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Socio-economic influences and government support programs on the survival decisions of small-scale coastal fishers during the COVID-19 pandemic and the new normal

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Abstract

Socio-economic conditions and government program policies are critical to the probability of fisher survival decisions during the COVID-19 pandemic and the New Normal. The data analysis technique is a logit model regression estimation. The results found that during the COVID-19 pandemic, the fishing infrastructure assistance program provided the most significant opportunity for the decision to survive as a fisherman. In contrast, the age of the fisherman and the number of family dependents provided the slightest opportunity. On the other hand, during the New Normal period, the fishing experience provides the most significant change for the fisher's decision, while the slightest chance is the fisher's age. This decision becomes his survival choice in working as a fisherman to fulfill the economic needs of his household. A sustainable mentoring program must continue to be implemented to overcome the uncertainty of fishermen's income.

Keywords: Survival decision, COVID-19 pandemic, New Normal, fishers

Introduction

The COVID-19 pandemic has spread worldwide, particularly in regions such as East Asia to Europe and North America, as a global fish producer and consumer (FAO, 2021) ^[15]. The implications of the pandemic have an impact on the disruption of the small-scale fisheries sector, fishing (Campbell *et al.*, 2021) ^[10], marketing, reduced prices (Sunny *et al.*, 2021) ^[57], processing, increasing health risks for fishers, and illegal fishing (Bennett *et al.*, 2020) ^[6]. The fishing community is vulnerable to the impact of the COVID-19 pandemic (Campbell *et al.*, 2021) ^[10]. They protect small-scale fisheries and consider their long-term sustainability (Lagares *et al.*, 2016) ^[28]. Surviving as a small-scale fisherman in coastal areas is a permanent choice in meeting the economic needs of his household. Fishermen's socioeconomic factors influence this decision (Bisack & Clay, 2020) ^[8], as well as the support of government programs, especially during the COVID-19 pandemic and the new normal. The spread of COVID-19 globally will make difficult decisions not only for fishermen and fish processors but also affect the economic conditions of fish sellers. As a result, it will also impact food insecurity (Bennett *et al.*, 2020) ^[6] and food security (Lau *et al.*, 2021) ^[29] worldwide.

Globally, the fisheries sector, especially small-scale fishermen, is the group most affected by the COVID-19 pandemic, influencing their survival decisions as fishermen. Social, economic, and cultural norms can influence fishermen's compliance or decisions (Bisack & Clay, 2020) ^[8] during the COVID-19 pandemic (Bennett *et al.*, 2020; FAO, 2020) ^[6, 14]. Likewise, the new normal period (Truchet *et al.*, 2021) ^[60] is for survival in coastal areas. During the new normal era, government policies regulate health protocols, primarily buying and selling land catch transactions. While at sea, of course, social distancing does not allow many members to operate in one boat or ship (FAO, 2020) ^[14]. The new normal raises significant questions about developing countries' coastal areas and fisheries management (Truchet *et al.*, 2021) ^[60]. The new normal is the latest way of life during the COVID-19 pandemic, where recovery tends to increase. Applying the new normal can be considered a form of preparedness based on

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epidemiological studies in various countries. The new normal is also a step to accelerate the handling of COVID-19 in the health, social and economic fields.

The Indonesian government's policy has designated Makassar City as a red zone status area because it has a mushrooming number of cases and deaths due to the COVID-19 pandemic. This incident is similar in other countries. This increase in cases will undoubtedly impact the political, economic, social, cultural, defense, and security aspects and the welfare of society globally, especially in Indonesia. The COVID-19 pandemic did not have an impact on reducing fishing trips. However, there are efforts to control the spread of the coronavirus by the government through health protocol regulations in the form of the Implementation of Emergency Community Activity Restrictions (ECAR) with Large-Scale Social Restrictions (LSSR). In implementing this rule, people must wear masks, regularly wash their hands with soap, avoid crowds, and reduce unnecessary mobility. In addition, vaccinations are also carried out to form immunity from coronavirus attacks. This control is carried out to avoid large gatherings, curfews, self-isolation, and partial or complete lockdowns (Untaru & Han, 2021) [62]. This regulation causes the interaction of fishermen to be minimal, such as buying and selling of catches in local, domestic, and international markets. Even though the catch has increased, the price of fish has continued to fall, so the fish are piled up and rotting in warehouses, and fish demand is declining due to the world community's lower purchasing power. Many markets remain unemployed due to social distancing or physical distancing.

