SOCIA
JURNAL ILMU-ILMU SOSIAL
ARTIKEL PENELITIAN

ISSN 1829-5797 (cetak) | ISSN 2549-9475 (*online*)
Socia: Jurnal Ilmu-ilmu Sosial Vol. 19, No. 2, Desember 2022 (32-41)

Diterima: 17-11-2022 | Direvisi: 13-12-2022 | Disetujui: 15-12-2022

Extreme Poverty Trap In Kalimantan Barat

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Abstract
Poverty is complex, conceptually and empirically, because it will affect how to understand poverty, its analysis, and policy formulation to overcome poverty. World Bank defines International Poverty Line (GK) as US$ 1.9 as it adjusts for inflation and living standards. Indonesia's poverty rate released by BPS uses a monetary approach, GK, which represents the minimum amount of money a person needs to meet food needs, equivalent to 2100 calories and other non-food needs. Ordinal regression Partial Proportional Odds Model (PPOM) found the best model with independent variables: Number of Household Members, Age, Defecation Facilities, Diplomas, Lightning, Main Activities, and Access to Clean Water, and all these variables significantly affect the status of poor both Extreme Poor, Poor, and Near Poor levels. It was found that Odds Ratio was very different at the Extreme Poor level. It was concluded that this category had different tendencies from other levels. Handling the extreme poor with various conditions requires different handling than the poor. Extremely poor with one household member, aged 1-14 years and 60 years and over, more in need of Social Assistance from the government. Extreme Poor with certain other conditions requires more research to determine the most effective alleviation program.
Keywords: *poverty, extreme poverty, ordinal regression, partial proportional odds model, odds ratio.*

1. Introduction
Poverty is a complex thing both conceptually and empirically. The definition of poverty is still a debate among philosophers, especially the specific definition. Poverty is the inability to meet some of the basic needs of life, such as food, shelter, clothing, education, health care, and security. Beyond this problem, the world needs a measure of practical importance in monitoring poverty rates. Indicators that capture conditions like this have different standards in several countries, and this is due to the diversity of ways of data collection, processing, and statistical development in a country (UNSD, 2005).

The measure of poverty becomes very important because it will affect how to understand poverty, analyze it, and formulate policies to overcome poverty (Alkire & Jahan, 2018). A measure of monetary poverty widely used in several countries assesses that poverty focuses on material shortages to meet food and other basic needs. The monetary approach to poverty in line with economic welfare is considered too narrow to reflect individual well-being. Individual well-being focuses on housing conditions, water, sanitation, electricity, education, and infrastructure (Sen, 2000).

The debate about whether or not the use of the Poverty Line is sufficient or not in determining whether someone is poor has been going on for a long time. The World Bank once defined the International Poverty Line in 1996 at US$ 1 per day. In 2015 this figure was revised to US$ 1.9 due to adjusting for inflation and living standards. This international poverty line is derived from the average poverty line of the 15 poorest countries (World Bank, 2022). This measure is the extreme poverty line globally.

So far, Indonesia's poverty rate released by Badan Pusat Statistik (BPS) uses a monetary approach, namely, the Poverty Line (GK-Garis Kemiskinan), to measure poverty. GK is interpreted as a representation of the minimum

amount of money needed by a person to meet food needs equivalent to 2100 calories and other non-food needs (Budiantoro et al., 2015).

Previous research, in general, has shown that the social, economic and governance sectors are recursively linked to poverty. Education and poverty partially affect income inequality (Hindun et al., 2019), while public spending and economic growth affect poverty levels positively and significantly (Yacoub & Adelia, 2011). On the other hand, infrastructure in an area also affects poverty, namely the length of access roads managed by the government, the number of public schools, and the number of health facilities (Syahrani et al., 2021).

In order to obtain the right policies to alleviate poverty, information on the individual demographic characteristics of the poor, as well as housing facilities owned by the poor themselves, is needed, especially in Kalimantan Barat Province. From previous research, it was found that several determinant variables in determining the characteristics of the poor were as follows:

1. Number of Household Members

   Households are individuals or groups of individuals who have one management in the monetary aspect. In a study conducted by Cooper and Sachs, poor households are demographically trapped with many children, so they have no choice but to invest other than to spend their existing income for consumption. The number of Household Members is the number of individuals in the household, including the head, which usually lives and settles in the household (Cooper & Sachs, 2005).

