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Tobit analysis of canned fish consumption in Erzurum province, Turkey

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ABSTRACT

This study aims to determine the attitudes and behaviors of consumers towards canned fish consumption and to analyze the factors affecting the consumption of canned fish in the Erzurum province, Turkey. Data were collected from 384 households through one-on-one interviews in Erzurum province. The proportional sampling method was used for sampling. In addition, the Tobit model was used to determine the factors affecting the consumption of canned fish. In the model, the demographic characteristics of the consumers and their consumption quantities were included as explanatory variables. The average household size was 4.46 individuals, and canned fish consumption was 161.69 g·year^{-1} per capita. Canned fish accounted for 11.50% of household fish consumption. The proportion of families consuming canned fish was 25.78%. As household fish consumption increases by 1 kg per year, canned fish consumption decreases by 1.29%. Moreover, when the price of canned fish increases by USD 1, canned fish consumption increases by 1.37%. When monthly fish expenditure increases by USD 1, consumption of canned fish increases by 0.48%. The fact that the head of the household is a civil servant increases the consumption of canned fish by 5.23%, and the consumption of canned fish is 11.8% higher in families who consider canned fish nutritious. As a result, canned fish enterprises should influence consumers to consume more canned fish, especially in the summer.

Keywords: Consumer behavior, Nutrition, Processed fish consumption, Tobit model.

Análise Tobit do consumo de peixe enlatado na província de Erzurum, Turquia

RESUMO

Este estudo tem como objetivo determinar as atitudes e comportamentos dos consumidores face ao consumo de conservas de peixe e analisar os fatores que afetam seu consumo na província de Erzurum, Turquia. Os dados foram coletados de 384 famílias por meio de entrevistas individuais na província de Erzurum, utilizando o método de amostragem proporcional. Além disso, foi utilizado o modelo Tobit para determinar os fatores que afetam o consumo de peixe enlatado. No modelo, as características demográficas dos consumidores e suas quantidades de consumo foram incluídas como variáveis explicativas. O tamanho médio do domicílio foi de 4,46 indivíduos, e o consumo de peixe enlatado foi de 161,69 g·ano^{-1} per capita. O pescado enlatado representou 11,50% do consumo doméstico de pescado. A proporção das famílias que consomem peixe enlatado foi de 25,78%. O consumo de peixe aumentou em 1 kg por ano, e o consumo de enlatados de peixe diminuiu 1,29%. Além disso, quando o preço do peixe enlatado aumentou em US$ 1, o consumo aumentou 1,37%. Quando o gasto mensal com peixes aumentou em US$ 1, o consumo de enlatados pescados aumentou 0,48%. O fato de o chefe da família ser um funcionário público aumentou o consumo em 5,23%, e o consumo foi 11,8% maior nas famílias que as consideram nutritivas. Como resultado, as empresas de conservas de pescado devem influenciar os consumidores a consumirem mais conservas de pescado, principalmente no verão.

Palavras-chave: Comportamento do consumidor, Nutrição, Consumo de peixe processado, Modelo Tobit.

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INTRODUCTION

Nutrition is succinctly defined as sufficient and balanced food intake (Haines et al., 2019). The primary cause of the immune system decline worldwide is malnutrition (Corcoran et al., 2019). As noted by scientists, this situation has been remarkably intensified after COVID-19. High-quality and healthy food strengthens the immune defense against disease-causing organisms and thus enables it to catch the disease or overcome a milder form of the disease (Birgisdottir, 2020; Cobre et al., 2021). A natural decline in immune function with age is often unavoidable, as evident in the COVID-19 pandemic, in addition to inadequate nutrition, lessened physical activity, and insufficient sleep, which causes weakening of the immune system, just as with age (Derbyshire and Delange, 2020). Currently, about 10% of people worldwide suffer from hunger (FAOSTAT, 2022). Thus, ensuring access to nutritious foods for these people is crucial. The most micronutrient-dense foods are dairy products, fruit, vegetables, meat, and fish. One of the prime factors in resolving malnutrition and health problems is ensuring adequate and balanced nutrition (Steenson and Buttriss, 2020).

