

Consumer Substitution Behavior and Price Elasticity of Demand for Fish Products in Coastal Nigeria: Empirical Evidence of Bayelsa State

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Abstract

This study investigated the responses of fish consumption patterns of households in Bayelsa State, Nigeria to price volatility. The sampling technique used was mixed cross sectional method, where four Local Government Areas (LGAs) were purposively selected due to their nearness to fish activities and high fish consumption pattern. The respondents were selected by systematic random sampling. The number of questionnaires distributed was 400 of which 308 were recovered and the analyses were based on the 308 responded questionnaires. A structured questionnaire (Effect of Price Change on Fish Consumption Patterns (EPCFCP)). Cronbach's Alpha was used to determine the reliability of the instrument and was found to have an acceptable internal consistency. Data were statistically analyzed with descriptive statistics, Spearman's Rank Correlation and Ordinal Logistic Regression. The results indicated that price changes of fish were statistically significant and affected household fish consumption trend leading to a decrease in fish consumption and an increase in substitution with other protein sources. The Spearman's Rank Correlation indicated that there was a moderate positive and statistically significant correlation between changes in fish prices and fish consumption behaviour of household members ($r = 0.547$, $p < 0.05$). But there was very little and statistically insignificant negative relationship between responsiveness to fish price changes and the household income ($r = -0.099$, $p = 0.083$). The results of the Ordinal Logistic Regression also showed that the overall model was statistically significant and that the price change of the fish, consumption pattern, household income and gender were significantly influencing fish consumption behaviour. Price changes in fish proved to be best predictors. The analysis shows that the prices of fish have a significant effect on household consumption decisions. It suggests the need for investment in aquaculture, subsidy for fish producers and availability of cheap and affordable credit, development of adequate storage and distribution system, and measures to support the purchasing power of the fish household to improve food security and nutritional status.

Keywords: Fish Price Changes; Fish Consumption Patterns; Household Income; Protein Substitution; Ordinal Logistic Regression; Bayelsa State; Nigeria.

Introduction

In Nigeria, especially the Niger Delta region which is rich in aquatic resources, fish is a critical food source and means of livelihood. Fish is one of the most readily available and culturally

acceptable animal protein sources in the riverine and coastal environment of Bayelsa State where extensive artisanal fishing activity can be found. Several families use fish as a staple foods and fish is more affordable than beef, poultry, and pork meals. In addition to its nutritional value, fish also plays a vital role in employment, income generation and in local trade, thus directly contributing to the overall socio-economic wellbeing of the population (FAO, 2020).

Price fluctuations, like all food commodities, have a strong impact on fish consumption. In microeconomics theory, a change in price influences the quantity demanded of a product, particularly if the household is living on a tight budget and spending a considerable amount of their income on food and other necessities. However, it is important to note that food price changes are especially significant for the consumers in developing countries like Nigeria because of its high poverty rate and income insecurity (Deaton & Muellbauer, 1980). Consequently, when fish prices change, there may also be significant changes in household consumption patterns such as a decrease in quantity consumed or change of the type of food consumed. Food prices have been on the rise in Nigeria in recent years, due to the high inflation rates, the exchange rate depreciation, the high cost of fuel, and transportation problems. The impact of these macroeconomic factors has been increasing prices of fish and other staple foods in the country (National Bureau of Statistics, 2023). Price changes are also likely to be quickly passed on to consumers in Bayelsa, where many communities lack well-connected and integrated fish markets, and are very localized. This implies a high sensitivity of the fish consumption patterns both with regards to national economy and local market conditions. The price-consumption relationship is further complicated by supply-side constraints in the fisheries sector. Small scale fish farmers and/or fish collectors using traditional fishing methods which does not ensure high productivity dominate the production of fishes in Bayelsa State. Effective availability of the fish is reduced due to seasonal scarcity of the fish, lack of adequate cold storage facilities and high post-harvest losses, which also contribute to the high costs of marketing. These challenges also cause the prices of fish to fluctuate, making consumers vulnerable to frequent and sometimes unpredictable price hikes in the local fish markets (Olomola, 2014). Price changes impact on quantity of fish consumed, as well as the type and quality of fish that is bought. Households might switch to more affordable fish species or processed fish products like dried or smoked fish, when prices rise, due to these products being less perishable and more affordable. In severe cases, the consumer can switch to plant protein or even negate the requirement of protein intake, which could affect the nutritional value and nutritional outcome of the diet (Aromolaran, 2004). These changes underscore the significance of price as a food choice and nutrition security factor. Households' price sensitivity to fish depends on their income status. A large population in Bayelsa State is in the low-income group that is more sensitive to price changes than the high-income group. Those groups may find that small price hikes for fish result in significant cuts in fish intake, since their limited budgets are concentrated on purchasing cheaper staple foods like cassava, garri and rice. This relationship between income and price highlights the food price shock sensitivity of poor households (FAO, 2020). Empirical research on the impact of price changes on fish consumption patterns (household and community) in Nigeria is still underdeveloped at the state or community level. Most of the literature has been based on national food demand or summed up food consumption data that may not show the significant variations at the local level on market structure, preferences, and livelihood dependence on fisheries (Adekoya & Miller, 2004). Hence, it is necessary to have a context-specific analysis, taking into account the particular socio-economic and environmental situations of Bayelsa State. In this background, the effect of price change of fish on fish consumption pattern in Bayelsa State is explored.

