

## **Barriers Factor Analysis of Fish Consumption Behavior in the Special Region of Yogyakarta and Central Java**

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### **ABSTRACT**

*Consumption is the initial phenomenon of this study. This study's general objective is to determine the grouping of factors inhibiting fish consumption and confirm the suitability of the factors. This type of research is a survey. Samples were taken by fulfilling the criteria of purchasing marine fish for family consumption, food processing, or cooking for daily family consumption. The selection of research sites with consideration of areas with fish low consumption levels in Special Region of Yogyakarta and Centre of Java. This study involved 427 respondents from various regions in Special Region of Yogyakarta-Centre of Java. Data analysis techniques in this study used factor analysis and Anova. Based on data analysis, it is known that there are six factors of barriers to fish consumption, namely family member preferences, processing methods, distribution and availability, myths and knowledge, cost or price, and tastes. The factors are then successfully reduced to three main factors, namely individual, food, and environment characteristics.*

*Keywords: Fish consumption, Barriers of consumption, Motivation of consumption, Fish product*

### **INTRODUCTION**

In general, the level of fish consumption in the world continues to increase. Based on data from the Food and Agriculture Organization (FAO) in 2018, in per capita terms, consumption of food fish has grown from 9.0 kg in 1961 to 20.2 kg in 2015, with an average rate of around 1.5 percent per year. Since 1961, the average annual increase in global consumption of vegetable fish (3.2 percent) has exceeded population growth (1.6 percent) and exceeded the meat consumption of all terrestrial animals, except poultry (4.9 percent). Fish is also a source of a daily healthy diet (Skuland, 2015), reducing the risk of stroke, diabetes, and cancer. Fish consumption provides health benefits for both young and old (Augood et al., 2008; He, 2009). FAO (2018) notes that fish and

fish products provide an average of around 34 calories per capita per day. Daily contributions of fish and fish products can exceed 130 calories per capita in countries that are still lacking in alternative protein foods. More than as an energy source, the contribution of fish food is very significant in easily digestible animal protein. A portion of 150 g of fish provides about 50 to 60 percent of adults' daily protein requirements. According to the FAO, the world population's protein intake comes from animals, around 16.6 percent, and 6.5 percent of protein from other food sources. The level of world fish trade is expected to expand to 25% from 2012 to 2021.

Despite an increase in per capita food availability and long-term positive trends in nutritional standards, malnutrition (including inadequate consumption of

protein-rich foods derived from animals) remains a significant and ongoing problem, especially in rural areas in developing countries. According to FAO data (2017), many food shortages are suitable for the needs of an active and healthy life. In 2016, the total number of people with chronic malnutrition reached 815 million, up from 777 million in 2015. However, it dropped from around 900 million in 2000, with the largest number and proportion in Asia and Africa. The food security situation has deteriorated, especially in parts of sub-Saharan Africa and Southeast and western Asia. In some countries, various forms of malnutrition such as child malnutrition, anemia among women, and obesity. Overweight and obesity are increasing in children in most regions and adults in all regions, mainly due to excessive consumption of high-fat and processed products. Fish with low-fat content and contain valuable nutrients have a significant role in improving an unbalanced diet, especially related to consumption policies.

In Asia, fish consumption in Indonesia is still relatively low even though Indonesia has abundant fish resource potential, which is 9.9 million tons in 2018 supported by the potential of fish farming land area. Indonesia's potential areas which reach 83.6 million hectares. Based on Central Bureau of Statistics data in 2018 concerning Agricultural Producer Price Statistics of the Livestock and Fisheries Subsector and Data on Rural Consumer Price Statistics of the Food Group there is a significant percentage of producer and consumer price differences for fishery commodities, including yellowtail fish (26.68 percent), skipjack fish (29.36 percent), cork fish (27.36 percent), and milkfish (36.23 percent). In Indonesia, fish consumption is relatively low compared to other Asian countries; for example, Singapore 80 kilograms per capita per year, Malaysia 70 kilograms per capita per year, Japan is almost 100 kilograms per capita per year. Despite an increase in the national fish consumption rate from year to year to 50.69 kg per capita in 2018, the Health Ministry's Basic

Health Research data in 2013-2018 show stunting in Indonesia from 37.8% to 30.8%.

