Sociodemographic Factors, Physical Area Characteristics and Health Service Associated Intervensions with Malaria: Cases in Pesawaran District_ Lampung Province*

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ABSTRACT

Malaria is an infectious disease that still a health problem. In 2020, it was reported that malaria cases in the world throughout 2019 were 229 million, with 409 thousand deaths due to malaria, especially with children under 5 years old. Malaria disease in 2019 in Indonesia was 250,644 cases, in Lampung Province 1,521 cases, and in Pesawaran Regency 888 cases with several extraordinary events (KLB). The occurrence of malaria cases is influenced by many factors, including sociodemography, physical area characteristics, and health service associated interventions. This study aims to determine the influence of sociodemographic, physical area characteristics, and health service associated interventions and to formulate recommendations for malaria control efforts based on prediction models in Pesawaran Regency. This study is an observational study with a cross-sectional design. A sample of 436 people with data collection techniques using secondary data sourced from e-sismal and Health Centers laboratory registers while primary data collection with a questionnaire guide to measure research variables. This study uses a causal relationship approach between variables (Y) and variables (X). The model chosen was a logistic regression with the response variable using a binary scale, namely malaria versus no malaria. Optimization of model parameters using statistical software. The results showed that the variables that had a significant positive effect on the incidence of malaria were the behavior stay outside at night, the distance of the vector breeding place 0-1,000 meters from the residence, the type of vector breeding place in the form of a lagoon, while the variables that had a significant negative effect were the use of mosquito repellent, the use of Long Lasting Insecticidal Nets (LLINs), Indoor Residual Spraying (IRS) and Mass Blood Surveys (MBS). Variables that have no significant effect on the incidence of malaria include age, sex, occupation, education, altitude, larviciding and removal of mosses.

Keywords: malaria, sociodemography, physical area characteristics, health service associated intervension.

INTRODUCTION

Malaria still becomes a health problem with a focus on activities for control. In the last three years, namely 2017 (0.44%), 2018 (0.66%) and 2019 (0.32%). Malaria cases in Lampung Province during this period were fluctuating, often accompanied by several extraordinary events, endemic malaria in several districts in Lampung Province such as South Lampung, Pesawaran, and West Coast Districts (Dinkes Provinsi Lampung, 2020). Pesawaran Regency is a malaria-endemic area with Annual Parasite Incidence (API) in 2017 (7.16%), 2018 (4.64%), and 2019 (2.00%), classified as an area with a medium malaria transmission rate or Medium Case Incidence (MCI). However, if explored further, there were only five health centers that reported malaria cases during the last 3 years from 15 health centers in Pesawaran Regency. These health centers are Hanura, Padang Cermin, Bunut, Maja and Pedada Health Centers (Dinkes Pesawaran, 2020). Sociodemographic factors that are closely related to the incidence of malaria are age, gender, education, occupation, a habit of stay outside at night, and use of mosquito repellent (Kemenkes RI, 2015). The physical area characteristics that affect malaria cases in a place are very diverse. The malaria vector of the Anopheles sundaicus mosquito, for example, lives and breeds in coastal and coastal areas. In the lowlands, one of the malaria vector mosquitoes is Anopheles aconitus. The main breeding places are terraced rice fields and irrigation canals, rivers with slow water flow, or ponds that are slightly alkaline. The vector of the malaria mosquito, Anopheles maculatus, breeds in mountains or in small rivers, clear water, and springs that are directly exposed to sunlight (Arsin, 2012). The factor of health service associated interventions for malaria control programs in Indonesia is to carry out plasmodium discovery activities as early as possible with the Mass Blood Survey (MBS) through laboratory examination and perform malaria treatment according to standards. Another health service associated interventions is to control malaria vectors by removing mosses and larvaciding at vector breeding places so that Anopheles mosquito larvae cannot develop into adult mosquitoes (Kemenkes RI, 2015).

The aims of this study were 1) to determine the influence of sociodemographic factors: age, gender, occupation, education, stay outside at night and using mosquito repellent with malaria; 2) Determine the influence of physical area characteristics: altitude (hypometry), the distance of vector breeding places and types of vector breeding places with malaria; 3) Determine the influence of health service associated interventions: larviciding, moss removal, use of Long Lasting Insecticidal Nets (LLINS), Indoor Residual Spraying (IRS) and Mass Blood Survey (MBS) on malaria; 3) Prepare recommendations based on prediction models in malaria control efforts in Pesawaran District, Lampung Province.