The urgency or essential information conveyed in the research is that the survival conditions of small fishermen in coastal areas have become a choice of work in meeting their basic needs, especially during the COVID-19 pandemic and the new normal. The socio-economic conditions of small-scale fishermen can be recommended by all interested parties, such as the community, industry, and government (Ünal & Franquesa, 2010) [60] as well as government assistance programs during a pandemic (Bhowmik *et al.*, 2021) [7] as a link and livelihood (FAO, 2020) [14]. Small-scale fishermen need special attention. Fulfilling their household's economic needs (Rahim *et al.*, 2022; Ali *et al.*, 2023) [22, 4] is not only affected by the impact of COVID-19 but also by the fishing season and global climate conditions. Small-scale fishermen also produce fishery commodities supporting the global food security production system (Limuwa *et al.*, 2018) [32] or food security worldwide (Torres *et al.*, 2022; Hastuti *et al.*, 2022) [59, 22]. Small-scale fisheries are increasingly becoming part of domestic and international market chains, which depend on marine fisheries for their livelihoods (Steenbergen *et al.*, 2019) [56]. Small-scale fisheries are closely related to employment and food supply (Marín-Monroy & Ojeda-Ruiz de la Peña, 2016) [37].

Research on fishermen's decision-making has been carried out in many other countries. Fishermen's decision to choose fishing locations in Hawaii, the United States of America, uses the random location utility model (Curtis & McConnell, 2004) [12]. Fishing decisions with flexibility in Denmark (Christensen & Raakjær, 2006) [11]. The influence of environmental, cultural, and economic factors on fish processing business decisions on the southeastern coast of Brazil (Lopes & Begossi, 2011) [33]. Decisions about fisherman income diversification behavior on the Kenya Lake Viktoria Coast (Olale & Henson, 2012) [44]. Fishermen's decision-making in using fishing technology with a mental

model approach (Hamzah *et al.*, 2014) [20]. Fishermen's decision model in choosing reef fishing locations in the Florida sea, United States (Saul & Die, 2016) [55]. A multi-criteria decision approach to constraints and opportunities in small-scale marine fisheries in Kenya using the Analytical Hierarchical Process method (Kimani *et al.*, 2020) [27]. The existence of marine mammal protection regulations in the Northeastern United States impacts fishermen's decisions to choose them (Bisack & Clay, 2020) [8].

However, research on the factors influencing the survival decisions of small-scale fishermen during the COVID-19 pandemic and the new normal has yet to be conducted to the best of the researchers' knowledge. Logit model estimation with a dummy variable estimation technique is needed to understand this research. Therefore, a variable socio-economic condition of fishermen is needed (Income from catches, age of fisherman, fisherman's formal education, fishing experience, number of family dependents) and government assistance programs (Direct cash assistance and infrastructure for fishing). The results of this study will provide knowledge and guidelines for fisheries management policymakers to maintain the survival of small fishermen in coastal areas as a basis for future improvements.

Materials and Methods

The primary method of this research is quantitative with a survey approach. The sample of the research area is the western coastal area of Makassar City, Indonesia. The research took place from November 2020 - February 2021. The sample respondents were 79 small-scale fishing households. Cross-section data is used based on the time dimension. The data sources are primary data obtained directly from fishermen and secondary data obtained from the Maritime Affairs and Fisheries Service and the Central Bureau of Statistics of South Sulawesi Province. The data collection method was done through direct observation and interviews with fishermen using a questionnaire.

The analysis of small-scale fishing households' survival decisions uses the response to the qualitative dependent variable or the logit model (Borooah, 2002) [9]. The model is based on a logistic distribution, which in most cases, describes the dichotomous dependent variable model. The hypothesis of this research objective is to analyse the influence of socio-economics and government programs on fishermen's survival decisions during the COVID-19 Pandemic and New Normal with logistic regression model analysis using the MLE method (Pampel, 2000) and multiple regression analysis as follows:

$$P_i = F(Z_i) = (\beta_0 + \beta_0 X_i) = \frac{1}{1 + e^{-Z_i}} = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_i)}} \quad (1)$$

Where, e : natural logarithm with a value of 2.718. P_i : probability with a value between 0 and 1. Z : lies between $-\infty$ and $+\infty$. Equation (1) can be manipulated by multiplying $1 + e^{-Z_i}$ on both sides, giving the following equation: The equation above can be manipulated by multiplying $1 + e^{-Z_i}$ on both sides, giving the following equation:

$$(1 + e^{-Z_i})P_i = 1 \quad (2)$$

From the above equation will result in the following equation:

$$\frac{e^{-Z_i P_i}}{(1-P_i)/P_i} \tag{3}$$

Equation (3) can be transformed into a natural logarithmic model to produce equation (4) as follows:

$$Z_i = \text{Ln} \left(\frac{P_i}{1-P_i} \right) \tag{4}$$

If $e^{-Z_i} = P_i$ then equation (4) can be written as

$$Z_i = \text{Ln} \left(\frac{P_i}{1-P_i} \right) = \beta_0 + \beta_i X_i \tag{5}$$

