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A COMPARISON OF LOGISTIC REGRESSION AND GEOGRAPHICALLY WEIGHTED LOGISTIC REGRESSION (GWLR) ON COVID-19 DATA IN WEST SUMATRA

Irvanal Haq[1*], Muhammad Nur Aidi[2], Anang Kurnia[3], Efriwati[4]

[1,2,3]*Department of Statistics, FMIPA, IPB University*
Bogor, 16680, Indonesia
[4]*National Research and Innovation Agency (BRIN)*
Bogor, 16911, Indonesia

*Corresponding author's e-mail: * **03irvanal@apps.ipb.ac.id***

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ABSTRACT

An understanding of factors that affect the recovery time from a disease is important for the community, medical staff, and also the government. This research analyzed factors that affect the recovery time of Covid-19 sufferers in West Sumatra. In addition, the consumption of a herbal made from Sungkai leaves, which is believed by some people in West Sumatra to accelerate the healing from Covid-19, was also included in the analysis. The recovery time here was categorized into two classes (binary): 1 for within 2 weeks, and 0 for more than 2 weeks. The methods used were logistic regression and geographically weighted logistic regression (GWLR). GWLR provides estimates of parameters for each location. The data used in this study is Covid-19 data of 2021 taken from the Regional Research and Development Agency (Litbangda) of West Sumatra with a total of 764 observations collected from 19 regencies/cities in West Sumatra. The results showed that there was no difference between the logistic regression model and the GWLR models based on the values of AIC and the ratio of deviance and degrees of freedom (df). The addition of spatial factors through GWLR models did not provide additional information regarding the recovery of Covid-19 sufferers within 2 weeks or more than 2 weeks. The logistic regression model gives the result that, at significance level α = 10%, residence, vaccination status, and symptoms significantly affect the recovery time within 2 weeks or more for Covid-19 sufferers, while other variables, namely sex, age, Sungkai leaves consumption status, and ginger consumption status have no significant effects.

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1. INTRODUCTION

The world was shocked by a new disease at the beginning of 2020, known as Covid-19. This is a disease caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) [1]. Covid-19 can cause respiratory system disorders, ranging from mild symptoms (such as the flu) to lung infections (such as pneumonia) [2].

One year since the first announcement of Covid-19 in West Sumatra on March 26, 2020, the number of cases in West Sumatra has reached tens of thousands of cases and 679 people have been declared dead. A number of hospitals were overwhelmed, and experienced many obstacles such as full isolation rooms or a lack of Personal Protective Equipment (PPE) for medical workers. Several regional officials, such as regents, deputy mayors, members of the Regional People's Representative Council (DPRD), and a number of community leaders have also been exposed to Covid-19, and several of them have died [3]. On August 7, 2021, West Sumatra became one of the five areas highlighted by President Joko Widodo due to the high spike in daily cases of Covid-19 [4].

People with positive Covid-19 with mild symptoms can usually recover within 2 weeks, while those with moderate to critical symptoms can recover between 3-6 weeks [5]. Knowledge about the factors that affect the recovery time for sufferers of Covid-19 is needed to provide appropriate treatment for patients of this disease at the individual level. In addition, efforts to deal with it on a regional scale are also needed because policy makers usually provide assistance by looking at the general condition of the disease by region, be it province or regency/city.

Research by Kaso et al [6], stated that factors that were significantly related to the recovery time of Covid-19 patients included residence, age, and sex. In Zandkarimi's research [7], it was found that the factors that influence the chances of recovery for Covid-19 patients in Kurdistan province are age, sex, coronary heart disease (CHD), cancer, and the use of antiviral drugs.

This study wants to investigate the factors that influence the recovery time for Covid-19 sufferers in West Sumatra. Additionally, the effect of traditional herbal ingredients, especially Sungkai (*Peronema canescens*) leaves on the recovery time of Covid-19 sufferers is also wanted to be known. This is because there is a belief in the community, especially in several areas in Sumatra that consuming a herbal made from Sungkai leaves can speed up the healing of people who have been confirmed to have Covid-19. Although this has not been medically proven, actually Sungkai leaves are not a new plant in the world of herbal medicine, because several studies have revealed the benefits of Sungkai leaves for health, including Sungkai leaf extract which functions as an anti-bacterial and anti-inflammatory [8].