In particular, some regions in Indonesia are still relatively low, such as in Central Java in 2018, only 29.19 kg/capita/year. This reality is contrary to the condition of Central Java, which has a reasonably vast sea reaching 1,640 million hectares with a reasonably good fishery yield on average as much as 956,000 tons of fish/year both from the catch of fishers and aquaculture. Another example, fish consumption in Bantul regency is also relatively low. Data from the Department of Agriculture, Maritime, Fisheries, and Fisheries of Bantul Regency shows that the average consumption of 22 kg of fish/capita/year is below the national standard of 45 kg/capita /year.

Several factors in inhibiting consumption can cause low consumption levels. Trondsen et al., (2003), in their study of several women in Norway, grouped several factors inhibiting fish consumption in consumer attitudes, health, consumption patterns, and socioeconomic factors as explanatory variables. Ivoninskii, (2016) has identified the level of fish consumption constraints based on factors of availability, price, self-efficacy, convenience, habits, health, taste perception, and other attributes. Brunsø et al., (2009) compared the barriers experienced by fish consumption through focus group discussions in Belgium and Spain grouping the factors inhibiting fish consumption in the form of price perceptions, odors when cooking, and better taste of meat. Badr et al., (2015) identified barriers to purchasing freshwater including taste, odor, texture, bone, appearance, difficulty in preparation, availability, conservation, price, place, freshness, and lack of knowledge about cooking methods which is classified as a sensory factor or sensory, ease and quality.

The general objective of this study was to determine the grouping of factors that inhibit fish consumption in Indonesia. Research on consumer behavior towards fish products has increased in recent years. Many extensive studies have

analyzed fish consumption behavior in several countries since 2000 (Carlucci et al., 2015), excluding Indonesia. An empirical analysis of fish consumption barriers in this region is relatively new. Regarding the inhibiting factors of fish consumption, there have not been many studies or literature discussing the barrier factors of fish consumption, especially in Indonesia, and are still experiencing limitations. In searching for literature and research through Google Scholar and other academic databases, not many studies have been found discussing the same thing in Indonesia. Djunaidah, (2017) seeks to identify the causes of low fish consumption, including lack of public understanding of the benefits of consuming fish, lack of smooth fish distribution, lack of facilities and infrastructure, as well as myths that develop in the community using secondary data. The factors discovered by some previous researchers need to be further confirmed through multi-dimensional testing in Indonesia. Besides, the sample used is that consumers in Indonesia who bring different characteristics and culture will undoubtedly bring differences in consumption choices. The prediction of a model may vary in conditions and culture (Bagozzi et al., 2000) and buying and consumption behavior (Hempel and Jain, 1978). Some of the research also point to different aspects of fish consumption. Some findings suggest that environmental aspects tend to be more dominant than intrapersonal (Gofton & Marshall, 1992), although situational factors are also an essential aspect of consumer behavior research (Foxall & Greenley, 1999). Practically understanding the level of individual fish consumption behavior is beneficial for the government and culinary fish managers (Lee & Nam, 2019).

## RESEARCH METHODS

This type of research is a survey. The population in this study are consumers with a low level of fish consumption or do not consume fish and are located in some regency-Special Region of Yogyakarta and Centre of Java. The sample in this study

was determined by purposive sampling. Samples were taken by meeting the criteria for purchasing marine fish for family consumption, or processing food, cooking for daily family consumption. The choice of research location is based on the consideration of areas with low consumption levels in Special Region of Yogyakarta-Centre of Java. Based on fish consumption data in the districts in the Special Region of Yogyakarta and the centre of Java, the lowest average consumption level is 4212 households.

The variables in this study are interdependence, namely the consumption barriers experienced by consumers related to fish consumption. These variable consisting of family members, processing methods, distribution or availability, myths and knowledge, aspects of cost or prices, and tastes (Badr et al., 2015; Trondsen et al., 2003; Scholderer & Grunert, 2001). This research also begins with a preliminary study through open interviews to explore information related to obstacles perceived by consumers in consuming marine fish. The results of the preliminary study are combined with other previous studies. The data used are primary. Data was collected through a survey using a closed questionnaire. The questionnaire was adopted from Badr et al., (2015), Trondsen et al., (2003), and Scholderer & Grunert, (2001), which has been combined with the preliminary studies. This study involved 427 respondents from various regions in Indonesia.