Referring to equation (5), the decision response for the survival of small-scale fishermen using a multiple regression equation estimation model with an estimated logit model (Gujarati & Porter, 2009) as follows:

$$FSDPCv19 = \left(\frac{P_i}{1-P_i} \right) = \beta_0 + \beta_1 \pi CB + \beta_2 FAG + \beta_3 FFED + \beta_4 FEXP + \beta_5 QDF + \delta_1 DmCDA + \delta_2 DmIFA + \mu_1 \tag{6}$$

$$FSDNN = \left(\frac{P_i}{1-P_i} \right) = \beta_6 + \beta_7 \pi CB + \beta_8 FAG + \beta_9 FFED + \beta_{10} FEXP + \beta_{11} QDF + \delta_3 DmCDA + \delta_4 DmIFA + \mu_2 \tag{7}$$

Where, **FSDPCv19** is fisherman survival decisions when Pandemic COVID-19 (1, to choose to stay as a fisherman; 0, for others). **FSDNN** is fisherman survival decisions when new normal (1, to choose to stay as a fisherman; 0, for others). β_0 and β_6 is intercept. β_1, \dots, β_5 and $\beta_7, \dots, \beta_{11}$ is

regression coefficient of the independent variable. $\delta_1, \dots, \delta_2$, is coefficient of a dummy variable. P_i is probabilities with values between 0 and 1. πCB is capture business income (IDR). **FAG** is fishermen age (year). **FFED**: fishermen formal education (year). **FEXP** is fishing experience (people). **QDF** is dependents of the family (people). Dummy of cash direct assistance, **DmCDA** is 1, direct cash assistance; 0, for others. Dummy infrastructure and facilities for arrest, **DmIFA** is 1, infrastructure and facilities for arrest; 0, for the other. μ_1 , dan μ_2 is error term

Results and Discussion

Socio-economic factors of small-scale fisheries during the COVID-19 pandemic (Bennett *et al.*, 2020; FAO, 2020) ^[6, 14] affect fishermen's decisions (Bisack & Clay, 2020) ^[8]. Socio-economic conditions factors in this study are fishing business income, age of fishermen, formal education, and family dependents (Table 1). The estimation analysis of the logit model regression was applied to this study, namely the factors influencing small-scale fishermen's survival decisions during the COVID-19 pandemic and the new normal (Table 2 and Table 3). The measurement of goodness of fit for the survival decision function of fishers with *Nagelkerke R²* shows the contribution of all independent variables (fishing income, age, formal education, fishing experience, direct cash assistance, infrastructure assistance) to variations in fisherman's survival decision opportunities. During the COVID-19 pandemic, it was 36.7% (Table 2), and the new normal was 19.4% (Table 3). The *Nagelkerke R²* value is equivalent to the adjusted *R²* value in the ordinary least square (OLS) method.

Table 1: Socio-Economic Conditions of Small-Scale Fishers

Socio-economic	Case	Description		
		Revenue (IDR)	Cost (IDR)	Income (IDR)
Catch business income (IDR)	Before the COVID-19 Pandemic	665,903.48	77,348.10	588,555.38
	During the COVID-19 Pandemic	345,776.90	81,259.49	264,517.41
	New Normal	507,928.50	84,525.31	423,403.48
Fishers age (year)			Frequency (People)	Percentage (%)
	≥ 20 - 29		16	20.25
	30 - 39		23	29.11
	40 - 49		25	31.65
	50 - 59		13	16.46
Fishers education (year)	Did not finish elementary school		19	24.06
	Finished elementary school		39	49.37
	Graduated from junior high school		13	16.45
	High school graduate		8	10.12
Experience at Sea (year)	5 - 10		27	34.18
	11 - 15		16	20.26
	16 - 20		15	18.99
	21 - 25		9	11.39
	26 - 30		12	15.18
Number of family dependents (people)	1 - 2		28	35.45
	3 - 4		40	50.63
	5 - 6		8	10.13
	≥ 7		3	3.79

Note: USD 1 (IDR 15, 000)

Simultaneous hypothesis testing using *-2 Log Likelihood* compared to *Chi-square* for the survival decision function of fishermen is 56,361 during the pandemic and 69,241 during the new normal respectively. The results show that simultaneously all independent variables influence

fishermen's survival decisions. Regarding the OLS method, the *Nagelkerke R²* value is equivalent to the F-test value compared to the F-table. It differs from the partial influence of the independent variables using the *Wald-test* on each of the fishermen's survival decision functions. The *Wald-test*

value is the same as the t-test value in the OLS method. The decision to catch also uses the value of $\text{Exp}(\beta_i)$ or the odds ratio to see if the probability or opportunity is getting bigger/smaller to decide to last longer as a fisherman during a pandemic and the new normal. If the value of $\text{Exp}(\beta_i)$ is greater than 1, then the chance of survival as a fisherman is greater. Conversely, if the value of $\text{Exp}(\beta_i)$ is less than 1, then the chance is smaller.

