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Mathematical Model of the Central Lombok Regency People's Interest towards the COVID-19 Vaccination

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ABSTRACT

The COVID-19 vaccination program as an effort to prevent COVID-19 infection is still less attractive to the public in some areas in Indonesia, one of which is Central Lombok Regency. This is indicated by data on the number of complete vaccine recipients who still have not reached the threshold value for the formation of herd immunity. The factors that influence people's interest in COVID-19 vaccination can be analyzed using a mathematical model. This study aims to obtain a mathematical model of the interest of the people of Central Lombok Regency towards COVID-19 vaccination and to find out what factors most influence the interest of the people of Central Lombok Regency towards COVID-19 vaccination. The method used in this research is quantitative descriptive method. The data collection technique used a questionnaire that was given randomly to 332 respondents, namely the people of Central Lombok Regency in the age range of 12 to 70 years. Data analysis was based on multiple linear regression analysis with classical assumption tests, namely normality, multicollinearity, and heteroscedasticity tests. The results of the study obtained a mathematical model of the interest of the people of Central Lombok Regency towards COVID-19 vaccination. Variable of trust in the vaccine effectiveness and trust in the government are the factors that influenced the interest of the people of Central Lombok Regency towards COVID-19 vaccination.

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A. INTRODUCTION

The outbreak of coronavirus disease 2019 (COVID-19) which was officially announced as a pandemic by WHO on March 11, 2020 has affected human welfare globally, including in Asian-Oceanian countries such as Indonesia (Chhetri et al., 2020). Several guidelines have been put forward to prevent transmission of the virus worldwide (Yasir et al., 2020). The Indonesian government has made various efforts to prevent the spread of COVID-19, one of them is by promoting a massive COVID-19 vaccination program.

The COVID-19 vaccination program continues to be carried out in various regions of the world, including in Indonesia. This vaccination aims to reduce the transmission of COVID-19, reduce morbidity and mortality due to COVID-19, achieve herd immunity and protect the community from the COVID-19 disease in order to remain socially and economically productive (Lasmita et al., 2021), (Murbiah & Wahyudi, 2021). Several vaccines such as Pfizer, BioNTech, and Moderna are reported to have good efficacy (Patel et al., 2022), (Olliaro et al., 2021). However, hesitancy about these vaccines does exist among the public. Such this

hesitancy can reduce vaccination coverage, inhibit the formation of herd immunity and increase the transmission of COVID-19 (Yufika et al., 2020). Herd immunity will be formed only if vaccination coverage is high and evenly distributed throughout region (Or Caspi, Michael J. Smart, 2020).

Data from the Ministry of Health of the Republic of Indonesia as of January 6, 2022, shown that the number of recipients of the complete COVID-19 vaccine (first and second doses) in Central Lombok Regency is still at 60.95%. This number has not reached the minimum value for the formation of herd immunity, which is 67% (Randolph & Barreiro, 2020). According to (Kadkhoda, 2021), for a high level of security this figure must reach 84% to 90%. This gives an indication of the lack of interest in the people of Central Lombok Regency to be vaccinated against COVID-19. Therefore, it is important to investigate what factors influence the public's interest in the COVID-19 vaccination and how much influence it has.

Many factors could affect the interest of public to get COVID-19 vaccination. The study have assessed the role of perceived risk, efficacy of vaccine, amount of information about vaccine, and types of occupation on acceptance of vaccination (Harapan et al., 2016), (Harapan et al., 2020), (Lazarus et al., 2021). In the research that has been conducted by (Irfan et al., 2021), attitude factors, perceptions about the risk of the COVID-19 pandemic, and the perceived benefits of the vaccine have a positive effect on people's intentions to get the COVID-19 vaccine. In another study, the factors that influence a person's willingness to accept pandemic prevention efforts are group beliefs, self-efficacy, perceived risk, knowledge about the pandemic (Ahmad et al., 2021).

The results of several previous research indicate that public interest or acceptance for COVID-19 vaccination in several regions in Indonesia is still lacking. Sutriyawan & Hidayatullah (2021) in their research explained that most people (54.1%) did not want to be vaccinated. The public's willingness to be vaccinated against COVID-19 is influenced by public knowledge, attitudes, and perceptions. In another study, Olivina (2021) found several factors that caused a lack of interest in the Indonesian people to vaccinate against COVID-19, including the limited information received regarding the types of vaccines, the number of vaccines available and the safety of the vaccine itself.