Statement of the Problem

Although fish is an essential food and a significant source of livelihood among households in Bayelsa State, there is dearth of empirical evidence to relate the effect of changes in fish prices on the consumption behavior of households in Bayelsa State. Fish is a main source of animal protein for most households, and is technically available, but has been challenged as becoming more expensive in recent years with the increasing prices of foods. The price volatility of fish is a concern and households, particularly the poor, may struggle to access fish at the price required to ensure sufficient consumption for good nutrition and food security.

There are macroeconomic and local factors affecting fish prices in Bayelsa State. The impact of inflation, fuel price hike and exchange rate volatility on fish production, transportation and marketing has contributed to the high cost of production, transportation and marketing of fish in Nigeria. Seasonal fluctuations in fish availability, the use of traditional fishing techniques, lack of storage and processing facilities, and significant post harvest loss are causing the fish prices to be variable in the local markets. All these factors leave consumers vulnerable to price volatility, but the consumption reactions to such price volatility can be poorly understood.

Several studies have investigated food price dynamics and food consumption behaviour in Nigeria, but most studies use aggregated national or regional data. These tend to obscure significant differences in consumption patterns, incomes, and market structures across states. The finding in this study does not do justice to the situation in Bayelsa state where a large percentage of the households are directly engaged in fisheries for both livelihood and food security.

However, this leaves a lot of room for a specific empirical study on the effect of price changes on fish consumption pattern in Bayelsa State. This kind of research is important to offer evidence-based knowledge on consumption reactions of the household, to inform fisheries and food price policies, and to guide interventions for improving food security, nutritional outcomes and persons' welfare in the state. Therefore, there is need to raise the following research questions to guide the study as follows:

1. How does of fish price changes affect the consumption patterns in Bayelsa State?
2. To what extent do households substitute fish with alternative protein sources in response to changes in fish prices in Bayelsa State?

Research Hypothesis

Based on the objectives of the study on the effect of price changes on fish consumption pattern in Bayelsa State, the following research hypotheses are formulated in null form:

- i. There is no significant effect between change in fish price and consumption pattern in Bayelsa State.
- ii. Changes in fish prices does not cause any Substitutional change to other source of protein by households in Bayelsa State.

Theatrical Framework

Law of Demand

The Law of Demand states that when the price of a good rises, *ceteris paribus*, the quantity demanded will fall (and vice versa) (Varian, 2019). The theory applied to fish consumption states that consumption will decline when the price of fish rises and rise when the price of fish falls. It is the main reason why the impact of price change on household fish consumption patterns is examined.

The theory of price elasticity of demand.

Price elasticity of demand is defined as the sensitivity of quantity demanded to the price (Tomek & Kaiser, 2014). Households with lower incomes are very sensitive to changes in the price of essential food items such as fish, cutting back on consumption if the price is increased. This theory allows one to measure the response of households to price changes and to determine the extent of consumption changes.