Fish is a crucial source of proteins, fats, lipids, vitamins, and minerals (Balami et al., 2019; Kumar et al., 2020). Many people know about the efficiency of a rich diet in fishery products because of their quality proteins, fats, vitamins, and minerals (Carlucci et al., 2015; Mishra, 2020). In addition, fish are rich in beneficial fatty acids, which are very important in human nutrition. Salmon, anchovies, sardines, pacific oysters, and trout are low in methylmercury and more favorable for people. Consumers should consume about 227 g (8 ounces) of seafood weekly (USDA, 2020). Canned fish is a product with high-added value that provides significant income to producers and intermediaries. It also contains major nutrients needed by consumers (Hansika et al., 2022).

According to the 2020 Food and Drug Organization (FAO) data, 86.2% of fishery products worldwide are consumed as food by people, and the remaining 13.8% are used for other purposes. The dense consumption of aqua products is in fresh fish, which accounts for 46% of fish consumption worldwide. Other products are frozen, canned, and cured fish, and their percentages are 29.2, 12.7, and 12.1%, respectively (FAOSTAT, 2022). In Turkey's total aquaculture production in 2021, 59% consists of fisheries, 32.8% of caught fish, 4.1% of other caught seafood, and 4.1% of inland fishery products. Per-capita production of fishery products ranged from 6.9 to 10 kg annually during 2009-2021 (TURKSTAT, 2022). The per capita consumption of seafood was 5 kg in Turkey in 2016. The equivalent consumption figures for Norway, Japan, and the world in the same year were 54.5, 47.9, and 20.3 kg, respectively (FAOSTAT, 2021; MAF, 2021). While 89% of the fishery products produced in the world are used for human consumption in 2019, 10.8% of this consumption was in the form of canned fish (FAOSTAT, 2021). Fish or canned fish consumption is very low in Turkey. Some studies have been conducted on canned fish consumption by households in Turkey. Adiguzel et al. (2009) and Yuksel et al. (2011) determined the canned fish consumption of households as 9.7 and 8.6%, respectively. In addition, Ozugur et al. (2019) determined this rate as 8% for university students, and Uzundumlu and Dincel (2015) reported that the percentage of canned fish-consuming families was 6% in Trabzon province in the Black Sea Region.

As the number of working members in the household increases and societies develop economically, the demand for these foods increases (Madsen and Chkoniya, 2019). It is thought that being a rich food source, ease of transportation and preparation, and cultural consumption habits are the factors most responsible for increasing the demand for this food (Almeida et al., 2015).

The increasing demand for this product has made it one of the most traded products in global supply chains (Forleo et al., 2022). The United Nations has designated May 2 as World Tuna Day (ISSF, 2021), as increases in consumption in recent years have led to a decline in world stocks with some tuna species facing a risk of overfishing (ISSF, 2021). Overfishing and environmental pollution have come to the fore in the 20th century as a situation in which humanity should take precautions, and consumers' attitudes toward environmentally certified products and their willingness to pay for eco-labeled seafood have been investigated in many countries (Banovic et al., 2019). Factors affecting the demand for seafood and canned fish are generally considered as sociodemographic variables such as age, education, presence of children, and place of residence (Giacomarra et al., 2021), in addition to the number of household members (Babatunde et al., 2018). The economic variables that affect canned fish consumption are canned product expenditure (Babatunde et al., 2018) and household income (Hansika et al., 2022). In addition, the demand situation may change against promotions such as price, quality, and discount of the product in the consumption of canned fish (Hansika et al., 2022).

When it comes to fish, the two things that come to mind are its positive effects on health and the approaches used in its marketing. There were two reasons for the increase in fish consumption worldwide. Firstly, the companies that produce

and process these products constantly present TV and radio advertisements, door-to-door brochures, small offers, and attractive prices to consumers. Secondly, income is increased in households in some countries thanks to economic development. Moreover, to increase fish consumption, these countries have used slogans together with such initiatives as People's Day and Sea Day (Madsen and Chkoniya, 2019).

The Tobit model was originally developed by Tobin (1958) and used to describe the relationship between a non-negative dependent variable (y_i) and a set of independent variables (x_i). The lack of consumption of any products by households is a significant state in data evaluation (Bai et al., 2008). The Tobit regression model is named a censored regression model and is used to estimate linear relationships between the dependent variable and independent variables. Censoring is performed on the independent variable in the Tobit model (Wang et al., 2022). When it comes to different consumption levels of people or not consuming, analyzing only those who consume this product in society is a result that is open to discussion. For this reason, in the analysis of such products, when faced with censorship sampling, the dependent variable may have values 1 and 0 if some observations can be and not be observed despite the values of the independent variable being known. The method used to analyze such a situation is the Tobit model, which can be estimated with the maximum likelihood method (Miran, 2021). This model has been widely used for determining the impact of demographic factors on consumption (Dong and Li, 2014).

