



Fish Consumption Behavioral Changes during COVID-19 Pandemic in Bandung City (Case Study in Regol District)

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Authors' contributions

This work was carried out in collaboration among all authors. Author DRP designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Author ZA and Author AR managed the analyses of the study. Author AAHS managed the literature searches. All authors read and approved the final manuscript.

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Case Study

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ABSTRACT

The spread of the Coronavirus outbreak has in changes in people's consumption patterns, including the consumption of fish products. The purpose of this study was to analyze changes in fish consumption behavior, what factors experienced changes in fish consumption behavior during the Covid-19 pandemic, and to analyze the understanding of the benefits of fish from consumers in the District Regol. The research was conducted in February - March 2021. The data used were primary. The method used is a case study with qualitative, quantitative the and descriptive data analysis. The sampling technique used an accidental sampling method with 100 respondents. Based on the results of the study, before the pandemic most respondents (39%) consumed fish twice a week, while in the pandemic phase, most respondents (46%) consumed fish only once a week and the amount of fish consumption in one week that is before the pandemic 47% consumers consume as much as <1kg, 43% as much as 1-2 kg and 10% as much as > 3kg, after

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the pandemic 55% consumers consume as much as < 1kg, 33% as much as 1-2 kg and 12% as much as > 3 kg. The purchasing system for the majority of consumers has not changed, that is, consumers still prefer to shop offline. The place of purchase for the majority of consumers has not changed, that is, consumers still prefer traditional markets.

Keywords: Covid-19; consumption behavior; benefits of fish; preferences.

1. INTRODUCTION

Coronavirus disease 2019 or often referred to as Covid-19 was announced to the public by WHO (World Health Organization) in Indonesia on March 11, 2020. The Covid-19 pandemic has a significant effect on the country, business, economy, and society. One of the impacts of the Covid-19 pandemic on the fisheries sector is the decrease in global demand for Indonesian fishery commodities. Statistics Indonesia [1] stated that there was a decrease in the percentage of expenditure on fish commodities per capita in one month, namely in 2019 the percentage of expenditure per capita for fish commodities in the City was 3.51, while in 2020 it was 3.44, for villages in the year 2019 amounted to 4.63, while in 2020 it was 4.51 and in City + Village in 2019 it was 3.89 while in 2020 it was 3.80.

To prevent the spread of the coronavirus, the government has implemented a lockdown or stay at home system. One of the results is that the market is closed, the decline in demand for fish makes fish unsold. Consumer demand has decreased in the market, as consumers prefer to buy other products that are sold online more often, while fresh fish is rarely sold online. This situation causes changes in social habits, food consumption and is followed by sudden changes in consumer behavior towards food.

The demand for fish products for the people of Bandung City has decreased according to the statement from the Ministry of Marine Affairs and Fisheries, namely that the demand for fish products during the Covid-19 pandemic decreased by around 20% [2].

The city of Bandung is one of the regions that implement the stay at home or PSBB system. One of the PSBB regulations closes public facilities including shopping centers, making consumption behavior in Regol District change due to the Covid-19 pandemic. The existence of social distancing makes consumers switch to buying products online, take away, or home delivery. The purpose of this study was to analyze changes in fish consumption behavior

during the Covid-19 pandemic in Regol District, to analyze what factors experienced changes in fish consumption behavior during the Covid-19 pandemic in Regol District, and to analyze the understanding of the benefits of fish from consumers in the District Regol.

2. METODOLOGY

The research method used in this research is a case study. Case studies are used to provide an understanding of something that grabs attention, the social process that occurs, or the experience of the person who is the background of a case.

2.1 Types and Sources of Data

Types and sources of data used are primary data and secondary data. Primary data in this study were obtained directly in the field through direct interviews with respondents using questionnaires. Secondary data obtained from this research comes from available libraries and is related to research topics such as libraries, the internet, and other general information.

2.2 Sampling Technique

The sampling technique used in this study was accidental sampling. Accidental sampling is an accidental sampling technique (coincidence) there are no certain criteria for respondents to fill in the data [3], by taking cases or respondents who happen to exist or are available in a place according to the context of the study. Researchers can be used as a sample if it is seen by the person who happened to be met suitable as a data source. In technique accidental sampling, sampling not predefined. The number of samples taken in this research was 100 respondents in Regol District, Bandung City.

