

Modelling Malnutrition Toddlers in East Java Province using Spatial Regression

Abdul Karim¹ Rochdi Wasono²

^{1,2}Department of Statistics, University of Muhammadiyah Semarang, Semarang, Indonesia
(Tel : +62-24-76740241; E-mail: abdulkarimcrb@gmail.com ; didikk2011@gmail.com)

Abstract An analysis of regression modeling which influenced by the characteristics of the region is very important, that modeling is the spatial autoregressive model. One type of regression model is a Spatial Regression, which performs a lag effect of the independent variables. This research will determine the factors that affect the incident of malnutrition toddlers in East Java Province using Spatial Regression, model was developed because the dependencies in the spatial relationships on the independent variables.

The data is used the value of malnutrition toddlers 38 districts and city in the province of East Java, there were a spatial autocorrelation on malnutrition toddlers and the factors variable that influence it. The results of spatial regression showed that the lag in the independent variables significantly affected, these lag independent variables were source of the percentage of babies received vitamin A, the mother got a Tablet Fe, examination of neonates (KN1).

Keywords : malnutrition, regression spatial.

I. INTRODUCTION

Poor nutrition or malnutrition is still common in developing countries, including in Indonesia. Malnutrition can be caused by nutritional deficiencies, such as not getting enough of certain vitamins or minerals. Malnutrition is a condition in which a person does not have enough nutrients to maintain normal biological processes. The most severe form of malnutrition is the result of the effects of starvation, so that the person does not get enough food and nutrition.

One infant health problems in East Java is malnutrition. World Health Organization estimates that 54 percent of infant and child mortality due to malnutrition while nutrition problems in Indonesia resulted in more than 80 percent child mortality (WHO, 2011). The impact of malnutrition in children can inhibit the development of physical and non-physical.

Malnutrition is one of the indicators of the Millennium Development Goals (MDGs) to be achieved, the target in 2015 the decline in malnutrition children to 3.6 per cent or malnutrition in children under five years of 15.5 per se (Bappenas, 2010).

Spatial regression is an extension of regression modeling, spatial regression not only see the global effect also see local effects. In this study, using spatial regression with lag on independent variables, the model is called spatial lag X (SLX) by Lesage and Pace (2009).

Research related to nutritional status, Riskiyanti (2010) investigated the factors that affect life expectancy, infant mortality and malnutrition in East Java with multivariate analysis. Inadiar (2010) examined the differences in the pattern about grindstones, love, care and malnutrition in infants of normal by using Chi-square. Conservation (2009) conducted the districts / cities in East Java with ordinal logistic regression bagging. Therefore, in this study developed a modeling malnutrition by taking into account spatial effects.

II. LITERATURE

A. Spatial regression

Regression analysis is one of the statistical methods that are mathematically studied the pattern of relationships between one dependent variable and one or more independent variables. The goal is to find out how much the value of the dependent variable on the basis of the influence of the independent variables.

Spatial regression with a lag in the independent variable is called spatial lag X (SLX) by Lesage and Pace (2009).

Model SLX is a local linear regression model that generates suspicion regression model parameters that are local. SLX models can be formulated as follows.

$$y = \beta X + W X y + \varepsilon \quad (1)$$

where y is the $N \times 1$ vector of endogenous variables, X is a $N \times p$ matrix of the exogenous variables, β is the $p \times 1$ vector of the regression coefficients, W is the $N \times N$ weighting matrix N which states the relationship between economic, spatial dependencies are parameters, and ε is vector of independent and identically distributed (IID).

The spatial weighting matrix (W) can be obtained based on the distance information from the adjacency (neighborhood), or in other words of the distance between one region with another region. Several methods for defining the intersection relations (contiguity) between regions according to Lesage [1999] Linear Contiguity among other things, Rook Contiguity, Bhisop Contiguity, Contiguity Linear Double, Double Rook Contiguity, Queen Contiguity.

In this study the weights used are the weight of the Queen Contiguity, the side-angle intersection define $w_{ij} = 1$ for entities met by side (common side) or angular point (common vertex) side with the region of concern, $w_{ij} = 0$ for the other regions.

B. Malnutrition

East Java Province is located at 110° to 115° 57BT 54BT-5 $^{\circ}$ and 371° 48LS LS-8 at the eastern tip of Java island has an area of 157 922 km². Geographically, East Java Province, bordering the Java Sea in the north, the east by the Sea of Bali and Bali Strait, west of the border with Central Java Province and the south by the Indian Ocean. East Java Province consists of 29 counties and 9 cities.

