







Analysis of Internal Community Factors in Participating in the Family Planning Program in Medan Johor District Using the Logistic Regression Method

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ABSTRACT

Regression is a statistical analysis method to describe the relationship between the dependent variable which has two or more categories with one or more independent variables on a categorical or continuous scale. The purpose of this study is to apply the logistic regression method to see how much influence the Internal Factor Analysis of the Community has in participating in the Family Planning Program in Medan Johor District. As is known, according to data from the BPS for North Sumatra Province, Medan Johor is included in a slum sub-district because it is caused by the dense population in this sub-district which is not in accordance with its area. The total population in Medan Johor District currently reaches 137,367 people, with an area of 16.96 km² and a population density of 8,099 people/km². So that in this study, it was found that the level of education, age and occupation did not have a significant effect on opinion, which had a significant effect on opinion with a Sig value of 0.020 < 0.05, namely the community's knowledge of the family planning program.

Keyword: Logistics Regression, Familu Planning Program, Medan Johor



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1. Introduction

The population in Indonesia is increasing from year to year, currently the population of Indonesia is increasing rapidly which has resulted in population density in Indonesia. The Central Statistics Agency (BPS) announced the results of the 2020 Population Census which took place last year [1][2]. BPS recorded data on the population in Indonesia as of September 2020 at 270.2 million people. This figure increased by 32.57 million people from the total population of Indonesia in 2010 which was 237.63 million people. On average, every year over the last decade the population of Indonesia has increased by 1.25% [3][4]. This is homework for the government and the community's active role in solving this problem. The government program, namely Family

Planning (KB) after the post-New Order, has not been well realized and accepted by the community, because several factors can influence the decision to take part in a family planning program. Basically, the results of the family planning program are useful for the development and development of Indonesian society itself. In reality, the pros and cons regarding family planning still occur. Just as there are those who think that determining the number of children is a human right where the government does not need to intervene and limit children with family planning, such as limiting sustenance from God. The term that is often heard in our society for this is "many children, lots of fortune"[5][6].

The city of Medan is one of the largest cities in Indonesia which continues to grow, both in terms of development of facilities and infrastructure and population. The population in the city of Medan calculated from 2010 to 2014 continues to increase. Based on the results of the 2010 population census, it reached 2,097,610 people, in 2011 it reached 2,117,224 people, in 2012 it reached 2,122,804 people, in 2013 it also increased to 2,123,210 people, and in 2014 it became 2,191,140 people (BPS, 2014)[7]. This data shows that a large or even excessive population will cause many problems and negative impacts. Population density occurs due to many things, namely the imbalance in the number of births and deaths, high birth rates, large amounts of urbanization, and many others. Several sub-districts in the city of Medan that have a large population are in the North Medan area, such as Medan Belawan sub-district, Medan Labuhan sub-district, Medan Marelan sub-district, Medan Tembung sub-district, Medan Denai sub-district, Medan Sunggal sub-district, and Medan Johor sub-district. There is even one in the central area of Medan City (GDPK-Medan 2015-2040).

According to data from BPS North Sumatra Province, Medan Johor is a densely populated sub-district because the large population in this sub-district does not correspond to the area. The population in Medan Johor District currently reaches 137,367 people, with an area of 16.96 km² and a population density of 8,099 people/km². Quoted from Population Composition (2019), population density is the ratio between the number of residents and the area occupied. Population density uses population units per person/km². The larger the number, the denser the area. On the other hand, if the number is smaller, the population will be sparser [8]. So, the appropriate area size is if the division gets a small number, then there is no population density in that area. The problem of population density in the city of Medan, especially in the Medan Johor sub-district, is influenced by the birth rate which is higher than the death rate and population movement. According to the BPS population census source for North Sumatra Province in 2012 the total birth rate (TFR) for Medan City was 216 (Susenas, 2012). If we observe the fertility pattern according to ASFR (birth rate according to age groups) in Medan city, namely at the age of 15-19 years it is 1, at the age of 20-24 years it is 8, at the age of 25-29 years it is 14, at the age of 30-34 years it is 12, at the age of 35 -39 years is 6, aged 40-44 years is 2, and aged 45-49 years is 0 (Susenas, 2012). According to Plumer (Slamet, 1994: 97), several factors that influence people to take part in the participation process in family planning programs are: internal and external factors. Internal factors include knowledge, work and level of education, while external factors include factors that originate from outside a person or individual. This factor includes the surrounding environment, including the people closest to you.