This data is taken with the provisions above 10% of the population data for the lowest level of fish consumption. Data were analyzed using Anova and factor analysis. ANOVA is used to examine differences in factors that inhibit fish consumption based on gender and age. The analysis of factors in this study functions to classify factors that inhibit consumption and reduce these factors.

## RESULT AND DISCUSSION

### Characteristics of Respondents

Characteristics of respondents in this study were described by gender and age. Characteristics of respondents based on

sex obtained in this study are presented in the following table 1:

**Table 1**  
**Gender**

Gender	Frequency	Percentage	Means	t-value	Sig.
Men	118	25%	4.40		
Women	354	75%	3.80	22.373	0.000
Total	472	100%			

Sources: Primary data processed

From these data, it can be seen that there are more women than men. Men were 118 respondents or 25%, while women were 354 respondents or 75%. Based on the results of the mean difference test, it is known that there is a significant difference in the consumption barrier between male and female consumers as indicated by a significance of 0.000. Based on average, the level of consumption constraints experienced by

men is higher than women. These findings explain that women are more likely to have experience in food processing than men, so they have a lower level of inhibition. Constraints faced by female consumers need to get the attention of marketers by focusing on this segment because it plays a direct role in food processing.

Characteristics of respondents based on age obtained in this study are presented in the following table:

**Table 2**  
**Age**

Age	Frequency	Percentage	Means	F-value	Sig.
17-30	118	25%	4.61		
31-40	222	47%	4.42		
41-50	113	24%	3.62	112.381	0.000
50-60	19	4%	3.41		
Total	472	100%			

Sources: Primary data processed

The characteristics of respondents are classified into four age groups that are 17-30, 31-40, 41- 50, and 50-60 years. The results of the mean difference test show that there is a significant difference in consumption barrier among consumers based on the age group which is indicated by a significance of 0.000. The younger age group shows the higher barriers that are felt. These findings are due to barriers related to skills or knowledge in processing and serving food made from fish, so young people need to get food processing education.

### Descriptive Analysis

The mean value of overall fish consumption barriers shows a value of 4.08, which is classified as high, which means that overall, consumers perceive

barriers to fish consumption, factually these barriers are explained in factor analysis. The perceived high consumption barrier can be caused by several factors, such as the findings of Djunaidah (2017) covering the lack of public understanding of the benefits of consuming fish, lack of smooth fish distribution, and lack of facilities and infrastructure.

### Data Normality Test

Data normality can be observed through skewness and kurtosis values. Based on the normality test data, it is known that all data derived from consumption barriers variable data have a critical ratio or a critical value below  $\pm 2.58$ . Values that fall within this range indicate that the data is normally distributed.

**Table 3**  
**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
Consumption barrier	472	3.41	4.64	4.0840	.31420
Valid N (listwise)	472				

Sources: Primary data processed

**Factor Analysis**

Factor analysis can group or reduce the number of similar questions so that at the same time can provide information on whether several questions in one attribute measure the same domain or not. Questions that have the same domain will become a group based on the closeness between items. Sixteen components are factor analysis with principal component analysis. There were 16 components extracted, namely the tastes of family members, conditions experienced by family members, how to process fish-based food, serving food, determining menus, weather/natural conditions, location/place, availability in the market, intestinal worms, believing itching, not many benefits, high cost requirements, expensive products, taste problems, odor problems, unattractive textures or appearances. The Kaiser Meyer Olkin (KMO) measure of sampling adequacy value is  $0.782 > 0.5$ , which means that the factor analysis can be continued in the analysis (Child, 2006).

**Communality**

Communality is a measure of the percentage of variation in variables explained by factors. The extreme value of communality is between 0.0 and 1.0. Estimation of 1.0 means that the variance of variables correlates perfectly with other variables due to several shared factors. For example, F1 (factor 1) is 0.741, which means a factor 1 question or item shows a 74.1% level of equality with other variables caused by several shared factors. In comparison, the remaining 25.9% is the uniqueness of that variable, which is influenced by other factors.

