child's brain development and cognitive capacity permanently (Soliman *et al.,* 2021). Later, stunted children often earn 10% less than their non-stunted adult colleagues, and are at higher risk of becoming obese and more prone to diabetes and cardiovascular diseases (Oo, 2023). Therefore, fish consumption is highly important in households, especially among children. However, factors such as income, age, educational, and household size, cost of fish, occupation, and expenditure among others affect household's consumption behaviour (Adeniyi *et al.,* 2012; Jimoh *et al.,* 2021).

Nigeria produces about 1.1 million tonnes of fish annually from all sources but consumes about 3.6 million tonnes (Daily Trust 2022; Ibirogba, 2022; Nnodim, 2022). Leaving a staggering self-supply shortage of about 2.5 million tonnes (Daily Trust 2022; Ibirogba, 2022; Nnodim, 2022), imported with over ₦500 billion naira per annum (Daily Trust, 2022). Given the annual fish demand of about 3.6 million tons, studies have shown that fish consumption in Nigeria is increasing, however, production is not (Institut Public de Sondage d'Opinion Secteur IPSOS, 2017; Bradley *et al.,* 2020; NBS, 2020). Even though Nigerians spend about ₦295 Naira (0.76 USD) weekly on fish (Byrd *et al.,* 2021), her low consumption status

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may be because fish is consumed typically by residents of states along the coastal belt of the country (FAO, 2018; Oyibo *et al.,* 2020; Okelola and Babalola, 2022). However, Enugu state is not among these states. Therefore, understanding the key determinants of fish consumption in the state is necessary to find out the needful strategies to remove the hindrances that prevent the households from effectively consuming the fish. This empirical finding will provide baseline for donors, NGOs, and INGOs, government and Health organizations seeking to improve the nutrition of the citizens of Enugu state through increase in fish consumption.

MATERIALS AND METHODS

Area of Study

The study was conducted in Enugu State, Nigeria. Its entire land area is ca. 8,022.96 km^2 which lies between 5º 56′ N and 6º 53′ N latitudes and 7º 05′ E and 7º 55′ E longitudes (Onyekuru and Apeh, 2017; Chiemela *et al.,* 2022; Apeh, *et al.,* 2023a). It shares boundaries with states like Abia, Imo, Ebonyi, Benue, Kogi and Anambra. Her population at the 2006 census was 3,267,837 (NPC, 2006) but with annual growth rate of 3% (NBS, 2016), its population is projected to 5,129,005 in 2022. The State is divided into six agricultural zones which are Agbani, Awgu, Enugu, Enugu-Ezike, Nsukka and Udi. The division into zones was to, among other reasons, help the government coordinate farming activities and manage programmes for farmers more efficiently at grass root level. Fish is among the major animal protein consumed in the state.

Sampling Procedure and Sample Size

The sampling frame consists of all the households in Enugu state. However, we conducted a stable cross-section survey of rural and urban areas. To choose the households studied, a multi-stage sample procedure was used. First, from the six agricultural zones, two local government areas (LGAs) were randomly selected from each of the zone as shown in Table 1. Secondly, two communities each of the urban and rural areas were randomly selected from each of the LGAs. In the end, 10 households were randomly chosen from each of these areas; however, 13 copies of the questionnaires were incorrectly filled in some areas as indicated in Table 1, thereby leaving a total of 467 households that were studied. A pretested, well-structured questionnaire that was intended to gather enough accurate data, including several factors about fish consumption, was used to perform the survey utilizing sample censuses. The head of the household (a male or female adult who provides for the family) was interviewed but in case of their absence, an adult member of the household aged 18 and above responded to the survey questions.

Data Analysis

The data was analysed using SPSS version 16. The households' demographic characteristics, fish characteristics and consumption patterns were analysed using illustrative statistics like mean, frequencies, and percentages. The Logit model adopted from Apeh *et al.* (2023b) was used to analyse factors affecting household fish consumption. This logit regression model was analysed in terms of probabilities (*P*) (consumption or not). Given the explanatory variables, the dependant variable will be a binary response either ($P = 1$) if a household consumes the fish or ($P = 0$), otherwise. The model was specified as thus:

$$Logit\pi_i = ln\left(\frac{p_i}{1-p_i}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots + \beta_{10} X_{10} + \mu \ldots\ldots\ldots (1).$$