2.3 Data analysis

This research uses data analysis methods in the form of qualitative analysis, quantitative analysis, and descriptive analysis. Qualitative analysis is used in this research to understand the benefits

of fish from consumers. Quantitative analysis is used to describe the general picture or characteristics of society and consumption behavior in Regol District, Bandung City by using numbers to facilitate the process of analyzing the data that has been collected. This analysis is generated from interviews and questionnaires that are tabulated in the data, then processed and analyzed according to the analytical method used so that the results can be seen. Data obtained from the quantitative analysis are presented in the form of tables, diagrams, or graphs and then analyzed descriptively.

2.4 Binary Logistic Regression

Binary logistic regression is one of the methods used to find a relationship between the dichotomous dependent variable (nominal or ordinal scale with two categories) with one or more independent variables that are continuous or categorical [4].

$$\text{Logit} [\pi (0/1)] = \frac{e^{(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7)}}{1 + e^{(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7)}}$$

Explanation :

$\pi (0/1)$ = Preference, *dummy* fresh fish variable 0; processed fish and fresh fish dummy variable preference 0; fresh sea fish 1

- β_0 = Constant
- $\beta_1 - \beta_9$ = Regression coefficient
- x_1 = Age
- x_2 = Gender
- x_3 = Education
- x_4 = Work
- x_5 = Income
- x_6 = Number of Family Members
- x_7 = Origin Tribe

The parameters tested in preference between fresh fish and processed fish as well as fresh and marine fresh fish are the model feasibility test, the likelihood ratio test, the coefficient of determination, and the Wald test.

3. RESULT AND DISCUSSION

3.1 Characteristics of Respondents

Based on the gender of the 100 respondents, the majority were 81 women and 19 men. Based on the age of 100 respondents, the majority of respondents are aged 30-34 years with 22 respondents.

Based on the number of family members from 100 respondents, namely the number of family members as many as 10 people, the number of family members 3-5 people as many as 83 people, and the number of family members ≥ 6 people as many as 7 people. The number of family members of the respondent will influence the decision to buy fish in the family, this is related to the amount to be purchased [5].

Based on the last education of 100 respondents, namely for junior high school as many as 7 people, for SMA as many as 60 people, for Diploma / Bachelor as many as 31 people, and Postgraduate as many as 2 people. That education greatly affects the knowledge possessed by respondents, as a housewife who takes care of the family and organizes food in the family, she will think more about the products to be consumed, especially meeting the need for animal protein such as fish [5].

Based on the work of 100 respondents, namely 6 students, 22 civil servants / private workers, 52 housewives, and 20 entrepreneurs. The majority of product buyers are housewives because they are usually housewives who arrange food for the household.

Based on the income of 100 respondents presented in Table 1, which is as follows.

Table 1. Respondents Frequency Distribution Based on Income per Month in Regol District

Income (/ month)	Frequency (Person)
<2,000,000	16
2,000,000 - 4,000,000	44
4,000,000 - 6,000,000	26
6,000,000 - 8,000,000	7
> 8,000,000	7
Total	100

Income has an important role in the household, because income will influence decisions in household consumption and has an influence on the frequency of fish purchases by consumers because if the income is greater, the level of consumer purchases will be more and the products selected will be of higher quality [5].

Based on the ethnicity of the 100 respondents, namely the Sundanese as many as 83 people, the Javanese as many as 7 people, the Sumatran people as many as 8 people, and for the Kalimantan and Malay tribes as many as 1

person. This is following the statement of the Bandung City Government [6] that the majority culture of the Bandung area is Sundanese culture.

3.2 Fish Product Purchasing System

In the fish product purchasing system that was carried out by respondents before the Covid-19 pandemic, all respondents used an offline purchasing system, namely as many as 100 people. The majority of the fish product purchasing system carried out by respondents is offline, namely as many as 96 people. Consumers consider that direct purchasing is an accurate purchasing model because they can feel and choose products directly.