One of the statistical methods that can be used for modeling with binary response variables is logistic regression [9]. In this study, the Covid-19 case in West Sumatra was modeled by logistic regression. The response variable has two values: 1 for the category of Covid-19 sufferers who recover within two weeks, and 0 for the category of Covid-19 sufferers who recover more than two weeks.

The application of global regression methods over a large area for the entire study area becomes unsuitable if there is local interaction with explanatory factors. Geographically weighted regression models (GWR), which produce different regression models for each location, are proposed to overcome this issue [10]. One development of logistic regression for analyzing spatial data is Geographically Weighted Logistic Regression (GWLR) [11].

Previous research using the GWLR model is research by Solekha and Qudratullah [12] to analyze poverty in the Province of East Nusa Tenggara (NTT). The study concluded that the GWLR model was better than the logistic regression model based on the classification accuracy. Other studies showing that the performance of GWLR models were better than that of logistic regression models are in [11], [10], and [13].

This study will compare logistic regression and geographically weighted logistic regression in analyzing the factors that influence the recovery time for Covid-19 sufferers in West Sumatra.

2. RESEARCH METHODS

This research will apply 2 models, namely logistic regression and geographically weighted logistic regression (GWLR). The response variable (Y) used is recovery time on a binary scale, with categories: within 2 weeks (symbolized by 1) and more than 2 weeks (symbolized by 0). Logistic regression analysis is

performed using R, while GWLR analysis is performed using GWR4 Version 4.0.90, and map creation using QGIS version 3.26.2-Buenos Aires.

2.1 Data

The data used in this study is Covid-19 data of 2021 taken from the Regional Research and Development Agency (Litbangda) of West Sumatra with a total of 764 observations collected from 19 regencies/cities in West Sumatra. The variables used in this study are in **Table 1** below.

Table 1. Variables Used

Variable	Variable Name	Type	Category
Y	Covid-19 recovery time	biner	1 = within 2 weeks 0 = more than 2 weeks
X1	Sex	biner	1 = female 0 = male
X2	Age	numeric	-
X3	Residence	biner	1 = urban 0 = rural
X4	Vaccination Status	nominal	1 = infected with Covid-19 before vaccination 2 = infected with Covid-19 after vaccine 1 3 = infected with Covid-19 after vaccine 2
X5	Symptoms	biner	1 = moderate 0 = mild or no symptoms
X6	Status of Sungkai leaves consumption	biner	1 = yes 0 = no
X7	Status of ginger consumption	biner	1 = yes 0 = no

West Sumatra is a province located on the Sumatra Island which consists of 19 regencies/cities. The map of West Sumatra Province is shown in **Figure 1** below.

Figure 1. Map of West Sumatra

The number of observations in each regency/city in West Sumatra is presented in **Table 2**. From **Table 2**, it can be seen that the area with the highest number of observations is Padang City, and the area with the least number of observations is Padang Pariaman Regency.

Table 2. The Number of Observations in Every Regency/City in West Sumatra

No.	Regency/City	The number of observations
1	Agam Regency	26
2	Dharmasraya Regency	37
3	Kepulauan Mentawai Regency	25
4	Lima Puluh Kota Regency	41
5	Padang Pariaman Regency	8
6	Pasaman Regency	19
7	Pasaman Barat Regency	33
8	Pesisir Selatan Regency	45
9	Sijunjung Regency	32
10	Solok Regency	60
11	Solok Selatan Regency	30
12	Tanah Datar Regency	66
13	Bukit Tinggi City	32
14	Padang City	155
15	Padang Panjang City	26
16	Pariaman City	41
17	Payahkumbuh City	33
18	Sawahlunto City	26
19	Solok City	29