If $ln\left(\frac{p_i}{1-p_i}\right) > 0$, this means fish consumption by a household, $\Rightarrow (P = 1)$. If $ln\left(\frac{p_i}{1-p_i}\right) \leq 0$, this means no fish consumption by a household , $\Rightarrow (P = 0)$. This $ln\left(\frac{p_i}{1-p_i}\right)$ is considered a latent variable, which is mostly denoted as *y**. In this way, its numerical value implies a binary response denoted either as 1 or 0 otherwise. *Ln* is natural logarithm, β_0 is intercept, $\beta_1 - \beta_{10}$ is parameter coefficients estimated, μ is error term, $X_1 - X_{10}$ is independent variables defined as: X_1 is age of household head in years, X_2 is gender of household head (dummy: 1 for male and 0 for female), X_3 is marital status (dummy: 1 = married and 0 otherwise); X_4 is education (years in school), X_5 is income in Naira, X_6 is household size (number of people in a household who feed from one pot), X_7 is occupation, X_8 is location (dummy: 1 for urban and 0 for rural), X_9 is access to market (dummy: 1 for yes and 0 for no access), X_{10} is price per fish in Naira.

Table 1: Sampling summary

Agricultural zones	LGAs	Communities		Number of households
		Urban	Rural	
Agbani	Nkanu East	2	2	35
	Enugu South	2	2	40
Awgu	Awgu	2	2	40
	Orji River	2	2	40
Enugu	Enugu North	2	2	40
	Isi-Uzo	2	2	40
Enugu-Ezike	Igbo-Eze South	2	2	37
	Igbo-Eze North	2	2	40
Nsukka	Nsukka	2	2	40
	Igbo-Etiti	2	2	39
Udi	Udi	2	2	40
	Ezeagu	2	2	36
Total	12	24	24	467

LGAs - local government areas

RESULTS AND DISCUSSION

Households' Socioeconomic Characteristics

Table 2 shows the socioeconomic traits of households in the research area. It shows that 39.54% of the household heads were aged between 48 and 57. The average age is 39. It is expected that younger generation have more knowledge on the nutritional and health benefits of consuming more fish in their diet. In corroboration, Samoggia and Castellini (2018) found a favourable correlation between age and consumption. Similarly, Aminu *et al.* (2016) reported that there is a relationship between age and household consumption habit. The distribution of households by gender as presented in Table 2 shows that the percentage of households' heads is dominated by males (71%). Males are known as the breadwinners and providers for homes, hence in male headed households where men is present, it is expected that they can afford to eat fish more frequently than in female headed families. In this line, Akuffo *et al.* (2020) found that males headed 71% of the fish-consuming households in Ghana.

Table 2 further shows that, 84% of households are married couples, while 16% were not married. The requirement of marriage may include providing healthy and nutritious meal to meet the nutritional requirements of the entire households hence the families will seek for affordable and available animal protein sources. In corroboration, Gbigbi (2021) found in Delta State, Nigeria that the majority of fish consumers (64.2%) were married. Table 2 also shows that 43.73% of the respondents have completed only primary education. In line with Apeh *et al.* (2023c), we considered literacy based on those who spent at least six years in school. With higher education level, the majority of respondents would have switched to eating frozen fish for fish protein if they had known that animal protein has a lot of cholesterol. Supartini *et al.* (2018) reported that respondents' levels of education and income positively impact consumption patterns; beef, fish, amongst other food items. Khan *et al.* (2018) found a direct correlation between education and fish product consumption. Also, Samoggia and Castellini (2018) reported that although there is a positive relationship between higher education and higher fish purchasing, there is no relationship between higher education and higher consumption of fish. However, higher education is believed to enhance the respondent's ability to comprehend and appraise nutritional/health information that can influence their behavioural attitudes towards eating a more nutritious food like fish (Apeh, 2018; Tikon *et al.,* 2023; Ugwuoti *et al.,* 2023).

Table 2 also shows that many (71.17%) of the households in the study area consisted of five members and less. Larger families require household heads to buy more food, including fish, to feed their growing number of members. Although Genschick *et al.* (2018) reported a positive relationship between fish consumption and household size, this may not translate to actual higher consumption by household members, as it may cost more to provide enough fish for all members of the family all the time. Table 2 shows that the majority (60.65%) of respondents have an annual income of ₦30,000 or less. Low income may have an impact on household fish consumption as a whole and further influence the quantity of fish that can be afforded for the entire household per time. Similarly, Akuffo *et al.* (2020) concluded that consumption is a function of income.