RESEARCH METHODS

This type of research is observational with a cross-sectional research design. This study uses a causal relationship approach between the dichotomous or binary response variable (Y) and the independent variable (X) in the form of interval or categorical data. The postulate of the model chosen is binary logistic regression with the response variable using a binary scale in the form of malaria versus not malaria. A score of 1 is given if a sample has malaria and if not, a score of zero is given. The two possible occurrences (1 versus 0) are theorized as a result of each independent variable which includes sociodemographic variables, physical area characteristics, and health service associated intervention variables. The predictor variables, symbols, units, and ways of scoring into the model are presented in Table 1 below:

Table 1. Predictor variables, symbols, units, and ways of scoring into the model

No	Malaria Incidence Predictor Variables	Symbol in Model	Unit	Data Scale	How to Score into the Model
1.	Respondent's age	[UMR]	Years	Ratio	=original data value
2.	Respondent's gender	[JKEL]	-	Binary	=1 if male; 0=if female
3.	Dummy_ respondent's occupation as fisherman/farmer	[D1_NLYN/PTMB]	-	Category	=If you're a fisherman or a farmer, you'll get a 1; otherwise, you'll get a 0.
4.	Dummy_ the respondent's occupation was as a farmer, gardener, or miner.	[D1_PTNI/BKBN]	-	Category	=1 if farmer/gardener; 0=otherwise
5.	Dummy_ the respondent's occupation as a trader/entrepreneur	[D1_PDGG/WRST]	-	Category	=1 if trader/entrepreneur; =0 otherwise
6.	Dummy_ respondent's occupation as military/police/government employes/employee/student	[D1_TPAKP]	-	Category	=1 if military/police/government employes/employee/student; =0 otherwise
7.	Dummy_ respondents graduated from junior high school	[D2_SMP]	-	Category	=1 Junior high school; =0 otherwise
8.	Dummy_ respondents graduated from senior high school	[D2_SMA]	-	Category	=1 Senior high school; =0 otherwise
9.	Dummy_ respondents passed college	[D2_PT]	-	Category	=1 college; =0 otherwise
10.	Stay outside at the night	[KRMH]	-	Binary	=1 if you are stay outside at the night; =0 if you're not stay outside at the night;
11.	Use of mosquito repellent	[MOAN]	-	Binary	=1 if using mosquito repellent; =0 if not using mosquito repellent
12.	Land elevation (hypometry)	[KTD]	Mdpl	Ratio	=original data value
13.	Dummy_ breeding places distance 0 to 1000 meters	[D3_JTPV5]	-	Category	=1 if within 1-1000 meters there is breeding places; 0 if others
14.	Dummy_ breeding places distance 1001 to 2000 meters	[D3_JTPV10]	-	Category	=1 if within 1001-2000 meters there is breeding places; 0 if others
15.	Dummy_ breeding places distance 2001 to 3000 meters	[D3_JTPV20]	-	Category	=1 if within 2001-3000 meters there is breeding Places; 0 if others
16.	Dummy_ lagoon types	[D4_LGN]	-	Category	=1 if lagoon; =0 if others
17.	Dummy_ swamp types	[D4_RWA]	-	Category	=1 if swamp; =0 if others
18.	Dummy_ abandoned pond types	[D4_TMBT]	-	Category	=1 if abandoned pond; =0 if others
19.	Dummy_ rice field types	[D4_SBTR]	-	Category	=1 If the rice fields are terraced, =0; otherwise
20.	Dummy_ irrigation canal types	[D4_SLIG]	-	Category	=1 if irrigation canals; otherwise, =0
21.	Dummy_ type of pond/dig	[D4_KLGL]	-	Category	=1 if the pond/dig; =0 otherwise
22.	Dummy_larvaciding	[D5_LVCD]	-	Category	=1 If larvaciding is done, =0 if any other
23.	Dummy_ moss removal	[D5_PLMT]	-	Category	=1 if moss removal is done; Otherwise, =0
24.	Dummy_ use of long lasting insecticide nets/LLINs	[D6_LLINs]	-	Catagory	=1 if using long lasting insecticide nets /LLINs=0 otherwise
25.	Dummy_ indoor recidual spraying/IRS	[D6_IRS]	-	Category	=1 If you indoor recidual spraying/IRS; =0 Otherwise,
26.	Mass blood survey/MBS	[MBS]	-	Category	=1 if you take mass blood survey /MBS; = 0 otherwise