Substitution Effect Theory

The Substitution Effect Theory is an economic theory that can be used to understand how consumers would react to a change in price of a good relative to another good. Specifically, as the price increases, consumers will tend to switch to a less expensive good to get the same utility, and vice versa, as the price decreases, they will tend to switch to the relatively more expensive good, if they can obtain it at a lower price (Varian, 2019). This effect is a fundamental one of consumer choice theory and it is closely related to the Law of Demand. Additionally, in Bayelsa State, the substitution can be within fish categories, such as fresh fish to smoked or dried fish, due to cultural and economic reasons. Given these theories, this study is based on the demand theory that provides a basic approach to the analysis of the impact of price on quantity demanded of fish.

Literature Review

In Southwestern Nigeria, Aromolaran (2004) looked at the correlation between food prices, household income and food consumption. The study was of the household survey type and used econometric methods, such as demand function analysis, to estimate the consumption responses. The results showed that the rise in the price of animal protein sources (fish) considerably decreased the consumption of households, especially in the low-income level group. The study concluded that food prices play a vital role in determining dietary pattern in Nigeria.

Deaton (1997) analysed in detail the empirical characteristics of household consumption in developing nations, using household survey data and micro-econometric analysis. The study utilized price and income elasticity estimations to see the response of the households towards the change in food prices. The results indicated that poor households are more affected from the price rises of foodstuffs than other groups, resulting in lower consumption and welfare losses. The study highlighted the sensitivity of the prices of essential food commodities, especially fish.

The impact of food price volatility on household welfare and food security in Nigeria was explored by Olomola (2014). The study employed both secondary data and descriptive and econometric analysis to evaluate the price trends and consumption trends. The results revealed that there was a decline in consumption and worsening food insecurity as a result of food price hikes, with fish prices not being spared of this development. The study also revealed that the supply-side factors like seasonality and inadequate storage facilities were the significant factors that account for the price volatility. Adekoya and Miller (2004) used descriptive analysis and sectorial data to analyse fish production, marketing systems and consumption trends in Nigeria. This study was conducted through an observation approach in the field together with the secondary data obtained from the fisheries institutions. The results indicated that the higher production and marketing cost was a factor that led to the price increase of fish, which had a negative impact on fish consumption by the households. The authors suggested that the development of fisheries infrastructures can contribute to the price stability and consumption improvement.

FAO (2020) did a review of fisheries and aquaculture data worldwide, based on secondary data, policy analysis and comparative regional studies. The report examined the trend of fish prices, fish

availability and fish consumption trend. The results indicate that price inflation and food insecurity actually decreased per capita fish consumption in many developing countries, especially the poor. The report highlighted the need for stable prices for fish in order to boost nutrition and food security. Olwande, Smale, Mathenge, Place, & Mithöfer, (2015) investigated household food consumption and market participation in sub-Saharan Africa, using household level survey data and econometric modelling. To evaluate food prices' influence on food choices, the study used regression analysis. The results showed that an increase in food prices caused households to cut back on consumption or to shift to alternative food products with a lower price. The study found that the negative impact of food price increases on food consumption is aggravated by income restrictions. Using time-series data and price elasticity models, Tomek and Kaiser (2014) examined the agricultural and food commodity prices as well as the impact of prices on consumption patterns. Econometric analysis was used to estimate the demand responses to price changes for the study. The results revealed that the demand of the food commodities with high budget shares, such as fish is relatively elastic in developing economies, which means that the increase in price causes a big decrease in consumption. The study found that price stabilisation policies play a major role in ensuring household welfare.

Using panel data analysis, Asche, Bellemare, Roheim, Smith, and Tveteras (2015) analysed global seafood markets and price transmission mechanisms in a set of countries. Econometric models were used to measure the impact of production level price changes on the prices and demand of consumers. The results showed that the price hikes of fish are rapidly passed on to consumers, resulting in a decrease in consumption especially in the low-income areas. The authors found that the increase of market integration further aggravates the effects of price shocks on consumption.