Table 2: Households socioeconomic characteristics

Variables	Frequency	(%)
Age (years)		
18-27	29	6.27
28-37	83	17.68
38-47	102	21.86
48-57	185	39.54
58 and above	68	14.64
Gender		
Male	332	71.10
Female	135	28.90
Marital status		
Married	392	83.94
Not Married	75	16.06
Education (years in school)		
No formal education	-	-
Primary school	204	43.68
Secondary school	168	35.97
Tertiary	95	20.34
Income (₦)		
Less than 10,000	86	18.44
10,000-20,000	100	21.48
21,000-30,000	97	20.72
31,000-40,000	91	19.39
Above 40,000	93	19.96
Household size		
5 members or less	332	71.17
6-10 members	99	21.10
Above 10 members	36	7.79
Occupation		
Civil service	194	41.54
Farming	102	21.84
Trading	96	20.55
Artisan	21	04.50
Other	54	11.56
Location		
Rural	215	46.04
Urban	252	53.96
Access to market		
Yes	378	80.94
No	89	19.06
Cost per fish (₦)		
Below 500	51	10.92
500-1,000	182	38.97
1,001-1,500	140	29.98
1,501-2,000	75	16.06
Above 2,000	19	4.07
Fish consumption in the last seven days		
Consumed	154	32.98
Not consumed	313	67.02
*Fish size consumed**		
Big	75	16.06
Small	238	50.96
Both	421	90.15
Source of fish		
Market	313	67.02
Rivers/creeks	42	8.99
Aquaculture	112	23.98

Field Survey (2022), *multiple responses recorded

Table 2 also shows that the majority (41.63%) of the households were salary earners (civil servants). A *priori* expectation is that the probability for salary earners to have a more planned and consistent consumption pattern than the non-salary earners is higher. This may also influence an increase in household purchasing power.

Many (54%) of the respondents reside in the urban area (Table 2). Also, the distribution of respondents according to their access to the market shows that the majority (81%) of the respondents have good access to fish in their local markets. Furthermore, it showed that the mean cost of one piece of fish is ₦1,477 per table sized fish. In a study by Ejike (2021), the incessant rise in the market price of fish is a major factor affecting consumption where the price of one kilogramme of fish has risen to about ₦1,500 to ₦2,000. Although the price may vary from place to place, an increase in the cost of food items and other home consumables is evident. This is therefore expected to affect the affordability of fish in many homes, especially the respondents who are mostly civil servants knowing that their salary has not been increased to measure up with the current inflation rate. Table 2 further shows that about 33% of the respondents had consumed fish in the past seven days. Also, the majority of the respondents (51%) consumed small-sized fish. Finally, the market (67%) was the major source of fish for the respondents. Some of the factors that may influence fish consumption are access, and affordability. This limitations to fish consumption where other animal protein sources are also not available/affordable, can lead to serious nutritional deficiencies. Güttler *et al.* (2012) and Limonte *et al.* (2021) have reported that deficiency in omega-3 fatty acid, vitamin D and iodine which are abundant in fish may lead to possible brain or heart problems.

Consumption Preferences of Fish

Based on fish species

The most fish species consumed by households are presented (Table 3). The most consumed fish species by households sampled was azu fridge (mackerel), in order words frozen fish with a mean score of 4.24. This was followed by crayfish, catfish, azu mkpacha (African knife) and okpororko (cod/stockfish) with mean scores of 4.01, 3.80, 3.57 and 2.96, respectively. A study by Albert and Tasie (2016) reported that frozen fish can be consumed in different forms, such as dried, smoked, fried, and cooked. This may have been the reason for the increased consumption unlike for other species like the okporoko, azu mkpacha, and catfish. Also, the preferences of these fish species may be associated to their availability, accessibility and cost. Gbigbi (2021) reported that health, availability, and taste are some of the key factors affecting preference for frozen fish species in Delta State, Nigeria.

Table 3: Fish species consumed

Fish species	Mean	Fish species	Mean
Catfish	3.80*	Okporoko (cod/stockfish)	2.96*
Bonga	2.45	Crayfish	4.01*
Nile perch	2.09	Azu fridge (mackerel)	4.24*
Tilapia	1.98	Hake	0.97
Azu mkpacha (Africa knife)	3.57*	Bony tongue fish	1.05
Croakers	1.11	Saltwater sardines	2.27
Snapper	1.23	Shrimp	0.91
Moonfish	1.41		

Field Survey (2022), * - MS ≥ 2.50

Based on fish forms

Table 4 shows the forms in which fish is consumed by respondents in the study area. It shows that the most form of fish consumed in the study area is in fresh form which accounts for the mean score of 4.56. This is directly followed by dried, frozen, fried and Grilled/roasted/smoked with mean scores of 3.91, 3.09, 2.61 and 2.55, respectively. In corroboration, Albert and Tasie (2016) who studied the consumption pattern of frozen fish reported that the mostly consumed form is dried/smoked, freshly cooked, and fried form. Albert and Tasie (2016) further linked these preferences to some factors such as spoilage, preparation technique, cost, availability, health factors, and storability amongst others.