Logistic Regression is a method of statistical analysis to describe the relationship between a dependent variable that has two or more categories and one or more independent variables on a categorical or continuous scale. Logistic regression can be divided into binary logistic regression, multinomial logistic regression, and ordinal logistic regression. The binary logistic regression model is used to analyze the relationship between one response variable and several predictor variables, with the response variable in the form of dichotomous qualitative data, namely a value of 1 to indicate the presence of a characteristic and a value of 0 to indicate the absence of a characteristic. The binary logistic regression model is used if the response variable produces two categories with values 0 and 1, so that it follows the Bernoulli distribution as follows:

$$f(y_i) = \pi_i^{y_i}(1 - \pi_i)^{1-y_i} \quad (1)$$

$$\pi(x) = \frac{\exp(\beta_0 + \beta_1 x)}{1 + \exp(\beta_0 + \beta_1 x)} \quad (2)$$

$$g(x) = \ln \left[\frac{\pi(x)}{1 - \pi(x)} \right] = \beta_0 + \beta_1 x \quad (3)$$

Model tests are carried out to examine the role of predictor variables on response variables simultaneously or as a whole. This simultaneous test is also called the chi square model test (Sepang, 2012). G test statistics or Likelihood Ratio Test:

$$G = -2 \ln \left[\frac{\binom{n_1}{n}^{n_1} \binom{n_0}{n}^{n_0}}{\prod_{i=1}^n \hat{\pi}_i^{y_i} (1 - \hat{\pi}_i)^{1-y_i}} \right] \quad (4)$$

2. Method

The study was using quantitative methods to analyze the internal community factors in participating in the family planning program in Medan Johor District using logistic regression. The data collection was done by some steps: a) Determining the sample size using the Slovin formula; b) Making a questionnaire using the Likert and Guttman Scale; c) Distribution of questionnaires to the community in Medan Johor sub-district and the following are several criteria in the research questionnaire. The education level was divided into middle schools, high school, bachelor degree, and magister degree.

3. Result and Discussion

Logistic regression is a type of regression which means it has a dependent variable and an independent variable. The special characteristic of logistic regression is that it has a dependent variable in the form of a dummy or nominal scale or is binary in nature. The concept of manual logistic regression calculations will be to calculate the likelihood first and then find the maximum value of the sum of the likelihoods using addins solver in Microsoft Excel. The advantage of using the maximum likelihood method is that the likelihood ratio test can be implemented to assess the suitability of the excess estimates of logistic regression parameters using MLE (Maximum Likelihood Estimation). MLE is a function of parameters that maximizes its chances of estimating the parameters. The following are the steps for calculating manual Logistic Regression and finding the maximum log likelihood value using Microsoft Excel:

- a) This logistic regression data consists of four independent variables so that the values to be looked for are b_0, b_1, b_2, b_3 and b_4 with the model $Y = b_0 + b_1 x_1 + b_2 x_2 + \dots + b_n x_n$
- b) The next step is to write b_0, b_1, b_2, b_3, b_4 and write a random value next to it. This value is the basic assumption value for determining likelihood. Here the author writes 0.01 for b_0 , 0.02 for b_1 , 0.03 for b_2 , 0.04 for b_3 and 0.05 for b_4 .

Next is to calculate the logit, or commonly known as the predicted Y value with the model $Y = b_0 + b_1 x_1 + b_2 x_2 + \dots + b_n x_n$ in the column next to X.

In hypothesis testing, this research uses logistic regression. In logistic regression test statistics, it is used to predict the probability of an event occurring by fitting the data to the logit function of the logistic curve. This method is a general linear model used for binomial regression. Like regression analysis in general, this method uses several predictor variables, both numerical and categorical. According to Ghazali (2012: 333), research generally uses a significance level of 1%, 5%, or 10%. In hypothesis testing, if $\alpha = 5\%$ is used, it means that the researcher has confidence that out of 100% of the sample, the probability of sample members not having population characteristics is 5%. Based on this theory, this test was carried out using a significance level of 0.05 ($\alpha = 5\%$). The conditions for rejecting or accepting a hypothesis are as follows:

- a) If the significance value is < 0.05 then the hypothesis is accepted (significant regression coefficient). This means that the independent variable has a significant influence on the dependent variable.
- b) If the significance value is > 0.05 then the hypothesis is rejected (the regression coefficient is not significant). This means that the independent variable does not have a significant influence on the dependent variable.

Significance testing in logistic regression can be divided into two, namely simultaneous testing and partial testing. Individual or partial testing can be done with the Wald Test. Meanwhile, simultaneous testing is carried out using the Overall Model Fit/Omnibus Test. Overall Model Fit Test was used to see whether the hypothesized model fits the data or not. The test is carried out by comparing the value between -2 log likelihood at the beginning (block number = 0) with the value -2 log likelihood at the end (block number = 1). The initial -2log likelihood value at block number = 0 can be shown in the following table.