During the COVID-19 pandemic, the chances of survival are influenced by the age of the fishermen, the number of family dependents, and the fishing infrastructure assistance program

with $\text{Exp}(\beta_i)$ values of 0.867, 0.608, and 6.583, respectively. The influence of each variable is at 1% and 5% error rates or 99% and 95% confidence levels. The infrastructure assistance program for fishing is the most influential variable on the chances of surviving longer as a fisherman because the $\text{Exp}(\beta_i)$ value is 6.583 or greater than 1 (Table 2). As with the new normal period, the chances of survival are influenced by fishermen's age and fishing experience with $\text{Exp}(\beta_i)$ values of 0.899 and 1.138, respectively. The influence of each variable at a 10% error rate or 90% confidence level.

Table 2: Analysis of factors influencing small-scale fishermen's survival decisions during the COVID-19 pandemic

Independent Variable	E.S	Coef. (β_i)	Std. Error	Wald-test	Sig.	Exp(β_i)
Fisherman income	+	0.004	0.003	2.174	0.140	1.004
Fisherman age	+	-0.142	0.076	3.543	0.060**	0.867
Fisherman formal education	+	-0.115	0.120	0.930	0.335	0.891
Experience at sea	+	0.077	0.076	1.047	0.306	1.081
Number of family dependents	+	-0.497	0.182	7.485	0.006***	0.608
Dummy of direct cash assistance	+	-1.213	1.156	1.101	0.294	0.297
Dummy for infrastructure assistance	+	1.884	0.950	3.932	0.047**	6.583
Intercept				7.190		
Nagelkerke R ²				0.367		
-2 Log Likelihood				56.361		

*** is a level error significance of 1% (0.01), or confidence level 99%. ** is a level error significance of 5% (0.05) or confidence level 95%; ns is not significant; and ES is an expectation sign. If the value of $\text{Exp}(\beta_i) > 1$, then the probability is getting bigger, otherwise if the value of $\text{Exp}(\beta_i) < 1$, then the probability is getting smaller

Table 3: Analysis of factors influencing the response of small-scale fisherman survival decisions during the New Normal period

Independent Variable	E.S	Coef. (β_i)	Std. Error	Wald-test	Sig.	Exp(β_i)
Fisherman income	+	-0.002	0.005	0.231	0.631	0.998
Fisherman age	+	-0.107	0.064	2.819	0.093*	0.899
Fisherman formal education	+	-0.019	0.109	0.030	0.862	0.981
Experience at sea	+	0.129	0.071	3.273	0.070*	1.138
Number of family dependents	+	-0.137	0.148	0.866	0.352	0.872
Dummy of direct cash assistance	+	-1.772	1.100	2.596	0.107	0.170
Dummy for infrastructure assistance	+	-0.984	0.866	1.291	0.256	0.374
Intercept				7.423		
Nagelkerke R ²				0.194		
-2 Log Likelihood				69.241		

* is a level error significance of 1% (0.10), or confidence level 90%.; ns is not significant; and ES is an expectation sign. If the value of $\text{Exp}(\beta_i) > 1$, then the probability is getting bigger, otherwise if the value of $\text{Exp}(\beta_i) < 1$, then the probability is getting smaller

Impact of the COVID-19 Pandemic and the New Normal

The impact of the COVID-19 pandemic has become a global threat to fishing communities in coastal areas, significantly changing behavior in making survival decisions. The economic behavior of small-scale fisherman households is a change in fishermen's decision-making behavior towards work or business productivity (Output) through changes in attitudes or economic action. Fishermen's behavior in catching fish in the fishing zone (Mukherjee, 2021) [41] generates income from their fishing efforts (Adili & Antonia, 2017) [1] as a contribution to household income. Globally, fisherman behavior is widely considered essential for fisheries management (Li *et al.*, 2021) [30] as fisheries economies develop worldwide (Harper *et al.*, 2013) [21]. Fishing households are closely related to household economic behavior and decision-making (Eriksson *et al.*, 2017) [13]. Behavior can range from catch production to household consumption expenditure during the COVID-19 pandemic and the new normal.