Nutritional status is defined as a state of equilibrium eksperimen in the form of a certain variable (Irianto, 2007)

Malnutrition is a condition in which a person is declared a lack of nutrients, or the nutritional status of the other expression is under the average standard. Nutrition in question may be proteins, carbohydrates and calories. In Indonesia, the case of PEM (Protein Energy Malnutrition) is one of the major nutritional problems that are often found in infants (Soekirman, 2000).

According to Bappenas (2010), the low nutritional status of children is influenced by economic factors and socio-cultural society such as: (i) the difficulty in getting quality food, mainly caused by poverty; (ii) the treatment and care of children who are not suitable due to low maternal education; and (iii) inadequate access to health services, sanitation and clean water. According to Samson (2011), nutritional disorder caused by a primary or secondary factor. The primary factor is that if the composition of any one food in quantity and quality due to lack of food supply, lack of good food distribution, poverty, ignorance, wrong eating habits and so on. Secondary factors include all factors that cause nutrients do not reach the cells in the body after consumption of food.

Poor nutrition affects the physical growth retardation, mental and thinking ability due to various micro-nutrient deficiencies such as iodine, Fe and PEM.

III. METHOD

The data used in this study is a secondary data obtained from the period of 2010 Riskesdas for this research were used as the unit of observation is a district and town in the province of East Java. The data used is percentage Genesis malnutrition for 38 district and city in the province of East Java. In addition to poor nutrition data, the data supporting factors the incidence of malnutrition is also used as a research variable.

Variable used in this study consists of two parts, namely the endogenous variables and exogenous variables.

A. Endogenous Variables

In this study used an endogenous variable, ie the value of the percentage incidence of malnutrition-based district in East Java.

B. Exogenous Variabeles

In this study used four endogenous variables, the percentage incidence of malnutrition, babies get vitamin A, iron tablet gets pregnant women, neonates examination (KN1) and each of the Extension Service district-based city in East Java.

C. Specifications Models Malnutrition Incidence in The Province of East Java

SLX models proposed are as follows,

$$y = \beta_0 + X_1\beta_1 + W X_1\beta_1 + X_2\beta_2 + W X_2\beta_2 + X_3\beta_3 + W X_3\beta_3 + X_4\beta_4 + W X_4\beta_4 + \varepsilon$$

Where,

- Y : the percentage of malnutrition
- X1 : percentage babies get vitamin A
- X2 : the percentage of pregnant women received iron tablet
- X3 : the percentage of neonates' examination (KN1)
- X4 : percentage of extension services
- W : spatial weight matrix queen

IV. RESULT AND DISCUSSION

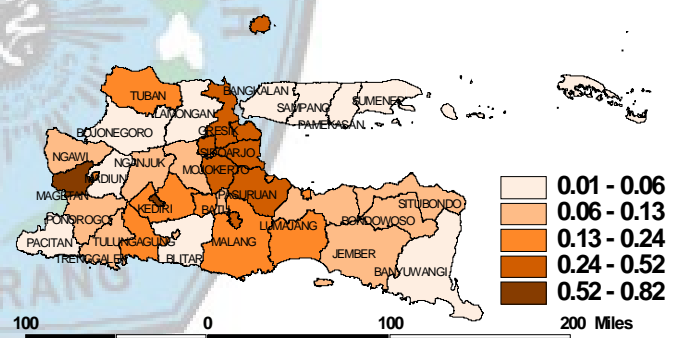


Fig. 1. Persentase kejadian gizi buruk

Figure 1 shows the percentage incidence of malnutrition based on counties and cities, areas that have a high incidence of malnutrition is Kediri, Hove and Sidoarjo. While Sampang, Pamekasan and Sumenep areas that have a low incidence of malnutrition.

Tabel. 1. Estimasi Parameter Model SLX

Parameter	Coefisien	P-Value
Intercept	0,288	0,44
X1	-3,022	0,93
X2	1,114	0,219
X3	1,698	0,000
X4	-0,868	0,01
WX1	-21,001	0,04
WX2	0,34	0,02

WX3	0,129	0,08
WX4	0,034	0,64
R-Square	0,702	

Based on the results of SLX Table 1 shows the spatial dependencies in the variables X1, X2 with an alpha of 5 percent and 10 percent X3. That is, percentage babies get vitamin A, the percentage of pregnant women received iron tablet and the percentage of neonates' examination (KN1) in a region, the region is affected by the surrounding neighbors.

V. CONCLUTION

Based on description of the incident malnutrition, every city in East Java shows variations and spatial grouping. Factors that influence the incidence of malnutrition in East Java is percentage of babies get Vitamin A, percentage of pregnant women get Fe tablet and examination percentage neonates (KN1).

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