In addition, research on the investigation of factors that influence the acceptance of COVID-19 vaccination using a mathematical model has been carried out by (Faturohman et al., 2021). In his research, the Technology Acceptance Model (TAM) was used to determine the factors that influence the acceptance of COVID-19 vaccination in Indonesia. The results showed that a high perceived benefit significantly increased the acceptance of the COVID-19 vaccine and a high perceived ease of use significantly increased the perceived benefit. Religiosity and the abundance of information about COVID-19 have no significant effect on vaccine acceptance. Other study analyzed factors that influence individual's intention to use COVID-19 vaccine with an adapted Cognitive-Affective-Normative (CAN) model. The result show that vaccine efficacy is the most important factor that influence individual's intention to have COVID-19 vaccination followed by social influence (Pelegrín-Borondo et al., 2021). Furthermore, with a different model approach, namely Partial Least Square Structural Equation Modelling (PLS-SEM), (Akther & Nur, 2022) found that belief in conspiracy theory decreases people's interest to being vaccinated of COVID-19. Meanwhile, individual

awareness, perceived benefits of COVID-19 vaccination and perceived ease of obtaining COVID-19 vaccines have a positive impact on attitude and acceptance of COVID-19 vaccination.

These three studies used a mathematical model approach to analyze the factors of public acceptance of COVID-19 vaccination, but it was different with this study in terms of the model approach used and the factors analyzed. This study aims to obtain a mathematical model of the interest of the people of Central Lombok Regency towards COVID-19 vaccination and to investigate which of the factors of ease of getting vaccinated, trust in the effectiveness of COVID-19 vaccination and trust in the government factors have the most influence on the interests of the people of Central Lombok Tengah towards COVID-19 vaccination. The model proposed in this study uses multiple linear regression approach with stepwise method to represent the interest of Central Lombok Regency in the COVID-19 vaccination. Validity and reliability of instrument testing is done using R program, as well as regression analysis and assumptions testing.

B. METHODS

The method used in this research is quantitative descriptive and survey method. We used 332 sample size, this amount has exceeded the minimum recommended for sample size with the sample- to-variable ratio rule. Ratio 15:1 or 20:1 are preferred to a minimum observation to variable (Hair et al., 2018), (Memon et al., 2020). Furthermore, this sample included people in Central Lombok Regency aged 12-70 years. Taking this age range based on the data that since July 2021 the process of COVID-19 vaccinating children aged 12 years has started (Toharudin et al., 2021) and the elderly (60 years and older) is one of priorities of COVID-19 vaccination (Paloyo et al., 2022). The data collection technique used a questionnaire to determine the interest of the people of Central Lombok Regency towards the COVID-19 vaccination which was distributed offline and online.

The variables in this study consisted of three independent variables and one dependent variable. The independent variables include the ease of getting vaccinated (X1), the effectiveness of the vaccine (X2), and trust in the government (X3), while the dependent variable in this study is the variable of interest in COVID-19 vaccination (Y). The following shows these variables and the question indicators for each variable, as shown in Table 1.

Table 1. Variables and Question Indicators

No.	Variables	Question Indicators
1	Ease of Getting Vaccinations for COVID-19 (X1)	1. COVID-19 vaccination can be obtained easily 2. Service facilities for COVID-19 vaccination are easy to find 3. Information about administering the COVID-19 vaccination is easy to obtain
2	Trust in the effectiveness of COVID-19 Vaccinations (X2)	1. There is a belief that COVID-19 vaccination can protect vaccine recipients from the risk of infection with COVID-19 2. There is a belief that COVID-19 vaccination can reduce the transmission rate of COVID-19
3	Trust in Government (X3)	1. There is a belief that the government is capable of overcoming the COVID-19 pandemic

No.	Variables	Question Indicators
		2. There is a support for any government policy to overcome the COVID-19 pandemic 3. There is a support for government's COVID-19 vaccination program to overcome the COVID-19 pandemic 4. There is a willingness to accept COVID-19 vaccine if provided by the government
4	Interest in COVID-19 vaccination (Y)	1. There is a willingness to accept the complete COVID-19 vaccine voluntarily 2. There is a willingness to invite family/friends who have not received the vaccine to be willing to receive the complete COVID-19 vaccine

Testing the validity of each item of the questionnaire statement uses a significance value, while testing the reliability of the questionnaire is based on the Cronbach's Alpha coefficient value (α = 0.05). Cronbach's Alpha of 0.6-0.7 indicates an acceptable level of reliability, and 0.8 or greater a very good level (Ursachi et al., 2015). The intervals of reliability level completely is described by (Taber, 2018), as shown in Table 2.