RESULTS AND DISCUSSION

Univariate Analysis Results

From the univariate analysis, data on the distribution of respondents was obtained based on 12 characteristics, namely: age group, gender, occupation, education, behavior stay outside at night, use of anti-mosquito drugs, elevation of the plains, distance from home to vector breeding places, types of vector breeding places within 0-3000 meters, intervention for vector breeding places, intervention for malaria vectors, and intervention for plasmodium.

Table 1. Distribution of research respondents based on characteristics

No	Characteristics of Respondents	N	%
	Sociodemography		
1.	Age group		
	a. 1-15 years old	3	0,69%
	b. 16 – 65 years old	425	97,48%
	c. > 65 years old	8	1,83%
2.	Gender		
	a. Female	296	67,89%
	b. Male	140	32,11%
3.	Profession		
	a. housewife/not working	132	30,28%
	b. Fisherman/Farmers	119	27,30%
	c. Farmer/gardener/miner	79	18,11%
	d. Trader/entrepreneur	25	5,73%
	e. TNI/POLRI/ASN/Employees/Students	81	18,58%
4.	Education		
	a. SD	64	14,68%
	b. junior high school	162	37,16%
	c. senior High School	198	45,41%
	d. College	12	2,75%
5.	Behavior outside the house at night		
	a. Get out of the house at night	220	50,46%
	b. Don't leave the house at night	216	49,54%
6.	Use of mosquito repellent		
	a. Do not use mosquito repellent	227	52,06%
	b. Using mosquito repellent	209	47,94%
	Physical Area Characteristics		
7.	Land elevation (Hypometry)		
	a. 0,00 – 25,00 mdpl	403	92,43%
	b. 25,01 – 50,00 mdpl	23	6,19%
	c. 50,01 – 100,00 mdpl	10	1,38%
8.	Distance from house to breeding place vector		
	a. 0 – 1.000 meter	155	35,55%
	b. 1.001 – 2.000 meter	56	12,84%
	c. 2.001 – 3.000 meter	22	5,05%
	d. > 3.000 meter	203	46,56%
9.	Types of vector breeding places within 0 – 3,000 meters		
	a. Lagoon	104	23,85%
	b. Swamp	76	17,43%
	c. Abandoned pond	54	12,39%
	d. Rice terraces	10	2,29%
	e. Irrigation canal	2	0,46%
	f. Excavation pool	9	2,06%
	g. No vector breeding grounds	181	41,51%
	Health Service Associated Intervensions		
10.	Vector breeding place intervention		
	a. No intervention	298	68,34%
	b. Larvaciding	76	17,43%
	c. Moss Lift	62	14,23%
11.	Malaria vector intervention		
	a. No intervention	232	53,21%
	b. Long Lasting Insecticidal Nets (LLINs)	156	35,78%
	c. Indoor Residual Spraying (IRS)	48	11,01%
12.	Plasmodium Intervention		
	a. No intervention	185	42,43%
	b. Mass Blood Survey (MBS)	251	57,57%

Analysis Results Binary Logistic Regression

Table 2. Results of optimization of research on the influence of sociodemography, physical characteristics of the area and health service efforts on malaria