Changes in fishermen's survival decisions during the COVID-19 pandemic are influenced by socio-economic conditions (Bennett *et al.*, 2020) [6] such as fishermen's income (Olale &

Henson, 2012; Purcell *et al.*, 2018) [44, 51], the age of fishermen (Li *et al.*, 2021) [30], fishermen's formal education (Bhowmik *et al.*, 2021) [7], and fishing experience (Macusi *et al.*, 2021; Njock & Westlund, 2010) [36, 42]. In the new normal period, fishing activities usually run from the supply side, local marketing system, global trade, and demand side. The new normal is the latest lifestyle during the COVID-19 pandemic in various countries to accelerate measures to deal with the coronavirus in the health sector (Truchet *et al.*, 2021) [60] by reactivating the world economy.

The existence of government assistance programs such as direct cash assistance, infrastructure, and fishing facilities also influence decision-making for small fishermen's survival during the COVID-19 pandemic (Bhowmik *et al.*, 2021) [7]. It is different from the new normal. Fishermen's income has started to increase, although it is not like it was before the pandemic. The government's efforts to deal with COVID-19 were also carried out while implementing the new normal for fishermen. Implementation of health protocols includes checking body temperature, wearing masks, reducing mobility, health checks, and administering vaccines. The coronavirus disease (COVID-19) has posed significant

challenges to human well-being and survival, especially among groups of people (Hossain *et al.*, 2022) ^[24] who depend on marine resources. The COVID-19 pandemic has created a global health and economic crisis (Ferguson *et al.*, 2022) ^[16] for small-scale coastal fishers (Hoque *et al.*, 2021) ^[23].

The influence of Socio-Economic conditions on Fishermen's Survival Decisions

Fishing income as a socio-economic factor does not affect the chances of fishermen's survival decisions during the COVID-19 pandemic (Table 2) and the new normal (Table 3). This result means that changes (up/down) in fishing income do not provide opportunities to continue to survive as fishermen. During the COVID-19 outbreak, the income of small-scale fishers decreased due to local marketing systems and global trade disruptions. Although the supply side (Catch) increased, selling took work. Fishermen only caught a few fish because purchasing power in various industries and communities decreased, resulting in an accumulation of catches. Implementing social or physical distancing has resulted in many informal sector workers being laid off and "Staying at Home," thus reducing the demand for fresh capture fishery products. People prefer to cook at home with processed food as their primary choice. The disruption of the capture fisheries sector market for small-scale fishers is due to the impact of the COVID-19 pandemic (Bennett *et al.*, 2020) ^[6], especially the price fluctuations of the marketing system from local to global, making it challenging to maintain a stable income as a livelihood for fishers over time (Outeiro *et al.*, 2018) ^[46].

Unlike the new normal period, fishing activities usually run from the supply side, local marketing system, global trade, and demand side. Fishermen's income began to increase, although not like before the pandemic. Government efforts to contain the rate of COVID-19 were made during the implementation of the new normal. In terms of health, health protocol rules are implemented, such as spraying disinfectants (port environment, fish auction, and coastal residents' homes), checking body temperature, providing masks, providing hand sanitizers, making hand washing stations, and providing supplements. From the social side, shareholder cooperation provides essential food assistance through fish rice with the slogan "Eat Fish Against Corona" to encourage the community, especially small-scale fishermen. From the business side, they assist in providing fishing, insurance for fishermen, and facilities for accelerating letters and administration of capture fisheries businesses such as license processing.

The fishing income of small-scale fishers fluctuates. Before the pandemic, fishermen's income was IDR 588 thousand, and during the COVID-19 pandemic, it fell to IDR 264 thousand, and the new normal rose to IDR 423 thousand (Table 1). Compared to the income of large-scale fishers, before the COVID-19 pandemic, their income (Small-scale fishers) was much smaller than that of large-scale fishers, which was about 2.2 times in high-income countries and nine times in low-income countries (Teh *et al.*, 2020) ^[58]. Fluctuations in income occurred due to operational costs that continued to increase before the pandemic IDR 77 thousand to the pandemic IDR 81 thousand and the new normal of IDR 84 thousand (Table 1). Understanding fishing revenues and costs is fundamental in managing fisheries to improve efficiency (Purcell *et al.*, 2018) ^[51]. Operational costs affect fishers' income (Al-Jabri *et al.*, 2013) ^[2].