Table 2. Intervals of Reliability Level

intervals	levels of reliability
0.93 - 0.94	excelent
0.91 - 0.93	strong
0.84 - 0.90	reliable
0.81	robust
0.76 - 0.95	fairly high
0.73 - 0.95	high
0.71 - 0.91	good
0.70 - 0.77	relatively high
0.68	slightly low
0.67 - 0.87	reasonable
0.64 - 0.85	adequate
0.61 - 0.65	moderate
0.58 - 0.97	satisfactory
0.45 - 0.98	acceptable
0.45 - 0.96	sufficient
0.4 - 0.55	not satisfactory
00.11	low

Mathematical modeling using multiple linear regression analysis approach. The data analysis was done using R software and it was carried out in descriptive statistics, analytical statistics (validity and reliability test, assumptions test), and multiple regression linear to determine impact of independent variables on the variances of dependent variable.

C. RESULT AND DISCUSSION

1. Description of the Respondents Characteristic

Characteristics of the respondents in this study collected through questionnaires include age group, gender, occupation, last education and history of comorbid disease. Respondent data by age group are presented in Table 3.

Table 3. Age of Respondents

Age Group	Amount	Percent (%)
12 – 17	239	71.99
18 – 23	47	14.16
24 – 29	10	3.01
30 – 35	7	2.11
36 – 41	2	0.60
42 – 47	7	2.11
48 – 53	9	2.71
54 – 59	6	1.81
60 – 65	5	1.51

Based on Table 1, it can be seen that the respondents are dominated by the age group of 12-17 years. Furthermore, the respondent's data by gender can be seen in Table 4.

Table 4. Gender of Respondent

Gender	Amount	Percent (%)
Male	151	45.5
Female	181	54.5

The characteristics of respondents by occupation can be seen in Table 5.

Table 5. Profession of Respondent

Occupation	Amount	Percent (%)
Students	288	86.75
Teacher/Lecturer	10	3.01
Housewife	10	3.01
Farmer	13	3.88
Employee	4	1.20
Entrepreneur	7	2.11

Based on the last education, the characteristics of the respondents can be seen in Table 6.

Table 6. Last Education of Respondent

Last Education	Amount	Percent (%)
Elementary School	19	5.7
Junior High School	285	14.16
Senior High School	6	3.01
Bachelor Degree	18	2.11
Postgraduate	4	0.60

All respondents in this study came from 8 districts in Central Lombok Regency as for the distribution is presented in Table 7.

Table 7. District of Respondents

Districts	Amount	Percent (%)
Batukliang	39	11.7
Praya Tengah	38	11.4
Jonggat	83	25.0
Kopang	2	0.6
Praya	31	9.3
Pringgarata	107	32.2
Pujut	21	6.3
Batukliang Utara	11	3.3
Total	332	100

In addition, as many as nine out of 332 respondents had a history of comorbid or congenital diseases that could worsen health conditions if exposed to COVID-19.

2. Validity and Reliability Test

The results of validity test to each item of questionaire by using R is significant on P =0.000 which less than $\alpha = 0.05$, it means that each item of questionare is valid. Cronbach's Alpha value of 0.88 as shown in Table 8 is overall test reliability score. Furthermore, we obtain the reliability interval for 95% confidence ie 0.86 – 0.9, The following can be concluded that overall this instrument is reliable, as shown in Table 8.

Table 8. Cronbach's Alpha Value and Reliability Interval

N-items	95% confidence interval		
	Lower alpha	Alpha	Upper alpha
11	0.86	0.88	0.9

In addition, Cronbach's Alpha value for each item of questionaire is displayed on the Table 9. These reliability scores indicating that each item of questionaire is reliable, as shown in Table 9.