The study of fish demand and consumptive pattern in Southwestern Nigeria was conducted by Adeogun, Ajana, Ayinla, Yarhere and Adeogun (2007) and descriptive statistics were used. The study used regression analysis to determine factors influencing fish consumption. The results showed that fish price is a significant negative determinant of fish consumption while income and household size are significant positive determinant of fish demand. The study highlighted that price hikes reduce the consumption of fish by households.

Household level data and econometric demand models were used to analyze the demand for fish in Ibadan metropolis by Ayanwale and Alimi (2004). The Almost Ideal Demand System (AIDS) model was used for the estimation of price and income elasticities. Results indicated that fish demand was price elastic and a rise in fish price led to a substantial fall in the quantity of fish consumed. The study has found that fish is an essential nutrient and is quite price sensitive.

Using secondary data and policy analysis, the food price, nutrition and consumption patterns were jointly evaluated by FAO, IFAD, UNICEF, WFP and WHO (2022). Trend analysis and comparative assessment was used in the study across the developing regions. The results showed that higher food price increased the difficulty of access to health promoting food products like fish, thereby posing a risk of malnutrition and food insecurity. The report focused on the need for focused action to manage food prices and help the vulnerable.

The study was carried out by the National Bureau of Statistics (NBS) (2023) in Nigeria, based on survey and administrative data, to investigate the trend of consumer prices and patterns of household spending. Descriptive and trend analysis techniques were used to determine the changes in food prices and food consumption. The results indicated, Nigerian states' fish prices kept increasing with the result being lower real household income and consumption of protein rich foods. The report stressed on the differential effects of the price rise on different income groups.

Daramola, Adeyemi and Lawal (2015) studied the determinants of fish consumption by fish households in Lagos State Nigeria. A cross sectional survey design was used in the study and multiple regression analysis was used to determine determinants of fish consumption. Additionally, the findings indicated a significant negative effect of fish price on the consumption of the household, and a significant positive effect of income and employment on household consumption. Garcia, Rice, and Charles (2015) analysed the effect of food price volatility on household consumption in coastal areas of Latin America. Panel data and fixed-effects regression models were used in the study. The results indicated that in periods of high price volatility, fish consumption decreased, especially in the case of artisanal fishing households that relied on market purchases for fish consumption, as opposed to their own catches. The study identified the vulnerability of households to market price fluctuations in the coastal areas.

Methodology

Research Design

This study used a two-state sample technique and the design was a cross sectional survey of a mixed methods approach. First, the purposive sampling techniques was used in selecting the LGAs with large fishing activities. Sagbama, Ekeremor, Souther-Ijaw and Yenagoa. The second was the use of Random sampling technique in selection of one hundred (100) fishing consuming households. The four hundred (400) was calculated by TaroYanene formula and the estimated population 2,019,162. Both quantitative and qualitative methods offer a wide and deep knowledge of situations. The quantitative aspect aims at getting numerical data on the magnitude and occurrences of the fish consumption pattern in the households of the study area in Bayelsa State and the qualitative aspect captures or describes the contextual explanations of the variables in the study. The decision on using a mixed methods approach is also provided by Creswell and Plano Clark (2018) who state that combining quantitative with qualitative data can help increase the validity and interpretability of the research findings.

Study Area

Location and Geography

The study is undertaken in Bayelsa State which is located in the Niger Delta region of the South of Nigeria. The state is roughly located between 5°23' and 6°45' East and 4°15' and 5°25' North (National population commission (NPC), 2006). Bayelsa State has Rivers State to the east, Delta State to the west and the Atlantic Ocean to the south. The Bayelsa State occupies an approximate area of 10,773 km² with vast wetlands, rivers, creeks and mangrove forests (FAO, 2020). These water bodies play a crucial role for being the support of rich aquatic biodiversity and are at the heart of fishing activities in the State, both artisanal and commercial.

There are numerous figures for the population of the study. There are many numbers for the population of the study.

The National Population Commission (2006) estimates the population of Bayelsa State to be more than 2 million of which a large percentage live in the riverine and coastal areas. Fishing has been an important feature of the livelihoods of most households and fish is an important source of animal protein and a dietary staple in most households (Aromolaran, 2004). Hence, the population of this study includes the consumers of fish in the households of the state of Bayelsa. Households in both urban and riverine communities comprise the target population since fish is a key source of protein and an important food component in the state (Aromolaran, 2004; FAO, 2020). The study therefore

concentrates on households in Bayelsa state, producers of fish and fish traders in the same state. Particular attention is given to low and middle-income households, which are most likely to be price sensitive and for whom changes in consumption can help to shed light on the impact of price changes on welfare and nutrition.