Table 1 -2 Log likelihood value (-2 Initial LL)

| Iteration History ^{a,b,c} | | |
|------------------------------------|-------------------|-----------------------|
| Iteration | -2 Log likelihood | Coefficients Constant |
| Step 0 | 1 | 552.928 |
| | 2 | 552.928 |

Table 2 -2 Log likelihood value (-2 End LL)

| Iteration History ^{a,b,c,d} | | | | | | | |
|--------------------------------------|---|------------|--------------|-----------|------|-------|-----------|
| | | -2 Log | Coefficients | | | | |
| Iteration | | likelihood | Constant | Education | Age | Work | knowledge |
| Step 1 | 1 | 546.221 | -1.204 | -.027 | .003 | -.056 | .056 |
| | 2 | 546.218 | -1.227 | -.027 | .003 | -.057 | .057 |
| | 3 | 546.218 | -1.227 | -.027 | .003 | -.057 | .057 |

Table 3. Model Fit Test

| Nilai -2Loglikelihood | | Information |
|-----------------------|---------|---|
| Initial | END | |
| 552,928 | 546,218 | A decrease in the value between the initial -2LL function) and the -2LL value in the next step (final -2LL) shows that the hypothesized model fits the data (Ghozali, 2013). A decrease in the value of -2 log likelihood indicates that this research model is declared fit, meaning that the addition of independent variables, namely education, age, employment, knowledge to the research model will improve the fit model in this research. |

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Testing the Feasibility of the Regression Model (Simultaneous) used *goodness of fitness test* that measured with *Chi-Square* pada Tabel *Hosmer and Lemeshow Test*

Table 4 Hosmer and Lemeshow Test

| Hosmer and Lemeshow Test | | | |
|--------------------------|------------|----|------|
| Step | Chi-square | df | Sig. |
| 1 | 10.407 | 8 | .238 |

Based on Table 4.8, it is known that the Chi-Square statistical value is 10.407 and the Sig value is 0.238. Note that the Sig value is $0.238 > 0.05$, so it is concluded that the model is feasible in matching the data.

In linear regression, both simple and multiple, the t test is used to test the significance of partial effects. In logistic regression, the significance test of partial effects can be tested using the Wald test. In the Wald test, the statistic being tested is the Wald statistic. The statistical value of the Wald test has a chi-square distribution. Decision making on hypotheses can be done using the probability value approach of the Wald test. The following are decision making rules based on the probability value approach.

If the probability value \geq significance level, H_0 is accepted and H_1 is rejected.

If the probability value $<$ significance level, H_0 is rejected and H_1 is accepted.

Table 7 Significance Test of Partial Effects

| | | Variables in the Equation | | | | | |
|---------------------|-----------|---------------------------|------|-------|----|------|--------|
| | | B | S.E. | Wald | df | Sig. | Exp(B) |
| Step 1 ^a | Education | -.027 | .104 | .069 | 1 | .793 | .973 |
| | Age | .003 | .019 | .024 | 1 | .876 | 1.003 |
| | Work | -.057 | .065 | .771 | 1 | .380 | .945 |
| | Knowledge | .057 | .024 | 5.371 | 1 | .020 | 1.058 |
| | Constant | -1.227 | .968 | 1.608 | 1 | .205 | .293 |

a. Variable(s) entered on step 1: education, age, work, knowledge.

After carrying out two tests using Microsoft Excel and the SPSS program, the logistic regression model was obtained as follows:

$$\pi(x) = \frac{\exp(-1,227 - 0,027 + 0,003 - 0,057 + 0,057)}{1 + \exp(-1,227 - 0,027 + 0,003 - 0,057 + 0,057)}$$

From Table 4.11, significant values are obtained, namely:

Educational Background (X1) has no significant effect on opinion with a Sig value of $0.793 > 0.05$.

Age (X2) has no significant effect on opinion with a Sig value of $0.876 > 0.05$.

Occupation (X3) has no significant effect on opinion with a Sig value of $0.380 > 0.05$.

Knowledge (X4) has a significant effect on opinion with a Sig value of $0.020 < 0.05$.

So from the four X variables we get variable X4 which has a significant effect on variable Y with a significant value of $0.020 < 0.05$

4. Conclusion

Based on the research results, it can be concluded that:

1. The Chi-Square statistical value is 10.407 and the Sig value is 0.238. Note that the Sig value is $0.238 > 0.05$, so it is concluded that the model is feasible in matching the data.
2. Education, age and employment together or simultaneously do not have a significant effect on opinion.
3. Educational ability, age, occupation, knowledge influence opinion by 2.2%, the remaining 97.8% is explained by other variables or factors.
4. Education has no significant effect on opinion with a Sig value of $0.793 > 0.05$.
5. Age has no significant effect on opinion with a Sig value of $0.876 > 0.05$.
6. Work has no significant effect on opinion with a Sig value of $0.380 > 0.05$.
7. Knowledge has a significant effect on opinion with a Sig value of $0.020 < 0.05$

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