Based on fish preparation method

Table 5 presents the methods fish consumed by the sampled respondents are prepared in the study area. It shows that 64% of the respondents prefer consuming their fish in boiled form while 23 and 13% of the respondents prefer consuming fish in fried and roasted forms respectively. This indicates that the respondents in the study area prefer consuming fish when it is in the boiled form to other forms in which fish is prepared in the study area. Similarly, Jimoh *et al.* (2021) reported that the most preferred fish preparation method is boiling, while Albert and Tasie (2016) reported roasting as the most preferred preparation method.

Table 4: Forms of fish purchased

Fish forms	Mean	Fish forms	Mean
Barbecue	2.44	Frozen	3.09*
Canned	2.05	Paste and mashed fish	1.01
Dried	3.91*	Powder	1.40
Fresh	4.56*	Salted	2.13
Fried	2.61*	Grilled/roasted/smoked	2.55*

Field Survey (2022), * - MS ≥ 2.50

Table 5: Fish preparation method

Preparation method	Frequency	Percentage
In-direct Heat (Boiled)	299	64.03
In-Direct heat (Fried)	107	22.91
Direct heat (Roasted)	61	13.06

Field Survey (2022)

Determinants of Fish Consumption by Households in the Study Area

The result for the logit regression as presented in Table 6 shows that the chi-square, which measures the goodness of fit of the model, is statistically significant ($\chi^2 = 159.48$; $p < 0.01$). Thus, the *a priori* expectation was that there is no significant relationship between the socioeconomic characteristics of the respondents and their fish consumption. However, this is not so because the model is of good fit. The pseudo-R^2 value (0.633) representing the explanatory power of the model also indicated that the model is good. The results of the logit regression analysis as presented in Table 6 reveal that out of 10 variables analysed in the model, nine were statistically significant at various levels of percentages.

From Table 6, the age of household head variable had a positive coefficient of 0.225 at a 10% level of significance. Thus, with a unit increase in the age of the household head, there would be about a 0.5% increase in the probability of fish consumption by a household while holding the effect of other variables constant. In order words, the higher the age, the more household heads are willing to consume fish in the study area. The relationship between age and fish consumption is often complex, but research consistently points to a negative and significant influence of age on fish consumption (Onyeneke *et al.,* 2020). Several factors contribute to this decline, creating a worrying trend with potential nutritional and environmental consequences (Adeniyi *et al.,* 2012; Jimoh *et al.,* 2021; Okelola and Babalola, 2022). Fish is a critical source of omega-3 fatty acids, essential for brain health, heart function, and cognitive decline prevention (Domingo *et al.,* 2006; Shashikanth and Somashekar, 2020). Reduced intake in older adults raises concerns about increased risk for Alzheimer's disease, cardiovascular issues, and depression (Soliman *et al.,* 2021). Additionally, decreased fish consumption may put pressure on terrestrial food systems, potentially contributing to environmental concerns like deforestation and greenhouse gas emissions (Kumoro *et al.,* 2022).

Table 6: Logit regression results of the determinants of household fish consumption in Enugu State

Variable	*B*	$p > z$	Marginal effect
Age	0.225	0.061*	0.005
Gender	–0.532	0.014**	0.011
Marital status	0.197	0.006***	0.056
Education	1.332	0.041**	0.023
Income (₦)	1.345	0.029**	0.058
Household size	–0.423	0.053*	0.043
Occupation	0.821	0.931	0.027
Location	0.234	0.021**	0.034
Access to market	0.520	0.016**	0.081
Price of fish (₦)	–1.436	0.011**	0.019
$n = 467$	LR Chi^2 (10) = 159.48	Pseudo R^2 = 0.633	Prob > Chi^2 = 0.01

Field Survey (2022). ***, ** and * significant at 1, 5 and 10% respectively, *B* - beta coefficient, $p > z$ - probability greater than *z*, *n* - number of observations, LR - logit regression, Prob - probability

The gender variable of the household head had a negative coefficient of –0.532 at a 5% level of significance. By implication, it means that female household heads consume fish more than their male counterpart by 1.1% in the study area while holding the effect of other variables constant. Thus, it means that despite the large percentage of male-dominated household heads in the study area as recorded in the demographic result, they consume fish less than the female. The marital status of the household head had a positive coefficient of 0.197 at a 1% level of significance. For this logit regression result, it means that the probability of household heads that are married to consume fish is more than the household heads that are unmarried by 5.6% in the study area. Married respondents may have larger household size, and hence have more member of the family who consume the fish they buy. This also is in agreement with the report by Onyeneke *et al.* (2020) who reported amongst other demographic factors that household size has positive and significant relationship with fish consumption.