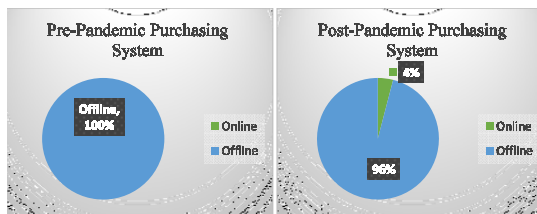


Fig. 1. Frequency distribution based on purchasing system

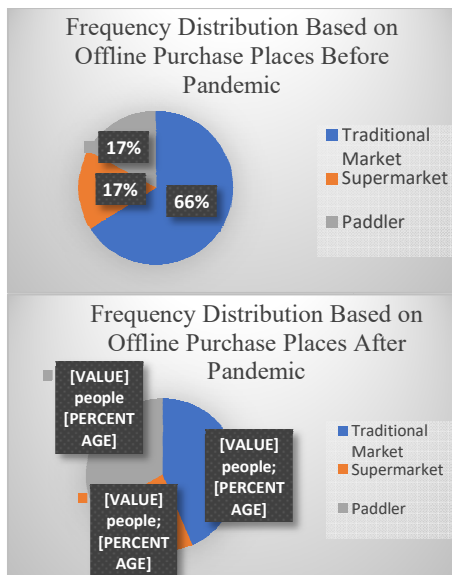


Fig 2. Frequency distribution based on offline purchase places

The majority of places to buy fish products offline before the pandemic was chosen by respondents, namely traditional markets, namely 66 people. It is the same as before the pandemic when even after the pandemic the majority of

respondents in Regol District still chose traditional markets to buy fish products, as many as 41 people. The majority of respondents to choose where to buy offline both before the pandemic and after the pandemic remained the same, but the number of respondents had changed. This change occurred because at the beginning of the pandemic the government issued a social distancing policy which in people staying at home more often and preferring to shop at peddlers.

Based on the respondent's choice, the following reasons for choosing an online and offline purchasing system can be seen in Tables 2 and 3.

Table 2. Respondents' Reasons for Choosing an Online Purchasing System

Online Reasons	Frequency	Percentage
Easy to access	1	17%
Secure	1	17%
Save time and effort	4	67%
Total	6	100%

Table 3. Frequency of Respondents' Reasons for Choosing an Offline Purchasing System

Offline reason	Before the Pandemic	After the Pandemic
Save cost	4	16
Can choose the product directly	81	67
Consumers are satisfied	15	11
Total	100	94

3.3 Frequency of Eating Fish in One Week

The majority of respondents consumed fish in one week before the pandemic as many as 39 people, while after the pandemic experienced a change, the majority of respondents consumed fish in one week, namely once, namely 46 people. Respondents of Regol District have decreased fish consumption in one week during this pandemic. This is following the Marine and Fisheries Ministry's statement [7] that the demand of the Indonesian people for fish consumption has decreased by 20%.

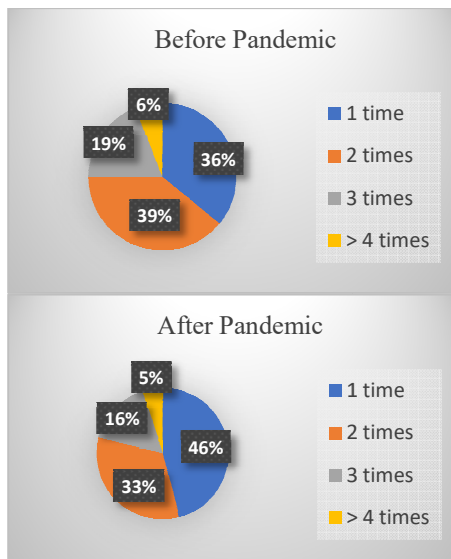


Fig. 3. Respondents frequency distribution based on the frequency of consuming fish in one week

3.4 Total Fish Consumption in One Week

The majority of the amount of fish consumption in one week of respondents in Regol District both before the pandemic and after the pandemic was still the same, namely with a lot <1 kg, but the number of respondents experienced changes. Most consumers buy fish in one time purchase of ½ kg and according to respondents, this amount is sufficient to meet the family consumption needs [5].