The increase in operational costs occurred due to the price of engine fuel, the increase in basic household needs due to the pandemic, and other additional needs (The purchase of masks, disinfectants, vitamins, and medicines to maintain endurance to avoid various diseases, especially the coronavirus). On average, the costs used by fishermen are not entirely their own. The costs used are obtained from loan assistance or debt from traders. The traders themselves buy all the catch. Fishers pay a 10% loan every time they sell their catch as a form of a profit-sharing agreement. The dependence of some small-scale fishers on lenders and marketers for financial assistance has led to debt (America *et al.*, 2020) ^[5]. There is a significant difference in net income between small-scale fishers and fish traders, where fishers' net income is smaller than that of fish traders (Jueseah *et al.*, 2020) ^[25]. In addition, the study area's pandemic has caused the fish price to drop by 50%, which is not proportional to the energy expended at sea. Hence, the fuel price is significantly higher when the catch decreases. The impact of the pandemic has disrupted fishermen's economic lives, and fishing income has decreased or fluctuated due to social distancing or physical distancing, especially during buying and selling transactions on land. Often fishermen no longer go to sea regularly and do not even go to sea once because of these regulations.

The age of fishermen affects the chances of survival decisions during the pandemic (Table 2) and the new normal (Table 3). With an $\text{Exp}(\beta_i)$ value smaller than 1, there is a slight chance of survival as a fisherman. Increasing age will decrease their productivity. However, fishermen in the study area still catch fish to fulfill their household needs during the pandemic and new normal. The average age of small-scale fishers in the study area is productive (20 - 50 years), and less productive > 50 years. The average age is 39, ranging from 20 - 58 years. Fishermen's age affects attitudes and perceptions of fisheries management (Liao *et al.*, 2019) ^[31] and differences in adaptability to changes such as fishing knowledge (Lau *et al.*, 2021) ^[29]. Globally, the COVID-19 pandemic has made everyone fear the coronavirus. They fear meeting in the workplace, especially those aged 50 - 65. In Taiwan, fishermen aged 40 are the productive age to get a bigger catch (Lu *et al.*, 2020) ^[35]. However, in the West Philippine Sea region of the Philippines, younger fishers fish more often than older ones (Muallil *et al.*, 2013) ^[40]. This is different in Kenya. Old or young fishers may fish in different locations as an alternative livelihood (Lu *et al.*, 2020) ^[35].

The COVID-19 pandemic is undoubtedly very vulnerable for elderly fishermen, but if fishermen do not carry out fishing activities, it will impact the life and welfare of their households. Fishermen still regularly catch fish. Fishermen in the research area are not afraid of the virus, but government regulations in the form of health protocols for the community to control the pandemic. The distribution of fishery products also experiences obstacles at the border due to the implementation of Large-Scale Social Restrictions (LSSR) with social and physical distancing. In contrast to small-scale fishers in Bangladesh, fishing time is reduced, and the COVID-19 pandemic causes fish distribution problems due to movement restrictions imposed during lockdown (Hoque *et al.*, 2021) ^[23]. For this reason, governments must be based globally on health protection and food security (Sunny *et al.*, 2021) ^[57]. The COVID-19 outbreak will impact food and nutrition welfare as a holistic indicator of the adequacy of quantity and quality, in terms of diversity, nutritional content, and safety, to meet the world's food needs (Lau *et al.*, 2021)

[29].

The formal education of fishermen does not affect the chances of survival decisions of fishermen, both during the COVID-19 pandemic and the new normal (Table 2). Empirically, the formal education level of 39 fishermen only finished elementary school, and 19 fishermen did not finish elementary school. In contrast, most fishermen in Bangladesh lack formal education (Bhowmik *et al.*, 2021) [7]. Despite their low level of formal education, fishermen's motivation to survive as fishermen is very high based on their experience. From this experience, they can quickly learn information on social media (Cell phones and television) that has informed them about the coronavirus that has killed many people. They continue to live as fishermen before the pandemic, during it, and in the new normal era. Although fluctuations in production and income still affect them.

Fishermen in the study area do not want their children to follow education, so they work hard to improve the household economy. They continue to be motivated to send their children to school because they know the importance of education in human life, even though their education level is up to senior high school. Education is essential to socioeconomic development, including poverty alleviation and increased resilience (Bhowmik *et al.*, 2021) [7]. In addition, education can reinforce existing stereotypes, such as simplifying complex matters and assisting in quick decision-making (Phiri *et al.*, 2020) [50], even as a critical factor in fishermen's behavioral decisions to diversify their desired income (Olale & Henson, 2012) [44].