The target population are the four Local government of Bayelsa state namely; Sagbama, Ekeremor, Souther-Ijaw and Yenagoa. It has the largest population size in the State with the expected population size of 2,019,162 as estimated for 2026 (NBS 2024).

Table 1 Projected Population

LGA	2006 Census	Growth rate (2.7%)	Projected 2026 population	Formula $Pop_t = P_0 e^{rt}$
Southern Ijaw	321,808	2.9	574,749	$321,808e^{0.029(20)}$
Ekeremor	269,588	2.9	481,484	$269,588e^{0.029(20)}$
Sagbama	186,869	2.9	333,748	$186,869e^{0.029(20)}$
Yenagoa	352,285	2.9	629,181	$352,285e^{0.029(20)}$
Total	1,191,401		2,019,162	

Sources: Author's computation 2026

P_t = projected population at time (t)

P_0 = Population based on census

e = Euler's number (2.71828)

r = annual growth rate = 2.9%

t = number of years since the base year = 20years

Source of Data Collection

Primary data were used to get firsthand information from 400 households in communities selected in Bayelsa State. Data for this study was collected using a structured questionnaire which gathered information about socio-economic characteristics of the households, fish consumption pattern, the quantity of fish consumed, expenditure on fish, perceived price changes and substitution with other protein sources. The use of questionnaires was appropriate for household consumption studies as it enables collecting quantitative data systematically that can be analysed statistically (Gujarati & Porter, 2009). Further, oral interviews were held with the householders and fish vendors to explain the responses and understand the price dynamics and consumption patterns at the local level.

Model Specification

To achieve objective 1 first the Ordinal Logistic Regression (OLR) model were formulated

$$\text{Log} \frac{P(Y \leq -j)}{P(Y \geq j)} = \alpha_j - (\beta_1 X_1 + \beta_2 X_2 + \dots + \beta_p X_p) \quad (1)$$

$j = 1$

Y = ordinal dependent variable

$X_1, \dots, X_p$ = explanatory/predictor variables

$\beta_1, \dots, \beta_p$ = regression coefficients

$P(Y \leq j)$ = probability that the outcome falls in category j or below

$P(Y > j)$ = probability that the outcome is above j

Data Analysis Techniques and justification.

The Tests of Normality was carried out to ascertain whether data is a continuous variable, or data/residuals are relevant to a statistical model estimation approximately follow a normal (Gaussian) distribution.

We did have more than 100 data, however, so the Kolmogorov–Smirnov normality tests were used to estimate the data. All the variables (EPCQC, CP, PIC, Income Level and Gender) showed a significance value of 0.000, which are less than 0.05. So, for each variable the null hypothesis of normality is rejected. The results show that none of the variables of the study are normally distributed. The data are ordinal (4 Likert scale) and do not meet the assumption of normativity, thus the non-parametric statistical techniques are suitable for this study. Hence, Spearman's Rank Correlation was used and this was suitable for analysing the relationship between the variables.

Result and Discussion

Table 1 Demographic Characteristic of the Respondents

Distribution	Frequency	Percentage (%)
Gender		
Male	184	59.7
Female	124	40.3
Total	308	100
Age		
21 -30	189	61.4
31 -40	76	24.7
41 –50	30	9.7
51 - 60	8	2.6
60 and above	5	1.6
Total	308	100
Marital Status		
Single	200	64.9
Married	99	32.1
Divorced	4	1.3
Widow	5	1.6
Total	308	100
Educational Background		
No Formal Education	9	2.9
Primary School	4	1.3
Secondary School	37	12.0
Tertiary	258	83.8
Total	308	100