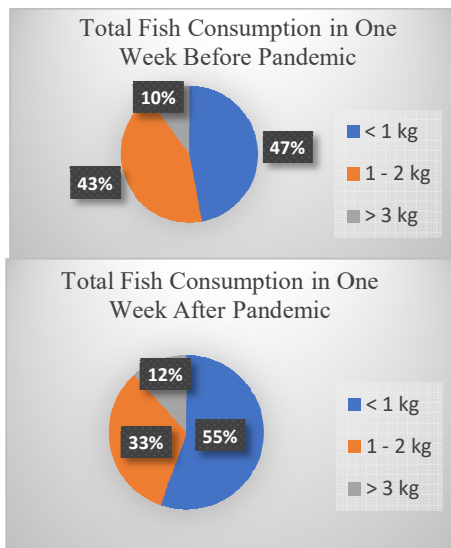


Fig. 4. Respondents frequency distribution based on total fish consumption in one week

3.5 Changes in the Amount of Fish Consumption during the Pandemic

The majority of respondents regarding changes in the amount of fish consumption during the pandemic, answered that the amount of fish consumption was fixed, namely 66 people or 66% of the total respondents.

Based on the choices of respondents who experienced the addition and reduction of the amount of fish consumption, here are the reasons for the respondents respectively presented in Tables 4 and 5.

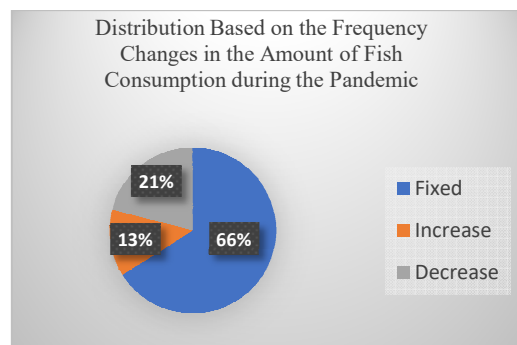


Fig. 5. Changes in the amount of fish consumption during the pandemic

3.6 Types of Fish Frequently Consumed by Respondents

Before the pandemic, respondents consumed fresh fish products more often, as many as 79 people, while after the pandemic, respondents consumed fresh fish products more often, as many as 67 people. The majority of fish products that were consumed more frequently by Regol District respondents both before the pandemic and after the pandemic had not changed, but the number of respondents experienced changes. Several cases show the impact on the disruption of marketing access to smallholder farmers' products to the market [8], so that urban people have difficulty accessing fruits and vegetables, milk, meat, including fish in fresh form.

Based on respondents' choices, the following reasons for choosing fresh fish before and after the pandemic can be seen in Table 6.

Based on respondents' choices, the following reasons for choosing processed fish before and after the pandemic can be seen in Table 7.

3.7 Types of Fresh Fish Frequently Consumed by Respondents

The majority of fresh fish products that are more frequently consumed by Regol District respondents both before the pandemic and after the pandemic have not changed, but the quantity of respondents has changed. Before the pandemic, 74 respondents chose fresh, fresh fish, but after the pandemic, it increased to 80 people. Before the pandemic, 26 respondents chose sea fresh fish, but after the pandemic, it decreased to 20 people.

This is due to the difficulty of shipping fresh marine fish to cities during this pandemic. According to the Ministerial Decree [9] during this pandemic, there was a problem not being absorbed by the fish caught by fishermen, one of which was due to the absence of means of transporting the catch.

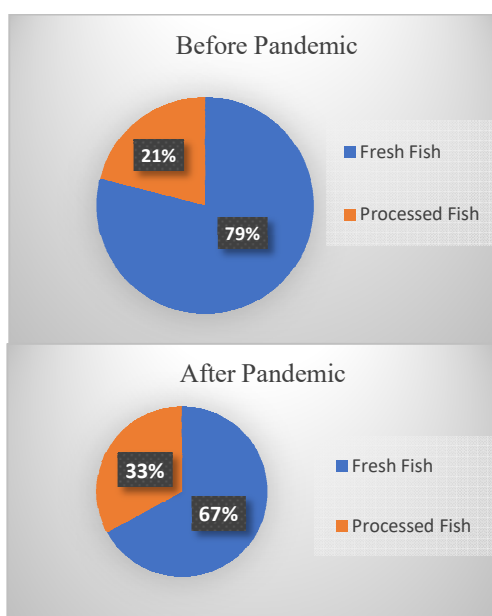


Fig. 6. Respondents frequency distribution based on fish products consumed more often