2.2 Logistic Regression

Logistic regression is a regression model that can be used to model data with binary or dichotomous response variable **[14]**. The general logistic regression model has several predictor variables that can be quantitative, categorical, or both **[15].** Binary logistic regression is a logistic regression with the response variable (Y) on a binary category scale, which has two categories of values: 0 which represents "failure" and 1 which represents "success". The logistic regression model with p predictor variables can be written as follows:

$$\pi(\boldsymbol{x_i}) = \frac{\exp(\boldsymbol{\beta' x_i})}{1+\exp(\boldsymbol{\beta' x_i})} \quad (1)$$

where $\boldsymbol{\beta'} = (\beta_0, \beta_1, \dots, \beta_p)$ is the parameter vector of the coefficients and $\boldsymbol{x_i'} = (1, x_1, \dots, x_p)$ denotes the vector of the independent variables. The logit model is

$$g(\boldsymbol{x_i}) = \ln\left(\frac{\pi(\boldsymbol{x_i})}{1-\pi(\boldsymbol{x_i})}\right) = \boldsymbol{\beta' x_i} \quad (2)$$

The estimation of parameters of logistic regression model was carried out using maximum likelihood method through iterative method with Newton Raphson method **[16]**.

2.3 Geographically Weighted Logistic Regression

Geographically Weighted Logistic Regression (GWLR) is a regression modeling developed by Atkinson et al. in 2003 by combining Geographically Weighted Regression (GWR) and logistic regression. GWLR is a non-parametric method for obtaining regression parameters by taking into account spatial factors and is an alternative approach to GWR which combines nonstationary parameters and categorical data **[17]**. The geographic location factor is a weighting factor in the GWLR model. This factor has a different value for each region which shows local characteristics in the GWLR model. The GWLR model can be written as follows:

$$\pi(\boldsymbol{x}_i) = \frac{\exp(\boldsymbol{\beta}'(u_i,v_i)\boldsymbol{x_i})}{1+\exp(\boldsymbol{\beta}'(u_i,v_i)\boldsymbol{x_i})} \quad (3)$$

where $\boldsymbol{\beta}'(u_i, v_i) = [\beta_0(u_i, v_i),\ \beta_1(u_i, v_i), \dots,\ \beta_p(u_i, v_i)]$ is the parameter vector of the coefficients, u_i indicates the latitude and v_i indicates the longitude. The logit model is

$$g(\boldsymbol{x_i}) = \ln\left(\frac{\pi(\boldsymbol{x_i})}{1-\pi(\boldsymbol{x_i})}\right) = \boldsymbol{\beta}'(u_i, v_i)\boldsymbol{x_i} \quad (4)$$

The weighting function of GWLR model used in this research is adaptive Gaussian kernel. Kernel function generally defines weights in such a way that observed data that is located closer to the i-th location in space has a greater influence on parameter estimation than data that is farther away from the i-th location. The kernel provides weight according to the optimum bandwidth whose value is determined from the data using the cross-validation (CV) method. Adaptive Gaussian kernel function is formulated as follows:

$$w_j(u_i, v_i) = exp\left(-\frac{1}{2}\left(\frac{d_{ij}}{h_i}\right)^2\right) \quad (5)$$

where d_{ij} is the *Euclidean* distance between the i-th location and j-th location, and h is the bandwidth. Bandwidth can be considered as the radius of a circle, all locations within that radius have an influence in estimating the parameters at the i-th location **[18]**.

2.4 Model Selection

The selection of the best model in this study was determined through Akaike's Information Criterion (AIC) with the following formula:

$$AIC(h) = D(h) + 2P(h) \quad (6)$$

D(h) is the value of the model deviation with the bandwidth (*h*), and *P(h)* is the number of parameters in the model with the bandwidth *(h)*. The model with the smallest AIC is the best model **[19]**.

3. RESULTS AND DISCUSSION

3.1 Data Exploration

The comparison of class on the response variable, namely the recovery time of Covid-19 sufferers (Y) in the data was of 764 respondents, 75% recovered within 2 weeks, and 25% recovered more than 2 weeks as shown in **Figure 2**.