Table 9. Summary of Validity and Reliability Test Results

No	Items of Questionaire	Sig.	Validity	Cronbach's alpha	Reliability
	Ease of Getting Vaccinations for COVID-19 (X1)				
1	COVID-19 vaccination can be obtained easily	0.000	valid	0.88	reliable
2	Service facilities for COVID-19 vaccination are easy to find	0.000	valid	0.88	reliable
3	Information about administering the COVID-19 vaccination is easy to obtain	0.000	valid	0.88	reliable
	Trust in the effectiveness of COVID-19 Vaccinations (X2)				
1	I believe that COVID-19 vaccination can protect vaccine recipients from the risk of infection with COVID-19	0.000	valid	0.87	reliable
2	I believe that COVID-19 vaccination can reduce the transmission rate of COVID-19	0.000	valid	0.87	reliable
	Trust in Government (X3)				
1	I believe that the government is capable of	0.000	valid	0.87	reliable

	overcoming the COVID-19 pandemic				
2	I support any government policy to overcome the COVID-19 pandemic	0.000	valid	0.87	reliable
3	I support for government's COVID-19 vaccination program to overcome the COVID-19 pandemic	0.000	valid	0.87	reliable
4	I am willing to accept COVID-19 vaccine if provided by the government	0.000	valid	0.87	reliable
	Interest in COVID-19 vaccination (Y)				
1	I am willing to accept the complete COVID-19 vaccine voluntarily	0.000	valid	0.87	reliable
2	I am willing to invite family/friends who have not received the vaccine in order to be willing to receive the complete COVID-19 vaccine	0.000	valid	0.87	reliable

3. Mathematical Model Building

We used a multiple linear regression approach to build a mathematical model of Central Lombok Regency people's interest in COVID-19 vaccination. At current stage, stepwise method for multiple regression analysis has been used to evaluate the collective role of the independent variables on the dependent variables. Stepwise method is a procedure to build a model in successive steps, and predictors can be added or deleted at each step (Aljarrah et al., 2017). This method introduced the most powerful variables into the regression model one at a time and this continues until the significance test error reaches to 5% (Arayesh, 2015). Initially, we considered the correlation between independent variables and dependent variables that can be seen in Table 10.

Table 10. The Correlation between Independent Variables and Dependent Variables

The first variable	The second variable	r	p-value
the ease of getting vaccines (X1)	interest in the COVID-19 vaccination (Y)	0.262	0.000
trust in the vaccine effectiveness (X2)	interest in the COVID-19 vaccination (Y)	0.499	0.000
trust in the government (X3)	interest in the COVID-19 vaccination (Y)	0.704	0.000

According to Table 6 can be said that there is a relationship between the ease of getting vaccines (X1), trust in the vaccine effectiveness (X2), trust in the government (X3) with interest in the COVID-19 vaccination (Y). After considering the correlation between independent variables and dependent variables, fourth variables were introduced into the multiple regression equation, respectively as follows:

a. **Step 1**: According to Table 6, variable of X3 has greatest correlation with variable of Y, that is r=0.704. So, the trust in the government (X3) is the first variable was entered into the regression equation. The value of F obtained from variation analysis is significant at P=0.000 level. It means that regression between variable of X3 and variabel of Y is significant. On the other hand, the coefficient of partial regression correlation is significant at p=0.000 that less than $\alpha = 0.05$. So, variable of X3 is fixed in the regression equation. In addition, the coefficient of determination and adjusted

determination coefficient were calculated as equal to R^2=0.496 and R^2_{adj}=0.494 respectively. It can be said that trust in the government variable alone contributes to about 49.4% of variations in the dependent variable of interest in the COVID-19 vaccination. The regression equation of the first step is:

$$Y = 0.571 + 0.490X3 \quad (1)$$

b. **Step 2:** According to Table 6, variable of X2 is the second greatest correlation with variable of Y, that is r=0.499. So, the trust in the vaccine effectiveness is the second variable was entered into the regression equation. The value of F obtained from variation analysis is significant at p=0.000 level. It means that regression between variable of X2, X3 and variabel of Y is significant. On the other hand, both of the coefficient of partial regression correlation for X2 and X3 is significant at p=0.000 that less than $\alpha = 0.05$. So, variable of X2 and X3 is fixed in the regression equation. In addition, the coefficient of determination and adjusted determination coefficient were calculated as equal to R^2=0.520 and R^2_{adj}=0.517 respectively. It can be said that the trust of people in the vaccine effectiveness and the trust of people in the government variable contributes to about 51.7% of variations in the dependent variable of interest in the COVID-19 vaccination. The regression equation of the second step is:

$$Y = -1.258 + 0.425X3 + 0.232X2 \quad (2)$$

c. **Step 3:** According to Table 6, the last variable of X1 has a correlation with variable of Y, that is r=0.262. So, the trust in the ease of getting vaccines (X1) is the last variable was entered into the regression equation. The value of F obtained from variation analysis is significant at p=0.000 level. It means that regression between variable of X2, X3 and variabel of Y is significant. On the other hand, the coefficient of partial regression correlation for X1 is significant at p=0.694 that greater than $\alpha = 0.05$. It means that there is no effect on the ease of getting vaccines for the interest in the COVID-19 vaccination. In addition, the coefficient of determination and adjusted determination coefficient were calculated as equal to R^2=0.520 and R^2_{adj}=0.516 respectively. It can be seen that the addition of variable X1 causes decrease in the value of adjusted determination coefficient by 0.01. So, the variable X1 should be removed from regression equation. The regression equation of the third step is:

$$Y = -1.163 + 0.427X3 + 0.238X2 - 0.016X1 \quad (3)$$

The following are the results of the regression analysis, as shown in Table 11 and Table 12.

Table 11. Summary of Regression Equation

Equation	Variable	R	R^2	R^2_{adj}	MSE	F variations significance level
(1)	X3	0.704	0.496	0.494	1.479	0.000
(2)	X3,X2	0.721	0.520	0.517	1.446	0.000
(3)	X3, X2, X1	0.721	0.520	0.516	1.448	0.000

Table 12. Coefficients of the Variables Introduced to Regression Equation

Equation	Variable	B	B standard error	Beta	t	sig	Correlation partial
(1)	X3	0.490	0.027	0.704	18.019	0.000	0.704
(2)	X3	0.425	0.031	0.610	13.610	0.000	0.600
	X2	0.232	0.057	0.181	4.043		0.218
(3)	X3	0.427	0.032	0.613	13.436	0.000	0.596
	X2	0.238	0.059	0.186	4.011	0.000	0.216
	X1	-0.16	0.040	-0.017	-0.394	0.694	-0.022

By the results of regression analysis with stepwise method, mathematical model of Central Lombok Regency People's Interest towards COVID-19 Vaccination is:

$$Y = -1.258 + 0.425X3 + 0.232X2 \quad (2)$$

4. Residual Assumption Test Results

a. Normality Test

In multiple linear regression, normality test on the data is performed on the residual variabel and determined distribution of the residuals whether normally distributed or not. Residuals are the difference between a predicted and observed quantity utilizing a particular mathematical model (Shamaan et al., 2015). Data is normally distributed if the significant value is greater or equal to $\alpha = 0.05$, otherwise data isn't normally distributed if the significant value is less than 0.05 (Himmah & Kaestria, 2022). This study used Kolmogorov-Smirnov as the proper residual variable normality test for data sample greater than 50 (Mishra et al., 2019). The distribution of residual variable described by histogram with normality curve and normal Q-Q plot as shown in Figure 1 and Figure 2.