This study aims to determine the canned fish consumption behaviors of households in Erzurum province, Turkey. It is expected that the information obtained from this study provides essential information for policymakers and retailers producing and marketing canned fish products. In light of this information, it is considered that the results of this study will contribute significantly to the marketing strategies of the national and local companies operating in the sector.

MATERIALS AND METHODS

The primary data of the research was obtained by conducting face-to-face interviews with consumers in Erzurum province. Various national and international studies were used as the secondary data source, and questionnaires were prepared according to the objective. Based on the information obtained from the municipalities and neighborhood reeves, the number of surveys to be conducted in each district was determined using the unclustered proportional sampling method by taking the rate of households into account (Gurel et al., 2017; Uzundumlu, 2017) (Eq. 1).

$$n = \frac{(t)^2}{(e)^2}(p \times q) \quad (1)$$

In which:
t = t-table value corresponding to 95% significance level (1.96); p = the possibility of occurrence of the event (like canned fish); q = the probability of non-occurrence of the event (do not like canned fish); e = accepted error in the sampling (0.05).

Hence, when there is no information about the desired situation (p) and undesired situation (q) when p or q is 50% to 50% according to Eq. 1, the maximum sample size is 384.

$$n = \frac{(t)^2}{(e)^2}(p \times q) \quad and\ n = \frac{(1.96)^2}{(0.05)^2}(0.5 \times 0.5) = 384.16$$

The main data of this study were obtained through face-to-face interviews with 384 people in October–December 2018. Participants were randomly selected from three districts in the city center: Aziziye (in the west), Yakutiye (in the east and north), and Palandöken (in the south). The surveys were conducted with 175 individuals from the Yakutiye district, 155 individuals from the Palandöken district, and 54 individuals from the Aziziye district. In the consumer survey phase, individuals were allowed 5-10 minutes to complete the survey, and survey controls were conducted both in the field and in front of the computer by four interviewers who had survey experience in previous consumer studies.

Tobit model

Tobit model estimators are calculated using the maximum likelihood method (Giménez-Nadal et al., 2019; Miran, 2021).

In this study, a considerable number of consumers do not consume canned. Thus, the relationship between the canned fish consumption quantity of consumers and demographic factors can be determined using the Tobit model.

The Eq. 2 yielding the Tobit model is as follows:

$$y_i^* = \beta x_i + u_i \; i = 1,\ldots,n \quad (2)$$

In which:
x_i = a vector of explanatory variables; β = a vector of unknown coefficients; ε_i = the error term.

Random effects will also be included in this relationship. The y_i^* is unobserved latent variables. The observed dependent variable is y_i, in which the relationship between y_i^* and y_i is latent (Tobin, 1958; Susilo et al., 2021).

$$y_i = \begin{cases} 0, \beta x_i + u_i \leq 0 \\ y_i^*, \beta x_i + u_i > 0 \end{cases}$$

If y_i^* function is equal to zero or less than zero when y_i is not observed, it is thus equal to zero, or if y_i^* function is greater than zero, then y_i is equal to y_i^*. Besides these two cases, $u_i \cong N(0,\sigma^2)$ gives the expression of the Tobit model (Giménez-Nadal et al., 2019; Lebacher et al., 2021). When if $y_i^* > 0$, $y_i = 1$ and if $y_i^* = 0$, $y_i = 0$; in the probit model, if $y_i^* > 0$, $yi = y_i^*$ and if $y_i^* \leq 0$, $y_i = 0$, in the tobit model (Miran, 2021).

Below are the Eqs. 3 and 4, which yield marginal effects (Bai et al., 2008).

$$\frac{\partial E[y \mid y > 0]}{\partial x_k} = \beta_k \{1 - \lambda(\alpha)[\frac{(x_i\beta)}{\sigma} + \lambda(\alpha)]\} \quad (3)$$

The Eq. 3 estimates the marginal effect on the expected value for y uncensored observations, in which $\lambda(\alpha) = \phi((x\beta)/\sigma)/\Phi((x\beta)/\sigma)$. This indicates how a one-unit change in an independent variable x_k affects uncensored observations.