**Table 4**  
**Communalities**

	Initial	Extraction
F1	1.000	.786
F2	1.000	.732
F3	1.000	.774
F4	1.000	.742
F5	1.000	.824
F6	1.000	.796
F7	1.000	.823
F8	1.000	.882
F9	1.000	.861
F10	1.000	.818
F11	1.000	.731
F12	1.000	.747
F13	1.000	.884
F14	1.000	.893
F15	1.000	.933
F16	1.000	.934

Sources: Primary data processed

**Factor Rotation**

There are several stages of factor rotation in this study. The rotation factor method used is the varimax rotation method, where the results of rotation one can be seen after six iterations. Table 5 shows the component matrix of the variable grouping factors inhibiting fish consumption with a cumulative variance of 82.2 per cent; each factor is factor 1 (Eigenvalue = 5.59, accounted for 34.9 per cent), i.e. Family member preferences. Factor 2 (Eigenvalue = 1.98 accounted for 12.4 percent) namely Processing method. Factor 3 (Eigenvalue = 1.65, accounted for 10.3 percent) namely myth and knowledge Factor 4 (Eigenvalue = 1.61, accounted for 10.1 percent) namely taste. Factor 5 (Eigenvalue = 1.35, accounted for 8.4 percent) is cost or price. Factor 6 (Eigenvalue = 1.27, accounted for 6.1 percent) namely distribution and availability.

The results of the rotation factors in table 5 produce six factors. This result is confirmed by the findings of previous research and supported by FGD involving experts in consumer behavior. Factor 1 is a preference factor for family members, namely considering family preference or family members who do not like fish and allergic to fish. Factor 2 is a processing method factor, which is ignorance of how to process food from fish, serving, and combination processing. Factor 3 is a myth and knowledge factor related to local community trust related to the adverse

effects of fish consumption or security, such as intestinal worms, itching, and lack of knowledge about the benefits of fish. Factor 4 is a taste factor, including taste, smell/freshness, and texture/appearance. Factor 5 is the cost factor or price in the form of high prices for certain types or fluctuating and expensive processing costs. Factor 6 is a distribution or availability factor, which is sometimes limited to certain conditions, locations, and availability in the market. The results of the rotation component matrix are as follows:

**Table 5**  
**Component Matrix I**  
**Component Matrix<sup>a</sup>**

	Component					
	1	2	3	4	5	6
X1		.961 .963				
X2	.825 .758 .775					
X3					.801 .885 .854	
X4				.824 .892 .872		
X5			.919 .925			
X6						.844 .678 .811

Sources: Primary data processed

The following factor rotation method uses the varimax rotation method to reduce the factors to produce three factors. Table 6 shows the second matrix components of the variable grouping of the factors affecting the consumption of fish with a cumulative variance of 57.6 percent; each factor is factor 1 (Eigenvalue = 5.59, accounted for 34.9 percent) in the form of environmental characteristics (Preferences of family members, distribution and availability). Factor 2 (Eigenvalue = 1.98, accounted for 12.4 percent) is food characteristics (Processing method, cost, or price). Factor 3 (Eigenvalue = 1.65,

accounted for 10.3 percent) is individual characteristics (Myths, knowledge, tastes). The results of the factor rotation in table 6 produce three factors. These findings are confirmed by a concept developed by Shepherd (1989). Factor 1 is an environmental characteristic consisting of distribution, availability, and family members' preferences. Factor 2 is a factor of food characteristics consisting of the processing method and cost or price of fish. Factor 3 is an individual characteristic consisting of myths-knowledge and tastes. The results of the rotation component matrix are as follows:

**Table 6**  
**Component Matrix II**  
**Component Matrix<sup>a</sup>**

	Component		
	1	2	3
X1	.919 .905		
X2		.662 .697 .694	
X3			.633 .568 .595 .656
X4			.687 .643
X5		.737 .773	
X6	.736 .705 .718		

Sources: Primary data processed.