Predictor	Simbol	Coef.	SE Coef	Z	P	Odds Ratio	95% Lower	CI Upper
Constant		114.306	192.032	0.60	0.552			
Sociodemography								
Age (years)	[UMR]	α1 -0.0202340	0.0307743	-0.66	0.511	0.98	0.92	1.04
Gender (0=Female)	[JKEL]	α2 1.27568	0.978329	1.30	0.192	3.58	0.53	24.37
Workplace (0=IRT/Not Working)								
Fishermen/Farmers	[D1_NLYN/PTMB]	α3 -0.527641	1.09366	-0,48	0.629	0.59	0.07	5.03
Farmer/Gardening/Labor/Mining	[D1_PTNI/BRKBN]	α4 -0.563427	1.20772	-0.47	0.641	0.57	0.05	6.07
Trader/Entrepreneur	[D1_PDGG/WRST]	α5 -0.788517	1.34504	-0.59	0.558	0.45	0.03	6.35
Military/Police/Government Empployee/Employees/Student	[D1_TPAKP]	α6 -1.14061	0.989117	-1.15	0.249	0.32	0.05	2.22
Education								
Junior High School	[D2_SMP]	α7 0.627210	1.10794	0.57	0.571	1.87	0.21	16.42
Senior High School	[D2_SMA]	α8 1.61759	1.19726	1.35	0.177	5.04	0.48	52.68
College	[D2_PT]	α9 2.46045	195.779	1.26	0.209	11.71	0.25	543.29
Stay Outside at Night (0=No)	[KRMH]	α10 4.25364	0.901948	4.72	0.000	70.36	12.01	412.16
Using Mosquito Repellent (0=No)	[MOAN]	α11 -4.97580	107.085	-4.65	0.000	0.01	0.00	0.06
Physical Area Characteristics								
Plain Altitude (masl)	[KTD]	α12 0.0260722	0.0408866	0.64	0.524	1.03	0.95	1.11
Breeing place distance (0=> 3.000 m)								
0 – 1.000 m	[D3_JTV5]	α13 4.57420	135.840	3.37	0.001	96.95	6.77	1389.37
1.001 – 2.000 m	[D3_JTV10]	α14 0.883319	134.654	0.66	0.512	2.42	0.17	33.87
2.001 – 3.000 m	[D3_JTV10]	α15 2.11497	223.562	0.95	0.344	8.29	0.10	662.96
Type of breeding places (0=no breeding places)								
Lagoon	[D4_LGN]	α16 2.87183	1.44024	1.99	0.046	17.67	1.05	297.27
swamp	[D4_RWA]	α17 -2.09404	1.31722	-1.59	0.112	0.12	0.01	1.63
Abandoned Pond	[D4_TMBT]	α18 -0.154395	116.592	0.13	0.895	1.17	0.12	11.47
Rice Terraces	[D4_SBTR]	α19 -1.11470	235.406	-0.47	0.636	0.33	0.00	33.09
Irrigation canal	[D4_SLIG]	α20 3.06017	362.022	0.85	0.398	21.33	0.02	253736.88
Digging Pool	[D4_KLGL]	α21 -1.28773	351.707	-0.37	0.714	0.28	0.00	271.94
Health associated intervensions								
Breeding places intervention (0=None)								
Larvaciding	[D5_LVCD]	α22 -1.83076	120.223	-1.52	0.128	0.16	0.02	1.69
Moss removal	[D5_PLMT]	α23 -2.12563	110.126	-1.93	0.054	0.12	0.01	1.03
Vector Intervention (0=None)								
LLINs	[D4_LLINs]	α24 -2.70970	0.801491	-3.38	0.001	0.07	0.01	0.32
IRS	[D1_IRS]	α25 -2.67014	0.948238	-2.82	0.005	0.07	0.01	0.44
Plasmodium Intervention (0=Not Done)								
MBS	[MBS]	α26 -3.22031	0.796065	-4.05	0.000	0.04	0.01	0.19

Based on the results of the optimization of model parameters, it can be seen that the relationship between sociodemographic factors, physical characteristics of the region and health service efforts against malaria in Pesawaran District, Lampung Province can be formulated as follows:

$$\text{Ln}\frac{(p[Malaria] = 1])}{(1 - p[Malaria = 1])}$$

=1.14306–0.0202340[UMR] + 1.27568[JKEL]-0.527641[D1_NLYN/PTMB] - 0.563427 [D1_PTNI/BRKBN] - 0.788517[D1_PDGG/WRST] - 1.14061[D1_TPAKP] + 0.627210[D2_SMP] + 1.61759[D2_SMA] + 2.46045[D2_PT] + 4.25364[KRMH] - 4.97580[MOAN] + 0.0260722[KTD] + 4.57420[D3_JTV5] + 0.883319[D3JTV10] + 2.11497[D3_JTV20 + 2.87183[D4_LGN] - 2.09404[D4_RWA] + 0.154395[D4_TMBT] - 1.114470[D4_SBTR] + 3.06017[D4_SLIG] - 1.28773[D4_KLGL] - 1.83076[D5_LVCD] - 2.12563[D5_PLMT] - 2.70970[D6_LLINs] - 2.67014 [D6_IRS] - 3.22031[MBS]