Fishing experience does not affect the probability of survival decisions during the COVID-19 pandemic (Table 2). During the pandemic, fishermen continue to fish even though government regulations, such as COVID-19-related restrictions for public safety, must be implemented. The economic needs of their households must be met. Unlike during the new normal, the fishing experience dramatically affects the chances of fishermen's survival decisions (Table 3). The $\text{Exp}(\beta_i)$ value is greater than one and has a significant effect (Table 3), thus providing an excellent opportunity to survive as a fisherman. Since childhood, fishermen often go to the sea with their parents to catch fish during the fishing season as the primary economic need of their households. The average fishing experience of small-scale fishers is 16 years. Fishermen can use their fishing experience as a decision to survive as fishermen, both during the pandemic and the new normal now. The success of fishers in catching fish at sea is primarily determined by their experience in fishing (Macusi *et al.*, 2021) [36]. This experience can secure their livelihoods as a context for resource management and poverty alleviation (Njock & Westlund, 2010) [42]. In addition, the experience will provide information on biodiversity and food webs in the fishing environment (Rosa *et al.*, 2014) [54] and different influences in shaping patterns, such as fishing for large and small fish species (Alexander *et al.*, 2020) [3].

The number of family dependents affects the chances of fishermen's survival decisions during the COVID-19 pandemic (Table 2). However, it does not affect the chance of a decision in the new normal period (Table 3). There is a slight chance to survive as a fisherman during the pandemic, as seen from the $\text{Exp}(\beta_i)$ value smaller than 1 (Table 2). Empirically, the average number of family members covered is three people, with the highest number of 7 people (Table 1). The fishermen decide to work hard to get the maximum catch. The income from the catch is used for the needs of family

members (His wife and children) and repaying debts. The large number of family members in a fisher household provides a strong motivation to continue working as a fisherman. In the short and long term, there is no job besides fishing. Fishermen have been heavily indebted to traders (Fish buyers) as lenders during the fishing season, especially the lean season. During the COVID-19 pandemic and the new normal, fishermen in the study area have never been afraid to catch fish to meet the needs of their families. According to (Hoque *et al.*, 2021) [23], fishermen, as the family's primary breadwinners, are relied upon to provide food security for their families. In contrast to the findings of (Fiorella *et al.*, 2021) [17], in Kenya, most fishermen spend less time catching because the fear of being infected with COVID-19 is very high.

The Effect of Government Assistance Programs on Fishermen's Survival Decisions

The policy of the Direct Cash Assistance (DCA) Program from the central government has had no significant effect on decision opportunities during the COVID-19 pandemic (Table 2) and the new normal (Table 3). The results of interviews with small-scale fishers show that surviving as a fisherman is the right decision even though they do not receive direct assistance. There is no more work on the land, so it is necessary to do it at sea. Before the COVID-19 pandemic, fisheries business income earned an average of IDR 588 thousand per trip. During the pandemic, it dropped to IDR 264 thousand per trip. Buyers decreased because the selling price of fish fell 50% from the original price throughout Indonesia due to decreased purchasing power, and people were also afraid to go out. Government assistance programs are significant to the economy of fisher households in coastal areas. The new normal increases income by IDR 423 thousand per trip (Table 1). However, it has not yet had an impact on household welfare.

During the pandemic, the government has assisted in handling COVID-19 through the DCA program amounting to IDR 1.8 million. Assistance is provided for three months, IDR 600 thousand per month, in 2 stages. Phase I for three months (April, May, and June) and Phase II for three months (July, August, and September) for low-income families (Permenkeu No. 40, 2020) [49]. This assistance aims to ease the burden of living costs for underprivileged families, including small-scale fishing families, during the COVID-19 pandemic. The requirements for DCA recipients are families who have never received the Family Hope Program (PKH), Basic Food Card, Non-Cash Food Assistance (NCFA), and Pre-Employment Card. There needs to be more than this assistance to fulfill the economic needs of coastal fisher households. Fishermen must try to find additional income for their families (Rahim & Hastuti, 2023) [53]. However, there are no other jobs besides fishing, so his choice remains to stay as a fisherman. In addition, the government has also established a COVID-19 Public Health Emergency (Keppres No. 11, 2020) [26] to suppress the spread of the coronavirus from becoming more widespread. This regulation also covers school activities, work activities, religious activities, activities in public places or facilities, transportation capital restrictions, and other activity restrictions called the Large-Scale Social Restriction Guidelines (Permenkes No. 9, 2020) [48].

The government's requirements to receive the assistance program meant that many fishing households in the study area could not receive it. This is because they are not emotionally

close to the relevant parties, which makes it appear less transparent. In addition, they do not have cards or coupons to redeem the aid packages. Some are lazy to take the aid package because they need more confidence to get it based on their experience. In contrast to the assistance programs provided in Bangladesh, such as lack of transparency and accountability, exclusion and harassment of beneficiaries, distribution delays, and coordination gaps between participating agencies (Bhowmik *et al.*, 2021) ^[7].