   A study conducted by Suryana and Swarniati shows that the variable Number of Household Members significantly affects the poor status of a household, with a tendency for the number of household members above 4 (four) people to be more likely to be poor (Suryana & Swarniati, 2021). Similar research also concludes that people are more likely to be poor if the number of household members is more than 4 (four) (Amida & Sitorus, 2021), (Anisa, 2021) and (Hasyim & Veriyanto, 2022).

2. Age

   Age is calculated based on the year rounded down or the age at the last birthday. Various studies have used age as a characteristic in explaining poverty (Bernstein et al., 2018)(Kwan & Walsh, 2018) (Noren Hooten & Evans, 2019). The risk of poverty itself increases with age (UN, 2019). In particular, a study concluded that age affects poverty status (Amida & Sitorus, 2021).

3. Defecation Facility

   Defecation facilities indicate the availability of latrines/closets that every household member can use. The availability of these facilities is often associated with poverty (Njuguna, 2019) (Busienei et al., 2019). The study conducted by Harahap concluded that the availability of defecation facilities was a differentiating variable between the poor and the non-poor (Harahap, 2017).

4. Diploma

   A diploma shows ownership of proof of graduation after completing all academic requirements at a level of education. Many Studies resulted in a consistent conclusion, namely that education presented with certificate ownership affects poverty status (Khabhibi, 2013), (Merdekawati & Budiantara, 2013), (Hastuti, 2015), (Park, 2018) and (Suryana & Swarniati, 2021).

5. Lighting

   Lighting is the primary source of lighting used by households. The use of electricity as a source of lighting is considered an aspect that can reduce poverty (Nugroho, 2015) (Jayanthi, 2021), (Zuhri et al., 2019). Their research concludes that inequality in access to electricity in a region affects the percentage of poor households in the region.

6. Main Activities

   The main activity in question is work, namely, doing work to obtain or help to earn income/profits for at least one consecutive and uninterrupted hour (Amida & Sitorus, 2021), (Suryana & Swarniati, 2021) and (Hasyim & Veriyanto, 2022) conclude that working status affects the tendency toward poverty.

7. Access to Clean Water

   Access to clean water shows households' primary source of drinking water. If there is more than one source

of drinking water, the volume is the largest. Access to Clean Water is a source of drinking water originating from bottled water, refilled water, piped water (bore wells or pumps and protected wells and protected springs) with a distance of more than 10 meters from the nearest disposal of sewage or waste or feces. Previous research showed that access to clean water is one variable that significantly affects poverty (Merdekawati & Budiantara, 2013)(Park, 2018).

2. Methods

This study uses a monetary approach to measure poverty by adopting several poverty lines for extremely poor, poor, near poor, and not poor. The four categories indicate an order that cannot be ignored or is better known as an ordinal scale. Data types are an inseparable part of data analysis and presentation. The difference in the type of data size will affect the analysis tool to be used. There are 4 data size types: nominal, ordinal, interval and ratio (Dalati, 2018).

Several modeling errors involve data with ordinal scales, including treating ordinal variables as if they were continuous, already using techniques for ordinal data but not being integrated into the model framework, and using a frequency table approach (Winship & Mare, 1984).

The most familiar model for ordinal data is ordinal regression. Ordinal regression consists of 3 basic models: Cumulative Models, Sequential Models, and Adjacent Categories (Tutz, 2022). The selection of a suitable model depends on the data analysis needs. A model that is not following the needs, of course, will not be able to solve the problem (Ananth & Kleinbaum, 1997).

Ordinal Regression

Ordinal regression focused on exploiting the order in the dependent variable in a more straightforward structured pattern. The most widely used models for ordinal scale data are the Proportional Odds Model and the Proportional Hazards Model. This is because of the ease of interpreting the results of the two models above (McCullagh, 1980). Along with developing research for ordinal data, 6 (six) models can be applied to ordinal data (Ananth & Kleinbaum, 1997). The six models include:

1. The Cumulative logit model
2. Continuation ratio model
3. Constrained and unconstrained partial proportional odds models
4. Adjacent category logit model
5. Polytomous logistics model
6. Stereotype logistic model.