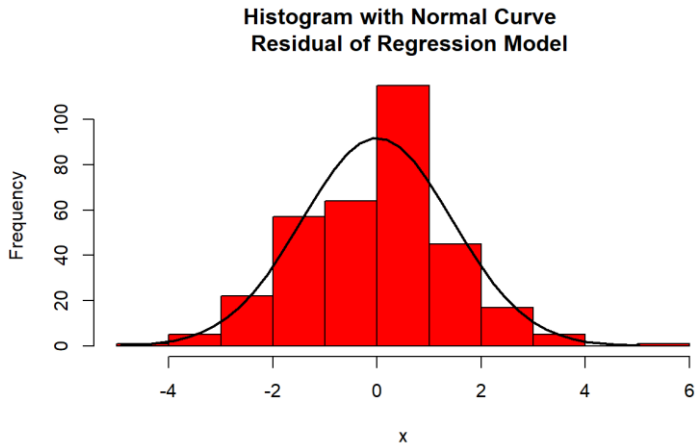

Figure 1. Histogram with Normal Curve for Distribution of the Residual Variable

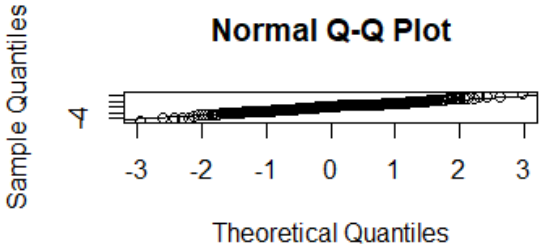

Figure 2. Normal Q-Q Plot Residual Variable

The results of normality test for residual variable with R is p-value=0.0658. It is greater than $\alpha = 0.05$, so we can conclude that the residual variable is normally distributed.

b. Multicollinearity Test
   The indication of a linear correlation between independent variables can be seen by the results of multicollinearity test in the regression model. In this study, a multicollinearity test was carried out to determine the existence of multicollinearity between the variables of the trust in the vaccine effectiveness (X2) and trust in the government (X3). The existence of multicollinearity is determined by the value of Variance Inflation Factor (VIF). The regression model doesn't have a multicollinearity problem if the VIF less than 10 (Shrestha, 2020). The value of VIF for both of X2 and X3 as the results of multicollinearity test using R is 1.374732. All values are less than 10, no multicollinearity problem between independent variables in the regression model is decided.
c. Heteroscedasticity Test
   Heteroscedasticity test was carried out to detect an inequality of variance from residuals in each observation on the regression model (Halunga et al., 2017). In this study, authors use Breusch Pagan Godfrey test. There is a heteroscedasticity if p-value is less than 0.05. By using R, we obtained p-value=0.41, it means that no variance inequality from residual is found.

This study suggested that Central Lombok Regency people's interest towards COVID-19 vaccination is influenced by their trust in the effectiveness of vaccination and trust in the government. It means that their interest to vaccinate against COVID-19 will increase if the government is able to maintain public trust especially to conquer pandemic of COVID-19 and make an effort to achieve the effectiveness of vaccination. This provides benefits for the government to determine the right strategy so that people's interest in receiving vaccines increases. The strategy includes administering the COVID-19 vaccine which has been recognized for its efficacy, such as Pfizer, BioNTech, and Moderna (Patel et al., 2022). Also, people are willing to accept COVID-19 vaccines only if they are provided by the government, so the government needs to ensure that the availability of these vaccines is sufficient and free of charge. Furthermore, the government should educate the public by mass campaign about the importance of the COVID-19 vaccination, their benefits for individual and community also.

D. CONCLUSION AND SUGGESTIONS

Our data suggest that the trust of people in the effectiveness of COVID-19 vaccination and the trust of people in the government contributes influence the people's interest for getting COVID-19 vaccination. Therefore, we recommend the government of Central Lombok Regency focus on providing good efficacious vaccines of COVID-19 and conduct mass campaigns on the importance of COVID-19 vaccination.

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REFERENCES

Ahmad, M., Akhtar, N., Jabeen, G., Irfan, M., Anser, M. K., Wu, H., & Işık, C. (2021). Intention-based critical factors affecting willingness to adopt novel coronavirus prevention in pakistan: Implications for future pandemics. *International Journal of Environmental Research and Public Health*, *18*(11). https://doi.org/10.3390/ijerph18116167

Akther, T., & Nur, T. (2022). A model of factors influencing COVID-19 vaccine acceptance: A synthesis of the theory of reasoned action, conspiracy theory belief, awareness, perceived usefulness, and perceived ease of use. *PLoS ONE*, *17*(1 January), 1–20. https://doi.org/10.1371/journal.pone.0261869

Aljarrah, M., Al-jarrah, Y., Galvão, R. K. H., Araújo, M. C. U., Fragoso, W. D., Silva, E. C., José, G. E., Soares, S. F. C., Paiva, H. M., Sari, T., & Kayral, I. E. (2017). Using stepwise regression to investigate c ustomers' propensity to change cellular phone providers. *Global Journal of Pure and Applied Mathematics*, *13*(9), 5013–5020.