Table 5. Reasons for Decreased Fish Consumption During a Pandemic

Reasons for Reduced Fish Consumption	Frequency	Percentage
Income decreased	12	57%
There are fewer fish marketers	2	10%
Over the majority of other products	7	33%
Total	21	100%

Table 6. Reasons for Fresh Fish More Often Consumed by Respondents Before the Pandemic

The reason for Fresh Fish	Before the Pandemic	After the Pandemic
It tastes better	7	9
High in nutrition	35	20
Easy to get	20	16
Safer and hygiene	5	7
Affordable prices	12	15
Total	79	67

Table 7. Reasons for Processed Fish More Frequently Consumed by Respondents Before the Pandemic

Reasons for Processed Fish	Before the Pandemic	After the Pandemic
It tastes better	10	11
High in nutrition	5	8
Safer and hygiene	6	14
Total	21	33

Table 8. Respondents Frequency Distribution Based on the Types of Fresh Fish Consumed More Often

Fresh Fish Types	Before the Pandemic	After the Pandemic
Fresh Fish	74	80
Sea Fresh Fish	26	20
Total	100	100

Table 9. Respondents' Frequency Distribution by Type of Processed Fish which is More Frequently Consumed

Types of Processed Fish	Before the Pandemic	After the Pandemic
Pindang fish	49	47
Canned fish	19	26
Fish meatball	10	17
Grilled fish cake	6	4
Salted fish	15	4
Pempek	1	2
Total	79	67

3.8 Types of Processed Fish Frequently Consumed by Respondents

The majority of processed fish products that are more frequently consumed by respondents in Regol District both before the pandemic and after the pandemic have not changed, but the quantity of respondents has changed, namely choosing the type of pindang fish. The results of the study are following the research of Luhur and Wardono [10], the preference for processed fish products at the Tabanan location is mostly for pindang fish and salted fish which are the main choices of the community.

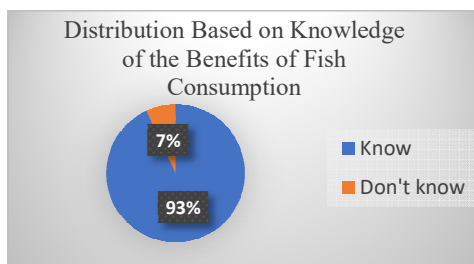


Fig. 7. Respondents' Frequency Distribution Based on Knowledge of the Benefits of Fish Consumption

3.9 Respondents' Knowledge Regarding the Benefits of Fish Consumption

The majority of respondents' knowledge of the benefits of fish consumption is that 93 respondents know the benefits of the fish consumption. Based on the research results, the average respondent knows the benefits of fish consumption, namely for body health, contains high protein and nutrients contained in fish. Public knowledge shows that almost all respondents, as many as 26 people or 92.86%, know about the nutritional content of fish and the benefits of fish [11]

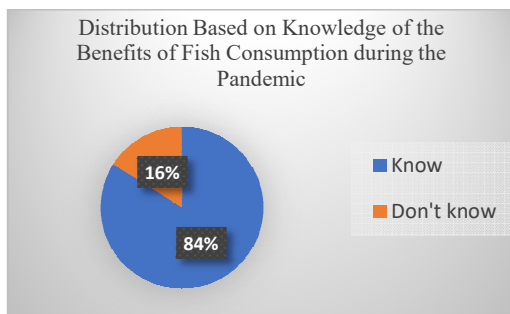


Fig. 8. Respondents' Frequency Distribution Based on Knowledge of the Benefits of Fish Consumption during the Pandemic

3.10 Respondents' Knowledge Regarding the Benefits of Fish Consumption During the Pandemic

The majority of respondents' knowledge of the benefits of fish consumption during a pandemic, as many as 84 respondents, knew about the benefits of fish consumption during a pandemic. Based on the results of the research, the average respondent knows the benefits of fish consumption, namely for body health, increasing body immunity or immunity, and preventing disease. The 60% of participants or respondents have heard or known about the benefits of fish, but there are still people who do not know the benefits of fish during a pandemic [12].