Currently, the development of ordinal data model research and adequate software support such as research (Agresti, 2010) (Tutz & Schauberger, 2013) (Long & Freese, 2001) (Long & Freese, 2014) and (Williams & Quiroz, 2020). The structure of the ordinal model consists of basic ordinal regression models, models with complex parameterization, hierarchical structured models, and mixer models developed recently. Structurally, the ordinal model can be seen from the most superficial side, the binary model. The review of the structure of the ordinal model includes existing models, and the model's opportunities can be expanded to consider future developments (Tutz, 2022).

Practically, studies that compare ordered stereotype models, proportional odds models, and linear models on the same data with ordinal levels three, four, and five yields the same conclusions about significant variables. Simulations with data samples of 100, 500, and 1000 also yielded the same conclusion. One advantage of the ordinal model compared to linear regression if dependent data is treated as a continuous variable is the leniency of the normality assumption (Fernandez et al., 2019).

Propotional Odds Models

The method used in this study is the Cumulative Ordinal Regression Model. This model is adapted to the needs of analysis in answering the problem of factors that affect poverty and recommendations for appropriate policies to address or alleviate poverty. Ordinal regression is generally grouped into 3 (three) basic models, namely Cumulative Models, Sequential Models, and Adjacent Categories Models (Tutz, 2022).

The cumulative Model is a derivative of the latent regression model, where the response variable is continuous. The simple Cumulative Model equation is as follows (Tutz, 2022):

$$P(Y \geq r|x) = F(\beta_{0r} + x^T\beta), \quad r = 1, \ldots, k \qquad (1)$$

Where : $\beta_{0r} = -\theta_{r-1}$

The Cumulative Model can be viewed as a collection of binary response models, which are equivalent to the following models:

$$P(Y_r = 1|x) = F(\beta_{0r} + x^T\beta), \quad r = 1,\ldots,k \qquad (2)$$

The general model that is often used is the Proportional Odds Model (POM), which uses a logistic distribution with a logit link function, so the equation above becomes:

$$F(\eta) = \frac{\exp(\eta)}{(1+\exp(\eta))}$$

$$logit\ P(Y \geq r|x) = \theta_r + x^T\beta \qquad (3)$$

The basic model of the Cumulative Logit Model is divided into three models, namely the Proportional Odds Model (POM), Non-Proportional Odds Model (NPOM) and Partial Proportional Odds Model (PPOM). The difference between the three models is on the assumption of parallel lines, where the slope of an independent variable in the model does not change for all levels of the response variable. According to this assumption, the parameters of different categories should not be changed. In other words, the correlation between the independent and dependent variables does not change with the categories of the dependent variable, nor do the parameter estimates change at the cutoff points. Ordinal logit regression finds $\alpha J-1$ cutoff points and j − 1 β parameter if assumptions hold for j − 1 logit comparisons of J class variables. This is where the ordinal logistic model differs from the multinomial logistic regression. Thus, the correlation between the regressor and the response variable does not change for each respondent, and the parameter estimates do not change for different cutoffs. If this assumption cannot be met, POM cannot be used as an analytical tool, so the next alternative model is PPOM and NPOM (Ari & Yildiz, 2014).

In a sense, this assumption states that the categories of the dependent variable are parallel to each other. If the assumption is invalid, there is no parallelism between the categories. The likelihood ratio, Wald chi-square, and other related tests are used to test the parallel lines assumption. In Ordinal Logit Regression, these tests check the equivalence of various categories to determine whether the assumptions are correct. If the assumptions are incorrect, the interpretation of the results is wrong, so an alternative model is used instead of the Ordinal Logit Regression model to find the correct results.

The Likelihood Ratio Test and Wald Brant Test (Dolgun & Saracbasi, 2014) test the assumption of parallel lines. In the Likelihood Ratio Test, the hypothesis being tested is the similarity of the coefficient value _k from all levels of the dependent variable, namely: $Ho = \beta_{1j} = \beta_{2j} = \ldots = \beta_{(k-1)j} = \beta \qquad j = 1,2,\ldots\ldots,J$

In the model's Wald test proposed by Brant, the proportional odds assumption was tested individually or jointly.

Kajian yang diangkat dari penelitian deskriptif dengan menggunakan pendekatan kualitatif bertempat di DIY yang memakan waktu sekitar tiga bulan dengan melibatkan 8 (delapan) informan, yaitu Sekretaris Gereja HKBP (satu orang), Pendeta Fungsional Gereja HKBP (dua orang), Koordinator PARHATA/Penyelenggara Pernikahan Adat Batak (satu orang), Pembina *Naposo* DIY (satu orang), dan *naposo* (tiga orang). Data diperoleh melalui wawancara dan dokumentasi, setelah itu dilakukan pemeriksaan kebasahan data menggunakan teknik *cross check.* Analisis data dilakukan secara induktif melalui langkah-langkah, reduksi data, kategorisasi dan unitisasi data, penyajian data, dan pengambilan kesimpulan.