Results of the Goodness of Fit Test on the Model

The results of the goodness of fit test in this study were of good value for the malaria incidence estimation model [YI] or the non-malaria incidence estimation model [YII] from the minitab output results showed that both could be assessed very well. The assessment is based on the fact that [YI] gives test results G = 511.535 (%) Df 26, P = 0.000, as can be seen in Table 3, which means that if someone has malaria, it is predicted with the influence of the three independent variables, thus the predictor model for [YI] can be expressed as the formulation of the model above.

Sociodemography

The results of this study also explain that $\alpha 10$ with Odd Ratio = 70.36 (P = 0.000) which means that if other variables remain constant, the behavior of stay outside at night without using personal protective equipment such as gloves, shirts, and trousers, then the respondent's chances of being exposed malaria increased to 70.36 times compared to respondents who did not leave the house at night. The increased chance of getting malaria was very significant as shown by P=0.000. This is in line with research by Nababan, et al (2018) in Purworejo Regency, Central Java Province which concluded that the habit of going out at night has a relationship with the incidence of malaria with a P-value = 0.01 and an Odds Ratio (OR) = 3.6. Leaving the house at night without using personal protective equipment such as gloves, long pants, and long clothes facilitates contact between humans and Anopheles mosquitoes. Anopheles mosquitoes with habitual behavior of biting humans (anthropophilic) and biting outside the house (exophilic) at 18.00 to 06.00 in the morning (Widoyono, 2011).

The results of statistical analysis show that the variable $\alpha 11$ is negative with Odd Ratio = 0.01 (P = 0.000) which means that, if other variables remain the same then respondents who use mosquito repellent have a decreased chance of contracting malaria to only 0.01 times compared to respondents who do not use mosquito repellent. This decrease in probability is significant, as indicated by the value of P=0.000. This is in line with research conducted by Budiyanto (2011) in Ogan Komering Ulu Regency, South Sumatera Province which stated that there was a significant relationship between the use of mosquito repellent and malaria cases with Odd Ratio = 0.231 (P = 0.0001). The behavior of the Anopheles mosquito which has a habit of biting at night between 18.00 and 06.00 in the morning which allows respondents who use mosquito repellent at night to have low contact with mosquitoes, thereby reducing malaria transmission through Anopheles mosquito bites.

Physical Area Characteristics

Physical area characteristic is variable distance of vector breeding places, based on the results of statistical tests conducted that the parameters α13, α14 and α15 are positive with the Odd Ratio value of 96.95 respectively; 2.42 and 8.29 with P value = 0.001; 0.512 and 0.344. This shows that if the other variables remain constant, each additional distance between the respondent's residence and the vector breeding place means the probability of contracting malaria becomes 96.95, respectively; 2.42 and 8.29 times the original. However, this opportunity is very real if the respondent's place of residence is within < 1000 meters from a vector breeding place with a P value of 0.001. This does not happen for the respondent's residence which is within 1001 - 2000 meters and 2001 - 3000 meters with vector breeding places because the P values are 0.512 and 0.344 respectively. This is in accordance with the results of research by Kazwani and Martini (2006) in East Lombok Regency, West Nusa Tenggara Province which stated that the distance between residence and vector breeding sites was associated with the incidence of malaria with Odd Ratio = 1.78 and P = 0.028. The distance of the respondent's house/residence <1,000 meters is relatively close to the vector breeding place, has a higher risk than the respondent whose house/place of residence is far from the vector breeding place. The close distance to the vector breeding sites causes them to be in a malarialogenic potential area or a potential area for malaria disease, which is influenced by two factors, namely receptivity and vulnerability. Receptivity is the presence of large numbers of malaria vectors and the presence of ecological factors that facilitate malaria transmission, while vulnerability is the presence of malaria sufferers or vectors who have been infected with malaria in a certain area (Harijanto, 2014). Receptivity is also caused by the distance radius of vector breeding sites which is <1,000 meters from the house/residence which is still within the range of the normal flying ability of the Anopheles mosquito. Anopheles mosquitoes have the ability to fly as far as 1 to 1.5 km (Kemenkes, 2014).