Occupation		
Civil Servant	61	19.8
Business	161	52.3
Public Servant	73	23.7
Others	13	4.2
Total	308	100
Income Level		
Below 50000	1	0.3
50000-100000	58	18.8
101000-200000	91	29.5
201000 and above	158	51.3
Total	308	100
Household Size		
1-3	123	39.9
4-6	91	29.5
7-9	74	24.0
10-12	8	2.6
13 and above	12	3.9
Total	308	100

Sources: Author's Computation 2026

Table 1 above shows the demographic characteristics of the respondents. Gender, age, marital status, education level, occupation, income and size of households are analyzed. The gender distribution indicates that 184 respondents were male (59.7%) and 124 respondents female (40.3%). This means that the incidence was higher among males than females. While the participation rate was slightly higher for males, a large percentage of females was included, indicating that the results are based on both male and female viewpoints. The age distribution shows that the age group 21-30 years old is the predominant age group accounting for 189 respondents (61.4%). While the respondents between the ages 31- 41 constituted 24.7% of Respondents, 76 representing (24.7%) of the respondent were between the ages of 31-40 years, also 30 respondents representing (9.7%) of population were between the ages of 41 -50 years. In case of age groups 8 and 5 persons (2.6 % and 1.6 % respectively) ranged from 51-60 years and 60 years and above respectively. The age distribution of the sample, with a high proportion of young adults, suggests that the sample was mostly economically active. The marital status, 200 respondents constituting (64.9%) were single, 99 (32.1%) were married, 4 (1.3%) were divorced, and 5 (1.6%) were widowed. This is the pattern of young age structure of the respondents. 258 (83.8%) of respondents had achieved tertiary education, 37 (12.0%) secondary education, 4 (1.3%) primary education and 9 (2.9%) had no formal education. A high level of tertiary education among the respondents will increase confidence in reliability and quality of responses obtained. By occupation, 161 (52.3%) respondents were engaged in business activities, 73 (23.7%) were public servants, 61 (19.8%) were civil servants and 13 (4.2%) were engaged in other occupations. This pointed to the fact that among the respondent's business activities are the major sources of livelihood. The income distribution shows that 158 (51.3%) of the respondents earned ₦201,000 and above, 91 (29.5%) earned ₦101,000–₦200,000, 58 (18.8%) earned ₦50,000–₦100,000, and only 1 respondent (0.3%) earned below ₦50,000. The high percentage of those with higher incomes indicates that purchasing power may be relatively high and thus affect consumption

choices. Household size analysis indicates that 123 (39.9%) of the respondents had a household of 1–3 persons, 91 (29.5%) had 4–6 persons, 74 (24.0%) had 7–9 persons, 8 (2.6%) had 10–12 persons, and 12 (3.9%) had 13 or more persons. The findings indicate that small- to medium-sized household's predominance. Thus, the demographic profile of the respondents indicated that the respondents were mainly male, young, single, highly educated, business oriented, relatively with high income and having small or medium size of households. The above characteristics suggest that the respondents were suitable to offer reliable and informed responses that were relevant to the study's objectives.

Empirical Result

Table 2: The effect of changes in fish price on the quantity of fish consumed by households in Bayelsa State, (EPCQC)

Predictor Variables	Spearman's rho	P-value	Decision
Consumption pattern(CP)	-0.023	0.692	Fail to reject H_{01} ($P < 0.05$)
Price Increase in fish (PIC)	0.547**	0.000	Reject H_{01} ($P > 0.05$)
Household Income (HI)	-0.0099	0.083	Fail to reject H_{01} ($P < 0.05$)
Gender (GEN)	0.175**	0.002	Reject H_{01} ($P > 0.05$)

Source: Authors own computation

The table 2 presents the results of the Spearman's Rank Correlation (Spearman's rho) analysis conducted to examine the relationship between Effect of Price Changes on Quantity Consumed (EPCQC), Consumption Pattern (CP), Price Increase in Fish Consumption (PIC), Household income (HI), and Gender (GEN) among households in Bayelsa State. Spearman's correlation was adopted because the variables were measured using ordinal (Likert-scale) data. The analysis was based on 308 valid responses.

The result shows a very weak negative relationship between EPCQC and Consumption Pattern (CP) ($\rho = -0.023$, $p = 0.692$). This relationship is not statistically significant.