Data Sources and Research Variables

The data used in this study is the March National Socio-Economic Survey (SUSENAS) of Kalimantan Barat Province conducted by BPS in 2021. The questionnaires used were Susenas Kor and Susenas Consumption/Expenditure Module. The March 2021 Susenas enumeration includes samples of 345,000 households to produce data representative at the national level up to the district/city level. The Susenas Kor Questionnaire covers various indicators related to population, education, health, fertility and family planning, housing, information technology and communication, social protection, and food insecurity. Therefore, the Consumption and Expenditure Module is a data source for two of the four national development targets, namely the poverty rate calculation and the Gini index.

The survey includes both urban and rural areas. The surveys collect data on individual characteristics, such as demographics, education, and health, and household characteristics, such as housing, social protection, and household consumption expenditures. A household is a group of people who live together in a building and have one person care for all their needs.

The unit of analysis is the population with poor status consisting of 4 (four) categories, namely Extreme Poor, Poor, Almost Poor, and Not Poor. Categorization is carried out on per capita expenditure variables by adopting BPS's Poverty Line (GK) concept.

The dependent variable (Y) is the status of the poor, i.e. people whose per capita expenditure is less than the poverty line. BPS has used the basic needs approach to calculate the poverty line since 1964 and was updated again in 1998. BPS has officially released the 2021 poverty line and distinguishes between urban and rural poverty lines (BPS, 2021a). The status of the poor is divided into 4 (four) categories, namely:

1. Extremely poor
   Namely, for residents with per capita expenditures less than the global GK, which is US$ 1.9, adjusted, the conditions in 2021 are equivalent to Rp. 358,233 (World Bank, 2022).
2. Poor
   Namely, for residents with per capita expenditures between GK Global and GK Kalimantan Barat Province, the conditions in 2021 are equivalent to the range of Rp. 358,234 - Rp. IDR 513,341 (BPS, 2021a).
3. Almost Poor
   Namely residents with per capita expenditure above the GK of Kalimantan Barat Province to 1.2 of the GK, the conditions in 2021 are equivalent to the range of IDR 513,342 - IDR 616,009 (BPS, 2013).
4. Not Poor
   Namely, for residents with per capita expenditures above 1.2 GK, conditions in 2021 are equivalent to a range above Rp 616,009 (BPS, 2013).

Table 1. Research Variables

Variable	Information	Scale
Dependent Variable Y: Status of the Poor	1.Extremely Poor 2.Poor 3. Almost Poor 4.Not Poor	Ordinal
Independent (x)		
Number of Household Members	1.One person 2. 2-3 people 3. More than equal to 4 people	Nominal
Age	1. 0-14 years 2. 15-60 years 3. Over 60 years old	Nominal
Defecation Facility	1.No Facility 2.Together 3.Personal	Ordinal
Certificate	1. SD and bellow 2. SMP - SMA 3. College	Ordinal
Lighting	1.Not Electric 2. Non-PLN Electricity 3. PLN Electricity	Nominal
Main Activities	1. No/not yet working 2. Working	Nominal
Access to Clean Water	1. No access 2.There is access to Clean Water Access	Nominal

3. Result and Discussion

Parallel-Lines Assumption Test

The first step in using the Cumulative Model is to test parallel lines, and this is to determine what model is suitable for the Cumulative Model group. Using STATA 14 software, the parallel-lines assumption test was carried out with results as shown in Table 2.

With a significance level of 95 percent, the test results above show that 3 (three) variables meet the parallel lines assumption, namely the variables with the decision to accept Ho, including the variables of Age, Diploma, and Main Activities. These three variables will have the same coefficient in the model and become a constraint in the model. These results conclude that using Proportional Odds Models (POM) is not recommended unless the model only involves 3 (three) variables that meet the assumptions of parallel lines.