Arayesh, M. B. (2015). Regression Analysis of Effective Factors on Increasing Factors on Trainer's Motivation of the Red Crescent Society (A Case Study, Ilam, Iran). *Procedia - Social and Behavioral Sciences*, *205*(May), 536–541. https://doi.org/10.1016/j.sbspro.2015.09.070

Chhetri, J. K., Chan, P., Arai, H., Park, S. C., Sriyani Gunaratne, P., Setiati, S., & Assantachai, P. (2020). Prevention of COVID-19 in Older Adults: A Brief Guidance from the International Association for Gerontology and Geriatrics (IAGG) Asia/Oceania Region. *Journal of Nutrition, Health and Aging*, *24*(5), 471–472. https://doi.org/10.1007/s12603-020-1359-7

Faturohman, T., Kengsiswoyo, G. A. N., Harapan, H., Zailani, S., Rahadi, R. A., & Arief, N. N. (2021). Factors influencing COVID-19 vaccine acceptance in Indonesia: an adoption of Technology Acceptance Model. *F1000Research*, *10*, 476. https://doi.org/10.12688/f1000research.53506.1

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2018). *Multivariate Data Analysis* (8 th). Cengage Learning.

Halunga, A. G., Orme, C. D., & Yamagata, T. (2017). A heteroskedasticity robust Breusch–Pagan test for Contemporaneous correlation in dynamic panel data models. In *Journal of Econometrics* (Vol. 198, Issue 2). https://doi.org/10.1016/j.jeconom.2016.12.005

Harapan, H., Anwar, S., Setiawan, A. M., & Sasmono, R. T. (2016). Dengue vaccine acceptance and associated factors in Indonesia: A community-based cross-sectional survey in Aceh. *Vaccine*, *34*(32), 3670–3675. https://doi.org/10.1016/j.vaccine.2016.05.026

Harapan, H., Wagner, A. L., Yufika, A., Winardi, W., Anwar, S., Gan, A. K., Setiawan, A. M., Rajamoorthy, Y., Sofyan, H., & Mudatsir, M. (2020). Acceptance of a COVID-19 Vaccine in Southeast Asia: A Cross-Sectional Study in Indonesia. *Frontiers in Public Health*, *8*(July), 1–8. https://doi.org/10.3389/fpubh.2020.00381

Himmah, E. F., & Kaestria, R. (2022). Path Analysis to Determine the Effect of Learning Outcomes of Prerequisite Mathematics on Learning Outcomes of Expert Systems Courses. *Numerical*, *6*(1). https://doi.org/https://doi.org/10.25217/numerical.v6i1.1625

Irfan, M., Shahid, A. L., Ahmad, M., Iqbal, W., Elavarasan, R. M., Ren, S., & Hussain, A. (2021). Assessment of public intention to get vaccination against COVID ‐ 19 Evidence. *Journal of Evaluation in Clinical Practice*, *28*(1), 63–73. https://doi.org/10.1111/jep.13611

Lasmita, Y., Misnaniarti, & Idris, H. (2021). *Analisis Penerimaan Vaksinasi Covid-19 di Kalangan Masyarakat*. *9*(4), 195–204. https://doi.org/10.29406/jkmk.v9i4.3056

Lazarus, J. V., Ratzan, S. C., Palayew, A., Gostin, L. O., Larson, H. J., Rabin, K., Kimball, S., & El-Mohandes, A. (2021). A global survey of potential acceptance of a COVID-19 vaccine. *Nature Medicine*, *27*(2), 225–228. https://doi.org/10.1038/s41591-020-1124-9

Memon, M. A., Ting, H., Cheah, J.-H., Thurasamy, R., Chuah, F., & Cham, T. H. (2020). Sample Size for Survey Research: Review and Recommendations. *Journal of Applied Structural Equation Modeling*, *4*(2), i–xx. https://doi.org/10.47263/jasem.4(2)01

Mishra, P., Pandey, C. M., Singh, U., Gupta, A., Sahu, C., & Keshri, A. (2019). Descriptive statistics and normality tests for statistical data. *Annals of Cardiac Anaesthesia*, *22*(1), 67–72. https://doi.org/10.4103/aca.ACA_157_18

Murbiah, & Wahyudi, J. T. (2021). Enhancing Of Community Readiness For COVID-19. *Proceeding of the 4th International Conference on Interprofessional Health Collaboration and Community Empowerment*, *December*, 14–16.