Education of the household head as a variable also had a positive coefficient of 1.332 at a 5% significant level. This shows that fish consumption increases among the formally educated household heads than their counterpart thus, implying a positive relationship between education and fish consumption. A similar report by Onyeneke *et al.* (2020) attributes this relationship with increased awareness and knowledge on healthy diets and eating habits. Also a study by Jimoh (2020) observed that a rise in education level could positively influence the consumer preferences of smoked and fresh catfish consumption in Kwara State, Nigeria. The income of the household head had a positive coefficient of 1.345 at a 5% level of significance. The logit regression results as presented in Table 6 indicates that a unit increase in monthly income of the household heads increases the probability of fish consumption by 5.8% in the study area while holding the effect of other variables constant. This means that household heads with more income consume fish more than their counterparts with low income. This is consistent with a study by Onyeneke *et al.* (2020) who reported that there is a relationship between income level and fish eating. Household size had a negative coefficient of –0.423 at a 10% level of significance. This logit regression result presented in Table 6 shows that a unit addition to household size decreases the probability of fish consumption by 4.3% in the study area while holding the effect of other variables constant. In order words, the households would decrease fish consumption by 4.3% as their size increases. In this case, it means that households with a size of six and above consume less fish than households with a size of five or less in the study area. This is, however, in contrast with the results of Adeola *et al.* (2016) and

Gbigbi (2021) who found that household size had a positive and significant effect on catfish consumption. This contrasting finding in this study may be attributed to income level.

With increased income level, household heads have several other essential needs to provide for family members, and in which case, may not be able to afford enough fish to carter for the nutritional requirements of the family. It may also imply that in larger households, members of the households prefer other protein sources to fish. The location of the household head as a variable had a positive coefficient of 0.234 at a 5% significant level. Also, household heads' access to the market also had a positive coefficient of 0.520 at a 5% level of significance. The implication of these findings is that urban people are better enlightened on diets and their nutritional needs, as well as have access to good market with storage facilities. Similarly, Onyeneke *et al.* (2020) shared the view that spoilage and storability amongst others are the key challenges to fish consumption.

The price of fish spent by a household head per fish likewise had a negative coefficient of 1.436 at a 5% level of significance. This logit regression result in Table 6 shows that a unit increase in price per fish decreases the probability of fish consumption by household heads by 1.9% in the study area while holding the effect of other variables constant. This implies that there is a negative relationship between the price of a fish and fish consumption. In other words, as the price of fish increases, the likelihood of fish consumption tends to decrease by 1.9%. Hence, the household heads in the study area are less likely to consume fish due to the cost. This result is consistent with the findings of Terin (2019), who reported that the socioeconomic features of household affect fish consumption in Turkey. This study demonstrated an inverse association between the price of frozen fish substitutes and consumption of frozen fish, the coefficient for the price of frozen fish substitutes is negative. This predicts that fish consumption will increase as replacements become more expensive.

CONCLUSION

This study identified the determinants of fish consumption in Enugu State, Nigeria. Using data gathered from households, a logit model was specified and examined as an estimation strategy. Age, gender, marital status, education, income, household size, location, market accessibility, occupation, and fish price were all taken into account during the investigation. Age, marital status, education, income, location, and market access were significant and positively associated with the likelihood of consuming fish, while gender, household size, and fish price were significant and negatively associated with the likelihood of consuming fish, according to the results of the logit regression analysis. Accordingly, being married, change in location and an increase in age, education level, income, and market access caused an incline in the likelihood to consume fish, but increase in household size, fish cost, and male headed households caused a fall in the probability to consume fish. This study therefore, recommends that policymakers should develop market strategies for increased fish consumption in Enugu State, Nigeria taking into account the factors considered. There is a need, therefore, to increase domestic fish supply in the state in particular and Nigeria in general, and ensure fish supplies to consumers at affordable prices in all markets in both urban and particularly the rural markets. Finally, there is a need to create consumer awareness of nutrition information through education and media promotion.

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