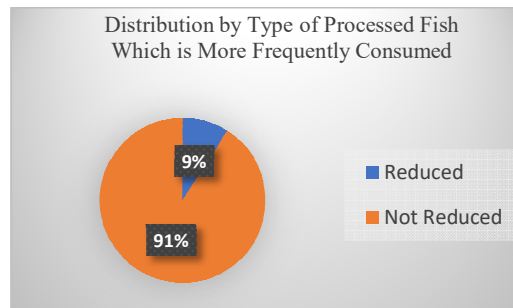


Fig 9. Respondents' frequency distribution by type of processed fish which is more frequently consumed

3.11 Respondents' Observations Regarding the Market for Fish Species obtained

The majority of respondents regarding observations of the market for fish species obtained, namely that the answer was not reduced, as many as 91 people or 91% of the total respondents and some respondents, namely as many as 9 people or 9% answered that it was reduced. The occurrence of fish products is reduced in the market because fishermen's catch is difficult to get to the market, Fishermen's catch is not absorbed by the market due to distribution and logistical constraints so that the selling price at the fishermen level falls [13].

3.12 Respondents' Observations Regarding the Increase in Fish Prices

The majority of respondents regarding observations of the increase in fish prices were not as many as 87 people. Fish prices have not

increased or even decreased, the Coronavirus outbreak has an impact on fisheries marketing, where fish prices have decreased by 50% [14].

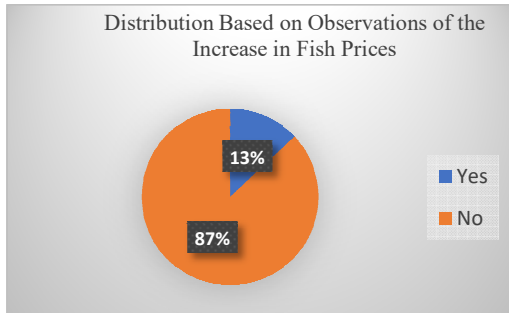


Fig. 10. Respondents' Frequency Distribution Based on Observations of the Increase in Fish Prices

3.13 Preference between Fresh Fish and Processed Fish Before and After the Covid-19 Pandemic

3.13.1 Feasibility test model

The results of the calculation of Hosmer and Lemeshow's Goodness of Fit Test before the pandemic show that the chi-square significance value is 0.439 (> 0.05), greater than the 0.05 significance level, this means that the model is acceptable because it fits the observation data and the regression model. feasible for use in further analysis.

The results of the calculation of Hosmer and Lemeshow's Goodness of Fit Test after the pandemic show that the chi-square significance value is 0.082 (> 0.05), greater than the 0.05 significance level, this means that the model is acceptable because it fits the observation data and the regression model. feasible for use in further analysis.

3.13.2 Likelihood ratio test

The results of the calculation of the Likelihood Ratio Test before the pandemic show a value of $79.966 > \text{Chi-square table} = 14.0671$, which means that with a 95% confidence level the independent variables simultaneously influence the independent variables.

The results of the calculation of the Likelihood Ratio Test after the pandemic show a value of $115.173 > \text{Chi-square table} = 14.0671$, which

means that with a 95% confidence level the independent variables have a simultaneous effect on the independent variables.

3.13.3 Coefficient of determination

Nagelkerke R Square in Regol District before the Covid-19 pandemic, which was 0.318 which stated that the ability of the independent variables to explain the dependent variable was 31.8% and the remaining 68.2% was explained by other variables outside the variables used in this model.

The Nagelkerke R Square value after the Covid-19 pandemic is 0.153 which states that the ability of the independent variables to explain the dependent variable is 15.3% and the remaining 84.7% is explained by other variables outside the variables used in this model. Variables that influence consumers to buy fresh fish, namely 86%, influenced by price, taste, fish quality, and consumer income [15].