Table 2. Parallel-lines. Assumption Test Results

Variables	*p-value*	Decision

Number of Household Members	0.00380	Reject Ho
Age	*0.07070*	*Accept Ho*
Defecation Facility	0.00975	Reject Ho
Certificate	*0.22540*	*Accept Ho*
Lighting	0.00000	Reject Ho
Main Activities	*0.64100*	*Accept Ho*
Access to Clean Water	0.00011	Reject Ho

Source: Primer Data

Models involving four other variables that do not meet the parallel-lines assumption can use Partial Proportional Odds Models (PPOM) or Non-Proportional Odds Models (NOM).

PPOM Model Test

The next step is to use the second alternative in Cumulative Models, namely Partial Proportional Odds Models (PPOM). The results of the Partial Proportional Odds Models (PPOM) test can be seen in Table 3.

Table 3.
Partial Proportional Odds Models (PPOM) Test Results

Chi-Square	*df*	*p-value*	*Decision*
9,10	6	0.1681	Accept Ho

Source: Primer Data

Global PPOM model test with Wald's test was conducted to compare the model with constraints to the original model without constraints, and the result is to accept H0, which means the model does not violate the parallel lines assumption. There are six constraints resulting from the Wald global test, namely:

1. Age for Y=1 and Y=2
2. Age for Y=2 and Y=3
3. Diplomas for Y=1 and Y=2
4. Diplomas for Y=2 and Y=3
5. Main Activities for Y=1 and Y=2
6. Main Activities for Y=2 and Y=3

The test results above show that the PPOM model can be used to see the factors that affect the Status of the Poor in Kalimantan Barat Province in 2021 by involving seven independent variables, namely Number of Household Members, Age, Defecation Facilities, Diplomas, Information, Main Activities, and Access to Clean Water. The model formed based on the test above has six constraints involving three independent variables: Age, Diploma, and Main Activities.

Formed Model

As previously mentioned, the PPOM model formed with six constraints produces the Odds Ratio, p-value, and Standard Error values, as shown in Table 4.

The PPOM model that is formed is still in the cumulative model clump, so for the interpretation of the Odds Ratio parameter, it compares the cumulative category to the above category. In detail, it can be explained as follows:

1. The Extremely Poor Category compared to the Poor, Near Poor and Non-Poor Categories
2. Extreme Poor and Poor Categories compared to Near Poor and Non-Poor Categories
3. Categories of Extreme Poor, Poor and Near Poor compared to Non-Poor Categories

To make it easier to analyze, the extreme poor category using ordinal regression, the category is placed in the first category in the dependent variable. With a cumulative interpretation, the poor category will show the difference compared to other categories.

Table 4 Odds Ratio, p-value, and Standard Error for Each Independent Variable by Category of Poor Status

Poor Category	Odds Ratio	p-value	Standard Error
Extremely Poor			
Number of Household Members	0.16840	0.00000	0.02502
Age	0.81990	0.00000	0.03116
Defecation Facility	1.90213	0.00000	0.09764
Certificate	1.85332	0.00000	0.07358
Lighting	1.76173	0.00000	0.11120

Main Activities	1.24658	0.00000	0.05441
Access to Clean Water	1.88719	0.00000	0.07439
Constant	4.09991	0.00000	0.82997

Of the seven independent variables, three independents that meet the parallel lines assumption have the same Odds Ratio value for the three models formed: Age, Diploma, and Main Activities. For the age variable, the younger the respondent, the greater the tendency to be in the Extremely Poor category. For the Diploma variable, the higher the education completed by the respondent, the greater the tendency of the respondent to be in the Not Poor category. Moreover, respondents who work tend to be in the Not Poor category for the Main Activity variable.

The conclusion for the variables of Age and Diploma in this study is in line with previous studies where the more mature the age, the tendency to be not poor, and the higher the education also has the same tendency. The fact that poverty in children and toddlers is very dependent on adults in their environment, in this case, parents (Amida & Sitorus, 2021) (Anisa, 2021). Likewise, with education, people with higher education have more choices and access to the economy.

Variable Number of Household Members resulted in conclusions contrary to previous studies such as those (Amida & Sitorus, 2021), (Suryana & Swarniati, 2021), (Anisa, 2021), and (Hasyim & Veriyanto, 2022), which concluded that the number of ART more than four people tend to be poor compared to the number of ART less than four people. In this study, there are different categories for the number of ART variables, namely one person, 2-3 people, and more than equal to 4 people. This categorization is based on the results of an analysis of extreme poverty in 35 districts/cities conducted by BPS that the extreme poor category is vulnerable with the number of ART 1 person and 2-3 people (BPS, 2021b).