Furthermore, the results of the statistical tests carried out showed that α16, α17, α18, α19, α20 and α21 the Odd Ratio values were 17.67, respectively; 0.12; 1.17; 0.33; 21.33 and 0.28 with P value = 0.046; 0.112; 0.895; 0.636; 0.398 and 0.714. This indicates that of the six types of vector breeding sites in Pesawaran Regency in the form of lagoons and kobakan, swamps, abandoned ponds, terraced rice fields, irrigation canals and excavated ponds that have a significant causal relationship if the other variables remain are lagoons with an Odd Ratio of 17.67. and P value = 0.046. This is in line with the research by Sukiswo et al., (2014) in Arongan Lambalek Subdistrict, West Aceh Regency which stated that an environment where there was standing water and bushes was associated with the incidence of malaria with Odd Ratio = 6.827 and P = 0.000. In this study, the distribution of respondents based on the type of vector breeding place in the form of lagoons was 23.85% or a total of 104 respondents, 72 respondents were exposed to malaria and 32 people were not affected by malaria. The lagoon has relatively not been a concern for broodstock interventions so far, as the results of the description analysis on the intervention variable for vector breeding sites with Larvaciding or moss removal, which is 68.34% there is no intervention on vector breeding sites.

Health Service Associated Intervensions

Health service associated interventions are the variable use of Long Lasting Insecticidal Nets (LLINs) and Indoor Residual Spraying (IRS). 0.001 and 0.005. It can be concluded that the intervention of health care efforts against malaria vectors by using Long-Lasting Insecticidal Nets (LLINs) and Indoor Residual Spraying (IRS), if other variables remain constant, can reduce susceptibility to malaria by 0.07 and 0.07 times, respectively, compared to if there isn't intervention against malaria vectors is carried out. The decrease was significant, as indicated by the P values of 0.001 and 0.005, respectively. This is in line with a study by Sir., et al (2015) in Abola District, Alor Regency, East Nusa Tenggara which stated that the use of insecticide-treated mosquito nets had an effect on the incidence of malaria with a P-value of 0.021. The use of Long Lasting Insecticidal Nets (LLINs) and Indoor Residual Spraying (IRS) has a similar way of working to control the malaria vector, namely the Anopheles mosquito. Long Lasting Insecticidal Nets (LLINs) are intended as a barrier or barrier so that people who wear them avoid being bitten by Anopheles mosquitoes. In addition to blocking the bite of Anopheles mosquitoes, Long-Lasting Insecticidal Nets (LLINs) can also kill mosquitoes because the mosquito nets have been applied to certain insecticides but do not harm the people who use them. Indoor Residual Spraying (IRS) also applies insecticide as a residue from spraying which is expected to also kill Anopheles mosquitoes that perch and rest on the inner walls of the house. The two health service associated intervensions in this study had a significant effect on the incidence of malaria.

The results of statistical tests on other health care effort factors, namely the Mass Blood Survey (MBS) variable, showed that 26 was negative, meaning that the chance of getting malaria decreased if other variables remained constant malaria decreased to 0.04 times the original, this decrease was significant because the P-value = 0.000. The results of this study are in line with the theory that the earlier Plasmodium is found in the community and malaria treatment is carried out according to standards, the transmission of malaria can be prevented so that malaria treatment can also function as prevention of malaria infection. The research of Putra et al., (2015) in Labuhan Maringgai Subdistrict, East Lampung Regency, Lampung Province stated that there was a relationship between the variables of respondents who had participated in the malaria eradication program tended to be healthier by 3.71 times earlier than respondents who did not participate in the malaria eradication program.