There is a moderate positive and statistically significant relationship between EPCQC and PIC ($\rho = 0.547$, $p = 0.000$), indicating that increases in fish prices are associated with greater changes in the quantity of fish consumed.

The correlation between EPCQC and Income Level is -0.099 ($p = 0.083$), indicating a weak negative but non-significant relationship.

Gender has a weak positive and statistically significant relationship with EPCQC ($\rho = 0.175$, $p = 0.002$), showing that responses differ slightly by gender.

Among the independent variables, CP has no significant relationship with PIC, Income Level, or Gender. Likewise, PIC is not significantly related to Income Level or Gender, and Income Level is not associated with Gender.

Generally, PIC has the strongest and GEN has the most significant relationship with EPCQC, while the remaining CP and HI has a weak and insignificant relationships with EPCQC.

Thus, H_{01} is accepted; implying that there is no significant effect between change in fish price and consumption pattern in Bayelsa State.

Table 3: The extent to which changes in fish prices lead to substitution between fish and other protein sources among households in Bayelsa State

S/N	Statement	MEAN	Std. Deviation	Decision	Interpretation
1	When fish prices rise, we purchases more meat, chicken, or eggs instead of fish	2.65	0.93	Agree	The respondents generally agreed that increase in fish prices encourages them to substitute fish with other protein sources.
2	High cost of fish encourage us to substitute fish with cheaper protein sources	2.68	0.88	Agree	The respondents agreed that high cost of fish motivates them to consume cheaper alternative protein sources.
3	we rarely substitutes fish with other protein sources irrespective its price increase	2.28	0.88	Disagree	The respondents generally disagreed, indicating that they do substitute fish when price increases.
4	Changes in fish prices influence our decision to consume alternative protein foods	2.78	0.88	Agree	The respondents agreed that change in fish price significantly influences their protein consumption decisions.
5	We can't do without fish irrespective of its price change	2.57	1.04	Agree	The respondent also moderately agreed that fish remains an important part of their diet despite price change.
	Grand mean		2.59	Agree	The overall mean score indicates that the respondents generally agreed that changes in fish prices influence substitution between fish and other protein sources among households in Bayelsa State. This suggests that rising fish price significantly affect households switching to relatively cheaper protein alternatives when fish becomes expensive

Source: Author's survey data computation 2026

The result in table 3 revealed that the, respondents generally agree that increases in fish prices encourage substitution of fish with other protein sources and influence household food choices. Thus, the findings suggest that rising fish prices significantly affect consumption behaviour. Hence, H_{02} is rejected. Implying that; Changes in fish prices causes Substitutional change to other source of protein by households in Bayelsa State.

Conclusion and Recommendation

From the results of this study it is concluded that the price variations of fish have significant effects on the consumption pattern of fish in the household in Bayelsa State. Many households, with the increasing price of fish, are trying to cut down on the amount of fish consumed and replace it with other sources of protein that offer a more affordable price. Fish is still a significant part of household food consumption but the consistent rise in the prices of fish encourages consumers to adapt their consumption patterns. The study also reveals that, the level of household income was not statistically significant and there was no statistical difference in the behaviour of low income versus high income households in their response to price changes in fish.

In addition, the results of the ordinal logistic regression indicated that the factors which play significant roles in the decision of household fish consumption are the changes in fish prices, purchasing capacity, income and gender. Hence, the contribution of stabilising fish prices alongside strengthening the purchasing power of fish consumers would play a great role in the sustainability of fish consumption and food security in Bayelsa State.

Overall, the study validates the hypotheses that fish price volatility continues to play a significant role in the nutrition and food security behaviors of households and that it would be more likely to be included in the policy agenda of those interested in this issue.

The following recommendations are based on the results of this study:

1. Policies to be designed by the Federal and Bayelsa State Governments to stabilise fish price should include an improvement in fisheries development, expansion of aquaculture output and market regulations.
2. Government must offer financial support or subsidy or offer low cost credit facilities to the fish farmers and fish marketers to decrease the production cost and fish supply.
3. Government should put in place regular monitoring system of fish prices to facilitate intervention when prices are subject to excessive fluctuations..