Based on the characteristics of respondents, it can be identified that overall, consumers have quite high barriers. Female consumers have higher barriers than males, and young consumers perceive barriers higher than older consumers. Age and sex factors also determine consumer consumption decisions (Verbeke & Vackier, 2005). The difference in choice in the sex category may differ in the perception of the benefits of fish. Stran & Knol, (2013) find women more frequently than men in checking for and use food label components, this causes differences in the assessment of perceived benefits so that the perceived barrier is also different. Besides, women also have higher dietary restrictions than men (Cornier et al., 2010). The study of factor analysis succeeded in producing six factors inhibiting fish consumption, namely family member preferences, processing methods, distribution and availability, myths and knowledge, costs or prices, and tastes. The extraction result is then reduced to three factors. Following the explanation from Randall & Sanjur, (1981), preferences form three main characteristics: individual, food, and environment. The findings from the analysis can be explained that the three characteristics play a role as a barrier to

fish consumption, namely; 1) environmental characteristics in the form of family member preferences, distribution, and availability; 2) individual characteristics in the form of myths and knowledge and 3) food characteristics in the form of processing methods, costs or prices and tastes.

Consumers' concerns about safety factors such as contamination of dangerous chemicals and harmful bacteria (Vanhonacker et al., 2010) are why consumers avoid fish. This aspect is due to the limited knowledge of consumers in choosing and processing fish. Knowledge and limited access to information are aspects of consumer constraints for fish consumption (Grieger et al., 2012; Kitano & Yamamoto, 2020). Consumers who are satisfied with safety are more likely to consume fish more frequently (Lee & Nam, 2019).

Aspects of food characteristics also become obstacles to fish consumption. This reason is consistent with the findings of Vanhonacker et al., (2010) that consumers have problems cleaning, prepare or present and evaluate the quality of fish (Brunsø et al., 2009). Besides that, another aspect of the food characteristic factor is price or cost. (Grieger et al., 2012) found that cost is the dominant factor that

constrains fish consumption. Fish consumption will decrease if the consumer considers the price an essential factor (Lee & Nam, 2019;. Brunsø et al., 2009) also found that price is the main obstacle for fish consumption, and other aspects such as fish odor and taste are followed.

These results follow the findings with Scholderer & Grunert (2001) that the availability of products and location of consumption, the need for adequate cooking skills, serving, and the agreement of family members become a part that inhibits fish consumption. The same thing is related to the lack of fresh fish, and the variation in quality is the most critical barrier given as an excuse not to eat more fish (Trondsen et al., 2003). The findings are also consistent with the findings of Badr et al., (2015) who examined several reasons including taste, odor, texture, bone, appearance, difficulty in preparation, availability, conservation, price, place, freshness, and lack of knowledge about cooking methods which become barriers for fish consumption. The ease of processing or consumption is one of the main factors to consume fish compared to other animal sources (Kitano & Yamamoto, 2020). This opinion is supported by the findings of Leek et al., (2000) that the aspect of versatility is a part of consumer considerations related to fresh fish consumption.

## CONCLUSION

Based on the findings, it can be concluded that there are six factors of fish consumption barriers, namely the preferences of family members, processing methods, distribution and availability, myths and knowledge, costs or prices, and tastes. The results are then reduced to three factors: individual, food, and environment.

Based on the conclusions in this study, it can be given some practical recommendations that are recommended to increase fish consumption with consumer education related to the myths perceived. The government needs to educate and socialize a correct understanding of fish myths. Promotional

activities underlining the safety of fish can contribute to increasing fish consumption. Related to the distribution factor constraints, marketers need to prepare smoothness in the distribution process supported by the government in terms of infrastructure. Besides, knowledge and skills in fish processing need to be given. Marketers can provide demonstrations of variations in fish processing techniques as food products. Producers, especially those engaged in food products made from fish, can process fish in the form of other food forms without reducing the essence of the nutritional benefits contained in fish.

Another factor not considered in this research is the consumer class, even though it impacts consumer preferences for fish (Mohan Dey et al., 2005). Skuland, (2015) also states the importance of social class considerations such as education and income in predicting fish consumption behavior because it relates to knowledge and perceived quality. Future studies can consider consumer or social class factors in assessing the barriers experienced by consumers.

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