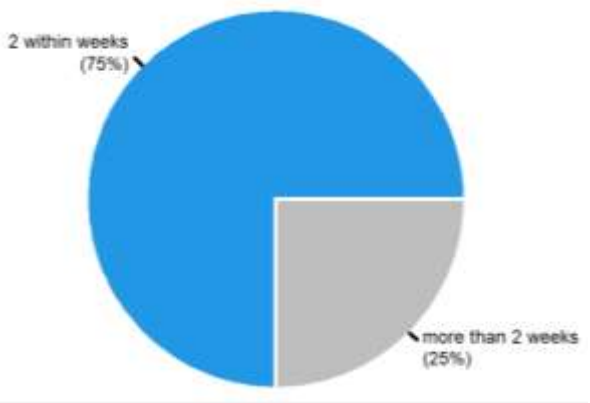


Figure 2. Percentage of recovery time of Covid-19 sufferers in West Sumatra

The percentage of recovery time for Covid-19 sufferers based on categorical predictor variables can be seen in **Figure 3**. It can be observed that in sex variable (X1), both in the female and male groups, the percentage of people who recovered within 2 weeks tends to be similar, namely 75.14% and 74.68% respectively. In variable of residence (X3), the status of recovering within 2 weeks is higher in people who live in urban areas with a percentage of 77.69%, while those living in rural areas is 72.19%. In vaccination

status variable (X4), the highest percentage of recovering within 2 weeks was found in people who had received the second Covid-19 vaccine, namely 79.78%, followed by people who had not received vaccine at 74.67 %, and the lowest was the people who had received the first Covid-19 vaccine at 63.93%.