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APPENDICES**Appendix 1: LIABILITY TEST****Reliability Statistics**

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.840	.828	20

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.785	.728	25

Appendix 2

PLUM EPCQC BY Gender WITH PIC CP INCOME

/CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)

/LINK=LOGIT

/PRINT=FIT PARAMETER SUMMARY TPARALLEL.

PLUM - Ordinal Regression**Notes**

Output Created		18-JUL-2026 10:54:51
Comments		
Input	Data	C:\Users\achor\Desktop\PROJECTS\ADJUSTED FOR FISH CONSUMPTION STUDY.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	308
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.

Cases Used		Statistics are based on all cases with valid data for all variables in the model.
Syntax		PLUM EPCQC BY Gender WITH PIC CP INCOME /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5) PCONVERGE(1.0E-6) SINGULAR(1.0E-8) /LINK=LOGIT /PRINT=FIT PARAMETER SUMMARY TPARALLEL.
Resources	Processor Time	00:00:00.06
	Elapsed Time	00:00:00.07

Warnings

There are 1504 (90.8%) cells (i.e., dependent variable levels by observed combinations of predictor variable values) with zero frequencies.

Case Processing Summary

			Marginal Percentage
		N	
EPCQC	1.40	4	1.3%
	1.80	13	4.2%
	2.00	13	4.2%
	2.20	30	9.7%
	2.40	32	10.4%
	2.60	33	10.7%
	2.80	65	21.1%
	3.00	46	14.9%
	3.20	30	9.7%
	3.40	30	9.7%
	3.60	8	2.6%
	4.00	4	1.3%
Gender	MALE	184	59.7%
	FEMALE	124	40.3%
Valid		308	100.0%

Missing	0	
Total	308	

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	1324.217			
Final	1174.058	150.160	4	.000

Link function: Logit.

Goodness-of-Fit

	Chi-Square	Df	Sig.
Pearson	3042.362	1503	.541
Deviance	1146.706	1503	.962

Link function: Logit.

Pseudo R-Square

Cox and Snell	.586
Nagelkerke	.590
McFadden	.109

Link function: Logit.

Parameter Estimates

		Estimate	Std. Error	Wald	df	Sig.	95% Interval Lower Bound	Confidence Upper Bound
Threshold	[EPCQC 1.40]	= -1.582	.907	3.044	1	.081	-3.359	.195
	[EPCQC 1.80]	= .192	.779	.060	1	.806	-1.336	1.719
	[EPCQC 2.00]	= 1.085	.767	2.002	1	.157	-.418	2.589
	[EPCQC 2.20]	= 2.252	.768	8.594	1	.003	.746	3.758
	[EPCQC 2.40]	= 3.105	.774	16.098	1	.000	1.588	4.622
	[EPCQC 2.60]	= 3.762	.780	23.239	1	.000	2.233	5.292

	[EPCQC 2.80]	= 4.872	.796	37.465	1	.000	3.312	6.432
	[EPCQC 3.00]	= 5.751	.811	50.241	1	.000	4.161	7.342
	[EPCQC 3.20]	= 6.515	.827	62.068	1	.000	4.894	8.135
	[EPCQC 3.40]	= 7.993	.873	83.929	1	.000	6.283	9.703
	[EPCQC 3.60]	= 9.210	.963	91.542	1	.000	7.324	11.097
Location	PIC	2.488	.216	132.35 7	1	.000	2.064	2.912
	CP	-.516	.207	6.241	1	.012	-.922	-.111
	INCOME	-.341	.130	6.899	1	.009	-.595	-.086
	[Gender=1.0 0]	-.534	.209	6.560	1	.010	-.943	-.125
	[Gender=2.0 0]	0 ^a	.	.	0	.	.	.

Link function: Logit.

a. This parameter is set to zero because it is redundant.

Test of Parallel Lines^a

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Null Hypothesis	1174.058			
General	1030.169 ^b	143.889 ^c	40	.450

The null hypothesis states that the location parameters (slope coefficients) are the same across response categories.

a. Link function: Logit.

b. The log-likelihood value cannot be further increased after maximum number of step-halving.

c. The Chi-Square statistic is computed based on the log-likelihood value of the last iteration of the general model. Validity of the test is uncertain.