The Eq. 4 estimates the marginal effect on the expected value for y (censored or uncensored) observations.

$$\frac{\partial E[y]}{\partial x_k} = \Phi\left[\frac{[(x\beta)}{\sigma}\right]\beta_k \quad (4)$$

$\Phi((x\hat{\beta})/\hat{\sigma})$ in which it is simply the estimated probability of observing an uncensored observation at these values of x. As this scale factor moves closer to one-fewer censored observations, then the adjustment factor becomes unimportant, and the coefficient β_k has a marginal effect at these particular values of x. Though not a formal result, this marginal effect suggests a reason why, in general, ordinary least squares (OLS) estimates of the coefficients in a Tobit model usually resemble the maximum likelihood (ML) estimates multiplied by the proportion of uncensored observations in the sample (Bai et al., 2008).

RESULTS AND DISCUSSION

The descriptions of all variables with their means and standard deviations are presented in Table 1.

Table 1. Descriptive statistics of the variables*.

Syntax for variables	Description	Standard deviation	Mean
CFISHCON	Canned fish consumption per capita (kg/household)	1.8700	0.7209
HSIZE	Household size (person)	0.2240	4.4583
AGE	Age of the household head (year)	0.0258	47.1354
EDUC	Education status of the household head is 1, if the total duration of education is greater than ten years, 0 otherwise	0.6099	0.6302
JOB	1, if the head of household is an officer, 0 otherwise	0.5639	0.3672
TENANT	Tenancy status (tenant = 1, landlord = 0)	0.5208	0.2708
INCOME	Monthly income of households ($/household)	237.61	435.74
NUTRIT	AHP coefficients (between 0 and 1), if households think canned fish is nutritive, this coefficient is greater than 0.5	0.4200	0.2345
FISHCON	Fishery product consumption per capita (kg/person)	7.5100	6.5145
HWIFE	1 if the spouse of the household head has a job, 0 otherwise	0.6025	0.1875
PRICE	Price of canned fish ($/200 g)	0.1584	1.4083
EXPEND	Monthly expenditure on fish ($/monthly)	0.0275	0.2411
N			384

*According to the average of October–November 2019, $1 = ₺ 5.55.

On average, the households' canned fish consumption quantity of households was 0.72 kg, the household size was 4.46 people, and the mean age of the household heads was 47.13 years. Among the total, 36.72% of the household heads were civil servants, and 27.08% of the households were tenants. Those households whose head had more than ten years of education level of the household head constitute 63.02% of total households, and the average monthly income was $ 435.74. Between the total, 23.45% of the household heads thought that canned fish was nutritive. The annual fishery product consumption was 6.52 kg per capita. Among the total, 18.75% of the wives in the households were employed. The average price for 200 g canned fish was $ 1.41, and the monthly expenditure on fish was $ 0.24.

According to the Tobit model, when the dependent variable was per-capita consumption of canned fish (kg/person), the independent variables were household size, age of the household head, education duration greater than ten years of the household head, the job of the head of the household is an officer, tenancy status of habitation, total monthly income of the household, household acceptance of canned fish as nutritious, per-capita fishery product consumption, spouse of the household head is employed, price of canned fish, and household's monthly fish expenditure. These factors as shown in Table 2.

When the number of household individuals increases, canned fish consumption decreases. This situation stems from the fact that canned fish is not a cheap product, so when the number of household members increases, canned fish consumption decreases. Since canned fish is a food that is generally consumed individually, there is a negative correlation between the number of households and the consumption of frozen and fresh fish. While the correlation between canned fish consumption and household size was significant in the estimates, it was insignificant considering the marginal effects. A correlation between fish consumption levels and the number of household individuals has been found in some studies. Fish consumption was found to be positively correlated with household size in one study (Marushka et al., 2021), but such a positive correlation was not found in India by Paramasivam and Malaiarasan (2021). Gbigbi (2021) also found a positive relationship between frozen fish consumption and household size.

The mean age of the household heads was 47.14 years. There was, however, no significant relationship between canned fish consumption and the age of the household head in both estimates and marginal estimates.

The average duration of the household head's education was about 10.8 years. The relationship between canned fish consumption and household head education was found to be inversely related. The correlation between canned fish

Table 2. Factors affecting consumer canned fish consumption quantity and marginal effects.