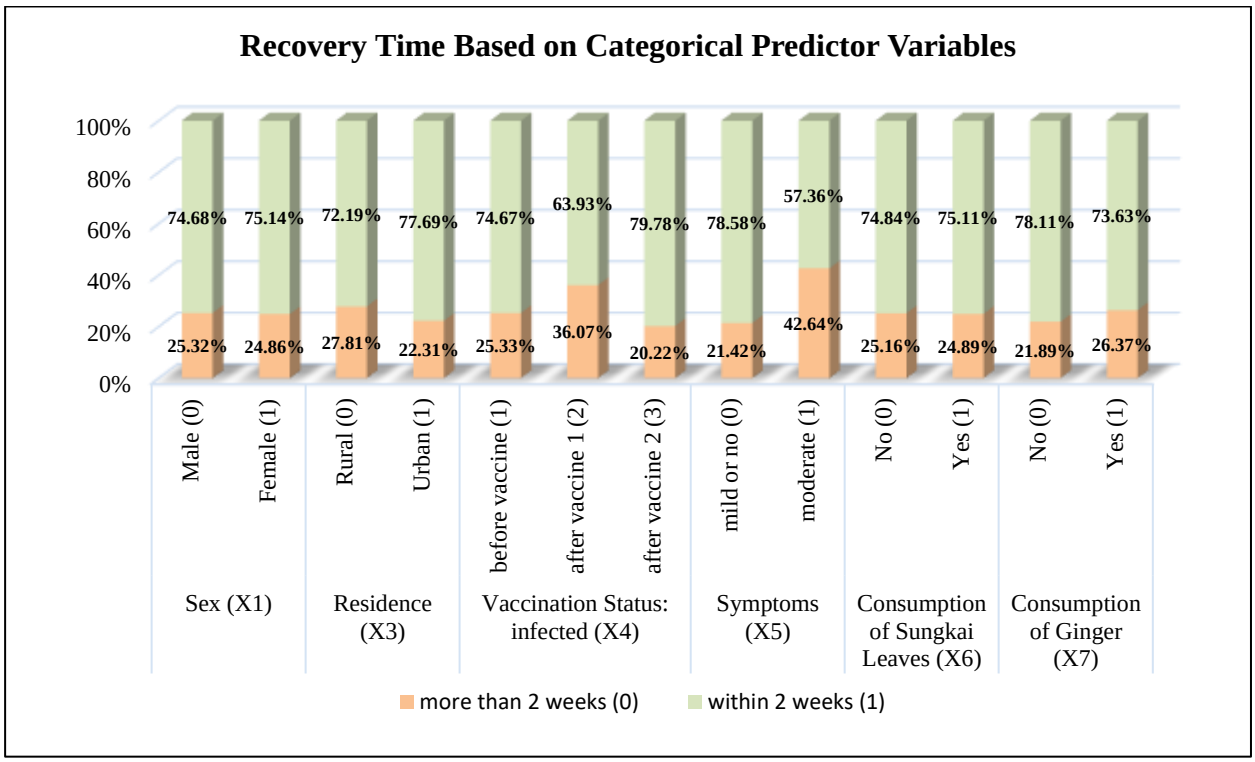


Figure 3. Comparison of recovery time of Covid-19 based on categorical predictor variables

For symptoms variable (X5), it is clear that people with moderate symptoms take longer time to recover than people with mild or no symptoms. Only 57.36% of people with moderate symptoms recovered within 2 weeks, while those with mild symptoms or no symptoms were 78.58%.

Sungkai leaves consumption (X6) and status of ginger consumption (X7) are basically dummy variables of herbal consumption. These two variables are created and separated manually because the two are not mutually exclusive, which in the analysis will involve the interaction of the two. It can be seen that for Sungkai leaves consumption (X6), the percentage that recovery within 2 weeks tends to be the similar for people who consume it or not with the percentage of 75.11% and 74.84% respectively, while for ginger consumption variable (X7), it was 73.63% for those who consumed ginger, and 78.11% for those who did not consume it.

Figure 4 shows a boxplot for the age distribution of Covid-19 sufferers based on their recovery time. It can be seen that the ages in the two groups tend to have a similar distribution where data between first quartile and third quartile was approximately in the age range of 35 years to 45 years.

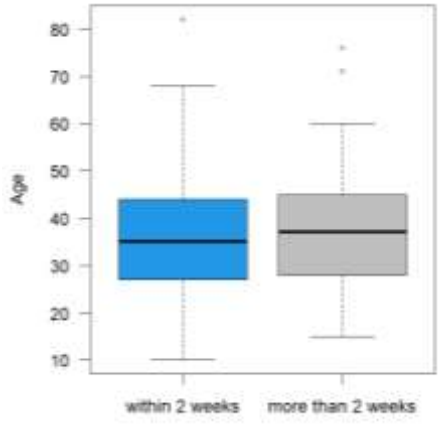
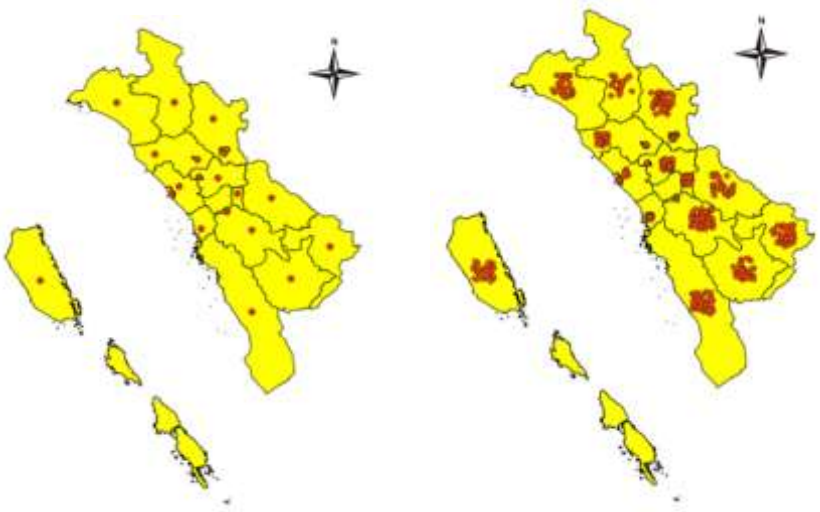


Figure 4. Age distribution of Covid-19 sufferers based on recovery time

3.2 Comparing the Models

The logistic regression model is used to determine the factors that influence recovery within 2 weeks and more than 2 weeks for Covid-19 sufferers in West Sumatra. The GWLR model is used to analyze spatial effects in the context of recovery within 2 weeks and more than 2 weeks for Covid-19 sufferers.