Transparent and inclusive involvement of stakeholders (Central government) (Morzaria-Luna *et al.*, 2020) ^[39] around the world can help the decision-making process for the survival of small-scale fishers in coastal areas, especially during the COVID-19 pandemic. Government assistance programs during the pandemic are carried out, from fishing activities to marketing catches, so that fishers do not need to go into debt again and their purchasing power is maintained. The dependence of some small-scale fishers on lenders and marketers for financial assistance has created a cycle of debt that often comes from social grants used for other purposes (America *et al.*, 2020) ^[5]. In some countries, the pandemic has had a significant economic impact on small-scale fishers who have stopped fishing and intermediaries who buy their products, with many markets closed for several months. Relief programs in some countries have contributed significantly to poverty alleviation over the past few decades (Bhowmik *et al.*, 2021) ^[7]. The coronavirus is also predicted to damage global food systems, including fisheries value chains, due to restrictions on human movement in many countries (Okyere *et al.*, 2020) ^[43].

Other government assistance programs (Infrastructure and fishing facilities) significantly influence the likelihood of survival decisions as fishermen during the COVID-19 pandemic compared to when there is no pandemic. This program includes fiber boats, outboard engines with power knots, gill nets, and fishing rods. Exp (β) is greater than 1 (Table 2). The assistance in the form of additional outboard motor boats with fishing gear can increase the production of catches and impact the household economy (household income and consumption expenditure). During the pandemic, the government continues to socialize the application of social or physical distancing so that fishermen are very limited in distributing their catches to other areas.

The government's significant support of sustainable infrastructure programs will reduce poverty and improve food security in the fisheries sector (McManus *et al.*, 2019) ^[38]. Poverty in the small-scale fisheries sector is a widespread problem because it affects a large population and is a complex problem that is difficult to define, explain and solve (Onyango & Jentoft, 2010) ^[45]. The existence of policy programs in the fisheries sector impacts income as an essential driver of fishermen's behavior in the area where fishermen are located (Hadjimichael *et al.*, 2013) ^[19], thus influencing fishermen's decisions, especially during the COVID-19 pandemic. The assistance programs in this study are the Direct Cash Assistance (DCA) program and the fishing infrastructure and facilities program. Globally, the government must immediately safeguard the impact of COVID-19 on fishermen's economic conditions so that they do not deteriorate by providing protection and business certainty guarantees, such as protection or empowerment funds. In addition, export demand will also be disrupted as several countries still depend on fish supplies from Indonesia.

Unlike during the new normal, fishing infrastructure and

facilities do not affect the chances of survival decisions. Fishermen have used fishing infrastructure and facilities to increase their catch. Empirical facts in the field found fishermen can go to the sea to catch fish. However, buying and selling transactions in markets, fish auctions, and ports still follow government health protocols, such as wearing masks and avoiding crowds. Vaccinations have been given from mid-2021 to early 2023. However, the COVID-19 pandemic still exists and has not ended.

The resilience of fishing communities plays a vital role during emergency response times, especially in the absence of outside assistance, with resilience capacities such as a sense of community, local knowledge, social capital, organization, cooperation, and trust contributing (Lopez-Ercilla *et al.*, 2021) ^[34]. The survival decisions of small-scale coastal fishers determine the economic sustainability of their households both during the COVID-19 pandemic and the new normal. Fishers' decision-making can bring opportunities to adapt and implement local solutions to prepare for future shocks (Lopez-Ercilla *et al.*, 2021) ^[34].

Conclusion

Socio-economic conditions and government assistance program policies have provided opportunities for survival decisions as small-scale fishers in coastal areas during the COVID-19 outbreak and the new normal period. The fishing infrastructure assistance program provides the most significant opportunity for the decision to survive as a fisherman. In contrast, the age of the fisherman and the number of family dependents provide the slightest opportunity. In the new normal period, the fishing experience provides the most significant opportunity for fishermen's decisions, while the slightest opportunity is at the age of fishermen. This decision becomes his survival choice in working as a fisherman to fulfill the economic needs of his household.

Globally, the sustainability of government assistance programs for small-scale fishers can continue to be realized through social safety nets (infrastructure and facilities, working capital, cash, and insurance) to overcome income uncertainty, especially during the COVID-19 pandemic and new normal. This program positively impacts their survival as small-scale fishers without having to go into debt again to capital owners to maintain their purchasing power. Health protocols are still carried out by implementing social or physical distancing because, until now, cases of coronavirus infection still exist. Even though the community has been vaccinated, COVID-19 information must always be conveyed. For this reason, the government or stockholders can facilitate by expanding access or information networks for fishery products globally by digitizing fisheries in the era of information technology and increasingly widespread globalization.

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