Variables	Estimates		Marginal Estimates	
	Coefficient	t-value	Coefficient	t-value
CONSTANT	-6.6230*	-3.478	-0.2120*	-2.159
HSIZE	-0.5750*	-2.569	-0.0184	-1.583
AGE	0.0202	0.781	0.0006	0.750
EDUC	-1.0860**	-1.780	-0.0347	-1.419
JOB	1.6364*	2.902	0.0523**	1.797
TENANT	-0.7942	-1.525	-0.0254	-1.240
INCOME	0.0003**	1.948	0.00001	1.378
NUTRIT	3.6823*	3.020	0.1177**	1.843
FISHCON	-0.4043*	-5.591	-0.0129**	-1.949
HWIFE	-1.4584*	-2.420	-0.0466	-1.602
PRICE	0.4353*	10.075	0.0137*	2.246
EXPEND	0.1526*	6.714	0.0048*	2.030
Sigma	2.3740*	13.893	0.0129	
Log-likelihood	-235.8339			

*Significance level at 0.05%; **significance level at 0.10%.

consumption and education was, however, not found to be significant in terms of marginal estimates. In this study, the household head tended to believe that fresh fish is more beneficial than canned fish in terms of health if they had higher education.

The consumption of fishery products has also been found to be positively and directly associated with education (Abdikoglu et al., 2020; Abuhlega and Hassan, 2021). Educated people have busy lives and are therefore less likely to consume seafood at home (Yousuf et al., 2019). In particular, during the COVID-19 pandemic, people have increasingly turned to home cooking and retail purchases, such as canned fish, that are easy to prepare (Franchi et al., 2022). Morales and Higuchi (2020) stated that the importance of fish in terms of human health is known, and individuals with high income and education levels consume more fish. Abuhlega and Hassan (2021) found that a lack of education and information about the effects of seafood on health promotes a negative fish consumption trend. Meng et al. (2023) determined that the higher the education status of individuals, the higher their purchasing tendencies, but this is not the case with fishery products.

As for jobs, when household heads are officers, compared with other occupations, their families consume more canned fish. This was confirmed by marginal effects predicting that when household heads were civil servants, the family would consume 0.05 kg more canned fish compared with other families. Rania et al. (2021) obtained results resembling those of this study during the pandemic period and explained this situation as due to many employees either having lost their jobs or being interrupted from working due to temporary production interruptions in the sector. In those families, consumption of fishery products decreased due to the decline in household income. While the consumption of fishery products increased in the same period, the status of jobs such as civil servants was not affected by this situation.

The average monthly income for the households was $ 435.74. A positive relationship was found between canned fish consumption and household income. On the other hand, the correlation between canned fish consumption and household income was not significant in terms of marginal effects. The results of Abdikoglu et al. (2020) and Hansika et al. (2022) are similar to those of this study, whereas household income increases, the demand for fishery products increases. Abuhlega and Hassan (2021) said that the form of fish consumed is associated with income. When the income of households increases, per-capita canned fish consumption also grows (Hosseini et al., 2020).

There was no statistically significant relationship between the likelihood of the household being a house owner or a tenant and canned-fish consumption considering both estimates and marginal estimates.

Some household members believe that canned fish can be a source of nutrition for them. Canned fish is believed to be appropriate for the diet; therefore, this view makes a positive contribution to canned-fish consumption and nutrient content in this study. According to the marginal effects, if the household considered canned fish nutritious, this raised the amount of canned-fish consumption by 0.11 kg in comparison with other households. Abdikoglu et al. (2020) said that consumers' belief that canned fish is beneficial for health increases per-capita fish consumption.

Consumers place more importance on taste and nutrition in fish consumption (Uzundumlu, 2017). Moreover, according to the annual report by the Household Food Consumption Panel, household fish consumption among young people is lower in 2021 than in 2019 and higher among retirees and older adults (apud De la Iglesia et al., 2022). Yousuf et al. (2019) determined that the consciousness of a person about the nutritional advantages affects fish consumption trends. Franchi et al. (2022) stated that canned and fresh fish show generally common nourishing properties, and the consumption of both forms of fish significantly reduce the colorectal cancer risk.