In the GWLR model, the kernel function used is adaptive Gaussian kernel. The GWLR model is made with 2 scenarios for determining geographic coordinates (longitude and latitude) for each observation. Scenario 1 uses regency/city coordinates for each observation, which means observations from the same region have the same coordinates. Scenario 2 is to randomly generate coordinates for each observation according to the area and the number of observations in that area. The coordinates (red dots) for scenario 1 and scenario 2 on the map can be seen in **Figure 5**.



(a) **(b)**

Figure 5. Geographic coordinates (red dots) of GWLR models,
(a) Geographic coordinates for scenario 1, (b) Geographic coordinates for scenario 2

From **Figure 5**, it can be observed that in scenario 1, there are only 19 coordinate points corresponding to the number of districts/cities in West Sumatra, where in the GWLR model, every observation within the same region will be assigned the same coordinates. In scenario 2, there are 764 different geographic coordinates because each observation has its own coordinate, but those coordinates still correspond to the regions and the number of observations in those regions.

The comparison between logistic regression and GWLR is carried out based on the values of AIC and the ratio of deviance and degrees of freedom (df). The ratio of deviance and degrees of freedom (df) that is closer to 1 indicates a better model, and the model with smaller AIC value indicates a better model. The comparison of the logistic regression model and the GWLR model is shown in **Table 3**.

Table 3. Comparison of Models Based on AIC and Ratio of Deviance and Degrees of Freedom (df)

Model	Deviance	df	Deviance/df	AIC
Logistic Regression	820.628	754	1.088	840.628
GWLR with scenario 1	809.765	733.306	1.104	840.389
GWLR with scenario 2	810.240	733.357	1.105	840.800

From **Table 3**, it can be seen that between the logistic regression model and the GWLR there is not much difference both in the ratio of deviance and the degrees of freedom (df) and in the AIC value. There was no significant difference between the logistic regression model and the GWLR model. The goodness of the model shown by AIC tends to be the same, which is around 840, and the ratio of deviance and the degrees of freedom (df) also tends to be the same, which is around 1.1. This shows that the addition of spatial factors through the GWLR model does not provide additional information in the context of recovery of Covid-19 sufferers within 2 weeks and more than 2 weeks, but suspicions about spatial influences in the spread process may occur, but outside the scope of this study. Furthermore, the analysis and interpretation of the model is only performed on the logistic regression model because from the above results the analysis using logistic regression alone is sufficient.

3.3 Analysis and Interpretation of Logistic Regression Model

Multicollinearity checks on predictor variables involving a combination of numerical and categorical predictors can be performed using Generalized Variance Inflation Factors (GVIFs) [20]. The square of the scaled GVIFs ($GVIF^{\frac{1}{2DF}}$) which is smaller than 4 indicates that there is no multicollinearity problem in the predictor variables [21]. The GVIFs and scaled GVIFs can be seen in Table 3.

Table 3. GVIF and Scaled GVIF of Predictor Variables

Variable	GVIF	DF	$GVIF^{\frac{1}{2DF}}$
X1	1.020	1	1.010
X2	1.063	1	1.031
X3	1.053	1	1.026
X4	1.025	2	1.006
X5	1.018	1	1.009
X6	1.057	1	1.028
X7	1.012	1	1.006

From Table 3, it can be observed that the square of scaled GVIFs for all predictor variables is below 4. It can be concluded that multicollinearity does not occur, so that modeling can be continued with logistic regression.

The results of the simultaneous hypothesis testing of the model are in Table 4. The test statistic G is 38.62 which is greater than the chi-square table value, which is *chi-square* $\chi^2_{(0.05,9)} = 16.919$. The conclusion from the testing is that H_0 is rejected, which means that there is at least one predictor variable that has a significant effect on the recovery time for Covid-19 sufferers in West Sumatra.

Table 4. Result of Simultaneous Hypothesis Testing

Test statistic G	DF	$\chi^2_{(0.05,9)}$
38.62	9	16.919

Parameter estimates and partial logistic regression parameter testing results can be seen in Table 5.