The difference in the categories of the dependent variable can also give different results; previous studies have categorized the status of the poor in only 2 (two) categories, namely poor and not poor. This difference further reinforces that the extremely poor and poor characteristics differ, so handling poverty

Main Activities	1.24658	0.00000	0.05441
Access to Clean Water	1.37050	0.00000	0.11252
Constant	86.92283	0.00000	41.8615
Poor			
Number of Household Members	0.25946	0.00000	0.02002
Age	0.81990	0.00000	0.03116
Defecation Facility	1.97994	0.00000	0.06441
Certificate	1.85332	0.00000	0.07358
Lighting	1.28362	0.00000	0.05707
Main Activities	1.24658	0.00000	0.05441
Access to Clean Water	1.83605	0.00000	0.09657
Constant	9.45463	0.00000	2.58091
Almost Poor			
Number of Household Members	0.27240	0.00000	0.01464
Age	0.81990	0.00000	0.03116
Defecation Facility	1.84094	0.00000	0.04843
Certificate	1.85332	0.00000	0.07358
Lighting	1.28009	0.00000	0.04611

in these two categories requires a different approach.

For the variable defecation facilities, the better the availability of defecation facilities, the greater the tendency of respondents to be in the Not Poor category. For the Lighting variable, the better the respondent's source of information, the greater the tendency of respondents to be in the Not Poor category. For the variable access to clean water, respondents who consume access to clean water have a high tendency to be in the category of not poor.

The value of the Odds Ratio of the constant variables in this study is very interesting to conclude because the pattern between levels of Poor Population Status shows a significant decrease in increasing poverty. When the population with all independent variables is in the lowest category (Number of Household Members is one person, age is in the category 0-14 years, there are no defecation facilities, diplomas that are owned by the elementary school or do not have a diploma, source of lighting is no electricity, Main Activities do not work, and do not have access to clean water for drinking water) then:

1. The tendency of respondents to fall into the category of Extreme Poor is 86.92 times compared to other categories. Naturally, with the characteristics of the respondents being children and living alone without adult assistance and the condition of housing facilities being inadequate, the chance of becoming Extremely Poor is huge.
2. The tendency of respondents to fall into the categories of Poor and Extremely Poor is 9.45 times compared to the categories of Almost Poor and Not Poor.
3. The tendency of respondents to fall into the category of Near Poor, Poor and Extremely Poor is 4.09 times compared to the Not Poor category.

The PPOM model of this study gives results that are not much different. Based on the results of the Social Assistance Program Effectiveness Survey (SEPBS) in 35 districts/cities in December 2021 by BPS (BPS, 2021b), extreme poverty is more in the Number of Household Members 1 person with Elderly Age (over 60 years). The Odds Ratio value for population characteristics with all independent variables is in the lowest category except age in the category above 60 years of 1.88 times the trend compared to the 15-60 year category and 1.89 times the trend compared to the 0-14 year category.

4. Conclusions

The best model to see the relationship between the independent variables (Number of Household Members, Age, Defecation Facilities, Diplomas, Information, Main Activities, and Access to Clean Water) and the Status of the Poor, which are categorized into four categories with the ordinal scale being Partial Proportional Odds Models (PPOM). The number of household members, age, defecation facilities, certificates, information, main activities, and access to clean water significantly affect the status of the poor, both at the extreme poor, poor and near poor levels. There is a very different pattern of Odds Ratio values at the Extreme Poor level, so it can be concluded that this category has different tendencies from other levels.

This research is limited to involving only seven independent variables, and research can be carried out with other variables outside this research, especially with independent variables at the regional level such as Human Development Index (HDI), Economic Growth, and Unemployment, to form a more comprehensive multilevel model that portrays poverty. The model used in this study has not considered the interaction between independent variables, so developing a model with interaction can be done to get a better model. The number of Household Members one person aged 1-14 years and 60 years and over, more in need of Social Assistance from the government. Handling the extreme poor with various conditions requires different handling than the poor. The Extreme Poor with certain other conditions requires more in-depth research to determine the appropriate or most effective alleviation program.

5. Acknowledgements

Researchers would like to thank the West Kalimantan Central Bureau of Statistics for the support and funding that has been given. Hopefully, the results of this research will be helpful.

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