The consumption of other fishery products together with canned fish is found to negatively contribute to both estimates and marginal estimates. According to the marginal effects, if the household bought an additional 1 kg of other fishery products, canned-fish consumption decreased by 0.01 kg. Due to the poor substitutability of fresh fish compared with animal protein foods, consumers have increased the demand for chicken as another protein source instead of preferring dried fish in the price increase of fresh fish. In addition, the low cross-price elasticity of fish for other animal protein foods reduces the substitutability of fresh fish. There is, however, a high correlation between the price of canned fish and fresh-fish consumption. Canned fish is the closest substitute for seafood, so, if the price is high, the demand for other seafood increases (Sandaruwan and De Silva, 2018). Because consumer demand for canned fish is flexible in structure, it is higher for the variety of other fish (García-Del-Hoyo et al., 2017). The majority of consumers prefer fresh fish to canned fish. These two products can be considered competitors against each other. While the advantage of canned fish is that it can be easily found in any season, the advantage of fresh fish is that consumers have the freedom to prepare it as they like.

There was a negative relationship between the employment of the household head's wife and canned-fish consumption. However, this was not found to be significant in terms of marginal estimates. The dramatic rise in employment of married women outside the home has increased consumer demand for ready-food products (Baker et al., 2020). In the interview with married people, although the demand for fish products is higher if the wife is responsible for seafood purchases, consumption expenditures on fish products decrease (Meng et al., 2023). The majority of consumers in Erzurum province preferred more ready-food products such as red meat and chicken meat because consumers consider these ready-food products to be easier to use and odorless compared with canned fish.

Moreover, the consumption of fish is at a very low level compared with chicken and red meat. Because this province is not close to the seacoast, fish consumption culture has not been established either at home or outside home. Uzundumlu (2017) said that per-capita fish consumption is three-four times higher in coastal regions. In addition, while per-capita fish consumption is 14.69 kg in the province of Tekirdağ, which has a coastal region (Abdikoglu et al., 2020), it is 6.5 kg in the Erzurum province, which does not have such a region (Uzundumlu, 2017). In addition, the average chicken consumption is 20.65 kg, the average red meat consumption is 19.61 kg (Sevim, 2022), and the average fish consumption is 7.65 kg (Uzundumlu and Dincel, 2015), indicating that the average consumption of red meat and poultry is about three times that of fish in Turkey.

There is a positive relationship between the canned-fish price and its consumption. According to the marginal effects, if the price of canned fish is increased by 1%, canned-fish consumption rises by 1.37%. Hansika et al. (2022) found that in island countries such as Sri Lanka, however, canned fish consumption decreases by 25.75 units per unit price increases. The findings of Adeli and Hassannejad (2020) are similar to those of this study, in which the price is a factor affecting the purchase of seafood, and the demand for fresh seafood is higher due to the expensive of ready-made seafood, but young people can create more demand for ready-made seafood despite the high price. Canned fish consumption is positively correlated with price because consumers think that, the lower the price of canned-fish products, the worse the product quality.

A positive relationship was found between expenditure on fish and canned-fish consumption. As the canned-fish price increases, it will affect the expenditure on fishery products. According to the results of the marginal effect, the average expenditure on canned-fish consumption increases by 0.005 kg per extra unit of household expenditure. Demand for canned fish is particularly linked to consumer income and product price (Hansika et al., 2022). Meng et al. (2023) found that brand labels, according to Hansika et al. (2022), and product quality increase the consumption of fishery products and therefore the consumption of fish.

CONCLUSION

Since the study area is not a coastal region, the consumption of fishery products is low. In particular, canned fish is consumed by 25.8% of households, so it is included in the already low consumption of fish, representing ten percent. When there is an increase in household size, education level of the household head, fishery products consumption of individuals, and maybe the tendency of the wife of the household head to be employed, the consumption of canned fish decreases. Increases in income, canned-fish price, fish expenditure, belief that canned fish is nutritious, and the possibility that the household leader is an officer result in increases in the canned-fish consumption of individuals. For these reasons, before consumers buy more canned products, information should be given about the benefits of fish to increase their fresh-fish consumption. In order to increase the consumption of canned fish in households with low income and fish expenditure, it would be beneficial for marketers to provide information about the benefits and health effects of these products.

In addition, it is necessary to inform this demographic about less costly canned products through promotional activities such as advertising. In families with a working wife, it is usually women who shop for food, and these women have false beliefs about the health effects of canned fish. In order to change their beliefs, society should be informed that canned fish prevents some diseases, as well as regarding its nutritional benefits.

CONFLICT OF INTEREST

Nothing to declare.

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DATA AVAILABILITY STATEMENT

All dataset were generated or analyzed in the current study.

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