Table 5. Estimates of Logistic Regression Model Parameters

Parameter	Estimate	St. Erorr	*W*	*p-value*	*Odds Ratio*
β_0	1.5561	0.398	3.9099	0.0001	
$\beta_1(1)$	0.0565	0.1872	0.302	0.7627	1.0581
β_2	-0.0119	0.0075	-1.5803	0.114	0.9882
$\beta_3(1)$	0.3669	0.1766	2.0783	0.0377*	1.4433
$\beta_4(2)$	-0.5678	0.2948	-1.9261	0.0541*	0.5668
$\beta_4(3)$	0.3564	0.2181	1.6342	0.1022	1.4282
$\beta_5(1)$	-1.0448	0.2071	-5.0457	0.0000*	0.3518
$\beta_6(1)$	0.1509	0.3365	0.4484	0.6539	1.1629
$\beta_7(1)$	-0.1561	0.3053	-0.5113	0.6091	0.8555
$\beta_6:\beta_7$	-0.0964	0.3937	-0.245	0.8065	0.9081

*) significant at $\alpha = 10\%$

From Table 5, it can be observed that based on the Wald test, the predictor variables that significantly affect the recovery time of Covid-19 sufferers at significance level α = 10% are residence (X3), vaccination status (X4), and symptoms (X5).

The coefficient of residence (X3) is positive (0.3669), with category 1 denoting urban area. The interpretation is that someone living in urban area has a higher estimated probability of recovery within 2

weeks than someone living in rural area, when other variables are held constant. The odds ratio of 1.4433 means that the estimated odds of recovering within 2 weeks for someone living in urban areas equal 1.4433 times the estimated odds for someone living in rural areas. The estimated odds are 44.33% higher for urban area individual.

The coefficient of X4(2) is negative (-0.5678), meaning that someone who was infected with Covid-19 after receiving the first dose of Covid-19 vaccine has a lower estimated probability of recovering within 2 weeks than someone who was infected with Covid-19 before receiving the vaccine, when other variables are held constant. The odds ratio value of 0.5668 means that the estimated odds of recovering within 2 weeks for someone infected with Covid-19 after receiving the first dose of Covid-19 vaccine is 0.5668 times the estimated odds for someone infected with Covid-19 before receiving the vaccine. The estimated odds are 43.32% lower for individual infected with Covid-19 after receiving the first dose of Covid-19 vaccine.

The coefficient of symptoms (X5) is negative (-1.0448), with category 1 indicating moderate symptoms. The interpretation is that someone with moderate symptoms has a lower estimated probability of recovery within 2 weeks than someone with mild or no symptoms, when other variables are held constant. The odds ratio value of 0.3518 means that the estimated odds of recovering within 2 weeks for someone with moderate symptoms is 0.3518 times the estimated odds for someone with mild symptoms or no symptoms. The estimated odds are 64.82% lower for individual with moderate symptoms.

Other variables, namely sex (X1), age (X2), Sungkai leaves consumption (X6), and ginger consumption (X7), at significance level $\alpha = 10\%$, have no significant effects on the recovery time within 2 weeks or more than two weeks for Covid-19 sufferers. That age does not have a significant effect in this study can be understood from the age distributions which tend to be the same in the group of people who recovered within 2 weeks and those who recovered more than 2 weeks as seen in **Figure 4**. That sex, Sungkai leaves consumption status, and ginger consumption status have no significant effects in this study can be understood from the proportion of each of these variables which tends to be the same in the group of people who recovered within 2 weeks and those who recovered more than 2 weeks as seen in **Figure 3**. The interpretation of these variables is as follows.

The coefficient of age is negative (-0.0119), meaning that the higher the age, the smaller the estimated probability of recovery within 2 weeks, when other variables are held constant. The odds ratio value of 0.9882 means that for every one-year increase in age, the estimated odds of someone recovering within 2 weeks become 98.82% of the estimated odds before the age increase.