Recommended Research Results

Referring to the results of the study, recommendations can be given to the community and local government as policy makers to tackle malaria in Pesawaran Regency by conducting public policy analysis to suppress malaria in the community. The steps for analyzing public policy include: 1) Listing several predictor variables that have been shown to have a significant effect on the incidence of malaria; 2) Presenting several program options in accordance with the first step; and 3) List several possible sources of budget that allow the implementation of malaria control activities. Meanwhile, the public policy options with great potential to reduce the incidence of malaria in Pesawaran Regency can be seen in Table 3 below.

Table 3. Public policy options with a high probability of reducing the incidence of malaria

No	Malaria Incidence Predictor Variables	Symbol in Model	Policy Domain	Parameter	Program Form What Can Be Submitted	Possible Sources of Funds
1.	Stay outside at Night	[KRMH]	Yes	α_{10}	[1] Counseling for recitation groups/other social groups	APBD/DD/ADD
2.	Use of mosquito repellent	[MOAN]	Yes	α_{11}	[1] Counseling for recitation groups/other social groups	APBD/DD/ADD
3.	Dummy_ TPV distance 0-1.000 meters	[D3_JTPV5]	No	α_{13}	[1] Establishment of the malaria prevention “10 Amal” [2] Reinforcement of Solaria (school of malaria)	DD/ADD
4.	Dummy_ Type of breeding places Lagoon	[D3_JTPV20]	Yes	α_{16}	[1] Production of sourche reduction [2] Distribution of larvae-eating fish [3] Larvaciding and integrated moss removal	APBN/APBD/DD
5.	Dummy_ LLINs Vector Interventions	[D6_LLINS]	Yes	α_{24}	[1] Counseling on the use of LLINs [2] Distribution/re-dyeing of mosquito nets with insecticide	APBN/APBD/DD
6.	Dummy_ IRS Vector Intervention	[D6_IRS]	Yes	α_{25}	[1] Periodic IRS [2] Training of village malaria cadres	APBN/APBD/DD
7.	MBS	[MBS]	Yes	α_{26}	[1] Periodic MBS[2] Training of malaria cadres for the manufacture of thick/thin blood preparations	APBN/APBD/DD

CONCLUSION AND SUGGESTION

Based on the description of this research as mentioned above which was done in Pesawaran Regency, Lampung Province, it can be concluded that 1) The incidence of malaria is influenced by sociodemographic factors: stay outside night and using mosquito repellent 2) The incidence of malaria is influenced by physical area characteristics: distance from vector breeding places 0-1,000 meters and the type of vector breeding place is a lagoon/kobakan; 3) The incidence of malaria is influenced by health service associated intervensions: the use of Long Lasting Insecticidal Nets (LLINs), Indoor Residual Spraying (IRS) and Mass Blood Surveys (MBS); and 4) Malaria predictor model can help predict the risk of malaria incidence in Pesawaran Regency, Lampung Province. From the results of the predictor model of this study, several programs can be recommended in an effort to control malaria in Pesawaran Regency, Lampung Province, namely 1) Counseling in the recitation group or social group; 2) Establishment of the Dasawisma malaria prevention and reinforcing Solaria (malaria school) with a clear curriculum and schedule and supported by fields that have competence in their fields; 3) Creation of source reduction channels to increase the salinity of brackish water or reduce water volume, distribution of larvae-eating fish (lead head), larvaciding and integrated moss removal in vector breeding sites so that Anopheles mosquito larvae can be controlled; 4) Counseling on the use of Long Lasting Insecticidal Nets (LLINs) and distribution or re-dyeing of Long-Lasting Insecticidal Nets (LLINs), especially in villages with high malaria endemicity and in hamlets where malaria clusters are formed; 5) Integrated Indoor Residual Spraying (IRS) with village malaria cadre training to maintain the quality and sustainability of vector control efforts that rely on community empowerment efforts; 6) Periodic Mass Blood Survey (MBS) and training of village malaria cadres to make thick/thin blood preparations, so that malaria cases in the community are found as early as possible so that malaria transmission can be prevented by standard treatment. All of these recommendations are aimed at achieving the goal of the malaria control program in Indonesia, namely malaria elimination by 2030.

It is recommended to conduct research with a larger and diverse sample, it is necessary to conduct research in various other areas to refine the malaria predictor model, especially on variables that have a relatively significant relationship with the incidence of malaria and conduct further research with a wider area coverage.

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