3.13.4 Wald test

Based on the results of the Wald test before the pandemic, the age factor has a Wald test value of 4.459 and a significance value of 0.035 and the income factor has a Wald test value of 5.802 with a significance value of 0.016, which means that the The significance of age and income factors is smaller than the significance level (> 0.05) which proved that age and income influenced preferences between fresh and processed fish before the pandemic. The higher the age of the respondent, the higher the preference for fish consumption, as well as a person's income affects the level of consumption of that person, meaning that if the income is greater then the food menu will be slightly better than someone with a lower income [16].

Based on the results of the Wald test after the pandemic, the age factor has a Wald test value of 4,675 and a significance value of 0.031 and the education factor has a Wald test value of 4,464 with a significance value of 0.035, which means that the The significance value of the age and education factors is smaller than the significance level (> 0.05) which proved that age affects the preference between fresh fish and processed fish after the pandemic. Age is very influential in consuming food, the level of nutrition and quantity of food must be adjusted according to age because individual protein needs are different [16].

3.14 Preference between Fresh Fish and Sea Fresh Fish Before and After the Covid-19 Pandemic

3.14.1 Feasibility test model

The results of the calculation of Hosmer and Lemeshow's Goodness of Fit Test before the pandemic show that the chi-square significance value is 0.069 (> 0.05), greater than the 0.05 significance level, this means that the model is acceptable because it fits the observation data and the regression model. feasible for use in further analysis.

The results of the calculation of Hosmer and Lemeshow's Goodness of Fit Test after the pandemic show that the chi-square significance value is 0.887 (> 0.05), greater than the 0.05 significance level, this means that the model is acceptable because it fits the observation data and the regression model. feasible for use in further analysis.

3.14.2 Likelihood ratio test

The results of the calculation of the Likelihood Ratio Test before the pandemic show a value of 101.122 $>$ Chi-square table = 14.0671, which means that with a 95% confidence level the independent variables have a simultaneous effect on the independent variables.

The result of the calculation of the Likelihood Ratio Test after the pandemic shows a value of 89.627 $>$ Chi-square table = 14.0671, which means that with a 95% confidence level the independent variables simultaneously influence the independent variables.

3.14.3 Coefficient of determination

The Nagelkerke R Square value in Regol District before the Covid-19 pandemic is 0.185 which states that the ability of the independent variable to explain the dependent variable is 18.5% and the remaining 81.5% is explained by other variables outside the variables used in this model.

The Nagelkerke R Square value in Regol District after the Covid-19 pandemic is 0.157 which states that the ability of the independent variable to explain the dependent variable is 15.7% and the remaining 84.3% is explained by other variables outside the variables used in this model.

3.14.4 Wald test

Based on the results of the Wald test before the pandemic, the age factor has a Wald test value of 7,873 and a significance value of 0.005, which means that the significance value of the age factor is smaller than the significance level (> 0.05) which is evident that age affects the preference between fresh and fresh fish. the fresh sea before the pandemic.

Based on the results of the Wald test after the pandemic, the age factor has a Wald test value of 4.778 with a significance value of 0.029, which means that the significance value of the age factor is smaller than the significance level (> 0.05) which is evident that age affects the preference between fresh and fresh fish. fresh sea after the pandemic. The independent variables that affect the preferences between fresh fish and sea fresh fish after the pandemic, both before and after the pandemic, have not changed.

4. CONCLUSION

Based on the results of the study, it shows that the frequency of fish consumption in one week has changed, before the pandemic, most respondents (39%) consumed fish twice a week, while in the pandemic phase, most respondents (46%) consumed fish only once a week. Changes in the amount of fish consumption during the pandemic, namely 66% regular consumption, 21% decrease, and 13% increase. It is possible to say that the pandemic event has halved the consumption of fish in the considered area.

The product purchasing system, where to buy fish, the amount of fish consumed in one week, the types of fish that are often consumed, the types of fresh fish that are often consumed, and the types of processed fish that are often consumed, have not changed for the majority of respondents both before and after the pandemic, but for the number of respondents experiencing changes.

Understanding the benefits of fish from consumers, namely 93% of the benefits of fish and understanding of the benefits of fish consumption during a pandemic, 84% of consumers know the benefits of fish consumption during a pandemic.

COMPETING INTERESTS

Autors have declared that no competing interest exist.

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