Olliaro, P., Torreele, E., & Vaillant, M. (2021). COVID-19 vaccine efficacy and effectiveness—the elephant (not) in the room. *The Lancet Microbe*, *2*(7), e279–e280. https://doi.org/10.1016/S2666-5247(21)00069-0

Or Caspi, Michael J. Smart, R. B. N. (2020). Herd immunity: Understanding Covid-19 by Haley etal. *Ann Oncol*, *January*, 19–21.

Paloyo, S. R., Caballes, A. B., Hilvano-Cabungcal, A. M., & De Castro, L. (2022). Prioritizing the vulnerable over the susceptible for COVID-19 vaccination. *Developing World Bioethics*, *22*(3), 162–169. https://doi.org/10.1111/dewb.12327

Patel, R., Kaki, M., Potluri, V. S., Kahar, P., & Khanna, D. (2022). A comprehensive review of SARS-CoV-2 vaccines: Pfizer, Moderna & Johnson & Johnson. *Human Vaccines and Immunotherapeutics*, *18*(1). https://doi.org/10.1080/21645515.2021.2002083

Pelegrín-Borondo, J., Arias-Oliva, M., Almahameed, A. A., & Prado Román, M. (2021). Covid-19 vaccines: A model of acceptance behavior in the healthcare sector. *European Research on Management and Business Economics*, *27*(3). https://doi.org/10.1016/j.iedeen.2021.100171

Shamaan, N. A., Shukor, M. S., Masdor, N. A., Sabullah, M. K., & Shukor, M. Y. (2015). Testing the Normality of Residuals on Regression Model for the Growth of Moraxella sp. B on Monobromoacetic Acid. *Bulletin of Environmental Science and Sustainable Management (e-ISSN 2716-5353)*, *3*(1), 16–18. https://doi.org/10.54987/bessm.v3i1.263

Shrestha, N. (2020). Detecting Multicollinearity in Regression Analysis. *American Journal of Applied Mathematics and Statistics*, *8*(2), 39–42. https://doi.org/10.12691/ajams-8-2-1

Taber, K. S. (2018). The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. *Research in Science Education*, *48*(6), 1273–1296. https://doi.org/10.1007/s11165-016-9602-2

Toharudin, T., Pontoh, R. S., Caraka, R. E., Zahroh, S., Kendogo, P., Sijabat, N., Sari, M. D. P., Gio, P. U., Basyuni, M., & Pardamean, B. (2021). National vaccination and local intervention impacts on covid-19 cases. *Sustainability (Switzerland)*, *13*(15). https://doi.org/10.3390/su13158282

Ursachi, G., Horodnic, I. A., & Zait, A. (2015). How Reliable are Measurement Scales? External Factors with Indirect Influence on Reliability Estimators. *Procedia Economics and Finance*, *20*(15), 679–686. https://doi.org/10.1016/s2212-5671(15)00123-9

Yasir, A., Hu, X., Ahmad, M., Rauf, A., Shi, J., & Nasir, S. A. (2020). Modeling impact of word of mouth and E-government on online social presence during COVID-19 outbreak: A multi-mediation approach. *International Journal of Environmental Research and Public Health*, *17*(8). https://doi.org/10.3390/ijerph17082954

Yufika, A., Wagner, A. L., Nawawi, Y., Wahyuniati, N., Anwar, S., Yusri, F., Haryanti, N., Wijayanti, N. P., Rizal, R., Fitriani, D., Maulida, N. F., Syahriza, M., Ikram, I., Fandoko, T. P., Syahadah, M., Asrizal, F. W., Aletta, A., Haryanto, S., Jamil, K. F., … Harapan, H. (2020). Parents' hesitancy towards vaccination in Indonesia: A cross-sectional study in Indonesia. *Vaccine*, *38*(11), 2592–2599. https://doi.org/10.1016/j.vaccine.2020.01.072