The coefficient of sex is positive (0.0565), with category 1 indicating female. The interpretation is that a female has a higher estimated probability of recovery within 2 weeks than a male, when other variables are held constant. The odds ratio of 1.0581 means that the estimated odds of recovering within 2 weeks for a female is 1.0581 times the estimated odds for a male. The estimated odds are 5.81% higher for a female.

The coefficient of X4(3) is positive (0.3564), meaning that someone who was infected with Covid-19 after receiving the second dose of Covid-19 vaccine has a higher estimated probability of recovering within 2 weeks than someone who was infected with Covid-19 before receiving Covid-19 vaccine, when other variables are held constant. The odds ratio of 1.4282 means that the estimated odds of recovering within 2 weeks for someone infected with Covid-19 after receiving the second dose of Covid-19 vaccine is 1.4282 times the estimated odds for someone infected with Covid-19 before receiving Covid-19 vaccine. The estimated odds are 42.82% higher for individual infected with Covid-19 after receiving the second dose of Covid-19 vaccine.

From the coefficient of X4(2) which is negative and the coefficient of X4(3) which is positive, this indicates the importance of receiving a complete dose of the Covid-19 vaccine, where the complete dose at the time of this data collection involved receiving the vaccine up to the second dose. Someone who received the second dose of Covid-19 vaccine has a higher estimated probability of recovering from Covid-19 within 2 weeks than someone who did not receive Covid-19 vaccine, while someone who received only the first dose of Covid-19 vaccine has a lower estimated probability of recovering within 2 weeks than someone who did not receive Covid-19 vaccine.

The coefficient of Sungkai leaves consumption status is positive (0.1509), with category 1 indicating yes. The interpretation is that someone who consumed Sungkai leaves has a higher estimated probability of recovery within 2 weeks than someone who did not consume, when other variables are held constant. The odds ratio of 1.1629 means that the estimated odds of recovering within 2 weeks for someone who consumed

Sungkai leaves is 1.1629 times the estimated odds for someone who did not consume. The estimated odds are 16.29% higher for someone consuming Sungkai leaves.

The ginger consumption status coefficient is negative (-0.1561), with category 1 indicating yes. The interpretation is that someone who consumed ginger has a lower estimated probability of recovery within 2 weeks than someone who did not consume, when other variables are held constant. The odds ratio of 0.8555 means that the estimated odds of recovering within 2 weeks for someone who consumed ginger is 0.8555 times the estimated odds for someone who did not consume. The estimated odds are 14.45% lower for someone consuming ginger.

From the interaction variable (X6:X7), information was also obtained that consuming Sungkai leaves along with ginger did not significantly affect the recovery time for Covid-19 sufferers. Its coefficient which is negative (-0.0964) means that someone who consumed sungkai leaves and ginger has a lower estimated probability of recovery within 2 weeks than someone who did not consume, when other variables are held constant. The odds ratio of 0.9081 means that the estimated odds of recovering within 2 weeks for someone who consumed Sungkai leaves and ginger are 0.9081 times the estimated odds for someone who did not consume. The estimated odds are 9.19% lower for someone consuming Sungkai leaves and ginger.

However, since these variables are not statistically significant, meaning that this study did not find enough evidence to prove that these variables affect the recovery time of Covid-19 sufferers, further research is still needed to truly understand the effects of these variables, especially Sungkai leaves consumption, on the recovery time of Covid-19 sufferers.

4. CONCLUSIONS

In this study, there was no difference between the logistic regression model and the GWLR model in the context of recovery of Covid-19 patients within 2 weeks and more than 2 weeks based on the values of AIC and the ratio of deviance and degrees of freedom (df). The factors significantly effecting the recovery time for Covid-19 sufferers based on logistic regression model are residence, vaccination status, and symptoms, while other variables, namely sex, age, Sungkai leaves consumption status, and ginger consumption status have no significant effects. The consumption of a herbal made from Sungkai leaves which is believed to speed up the healing from Covid-19 by some people in West Sumatra has not been proven to have an effect on recovery within 2 weeks or more than 2 weeks for Covid-19 sufferers in this study. Further health research is needed to investigate whether consuming Sungkai leaves can actually affect the recovery time from Covid-19.

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