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Linear Regression Analysis to Measure The Correlation Between Poverty Rate and Stunting Rate

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Abstract: Children's stunting or growth disorders are becoming major global health issues, particularly in impoverished nations. It is characterized by short height for children and affects future economic potential, health, and cognitive development over the long run. Stunting has a detrimental effect on cognitive growth, schooling, and future economic production in addition to being a sign of dietary deficiencies. This study aims to analyze the relationship between poverty levels and stunting rates. Using secondary data from health surveys and population censuses, this study analyzed the rate of stunting in children aged 0-5 years and correlated it with poverty indicators at the household and community levels. Correlation analysis methods were used to assess the relationship between these variables, while controlling for confounding variables such as parental education, access to health services, and nutrition. The multiple linear regression test results prove that the incidence of stunting is influenced by the poor population variable by 34.1%, so there are other factors that influence it by 64.9%. The results of the analysis show that there is a significant positive correlation between the poverty rate and the prevalence of stunting. This finding underscores the importance of cooperation between the health and economic sectors in efforts to reduce stunting and poverty.

Keywords: Pearson Correlation, Linear Regression, Data Mining, Stunting, Poor

INTRODUCTION

Stunting, or growth disorder in children, has become a serious global health problem, especially in developing countries. It is characterized by low height for childhood and has a long-term impact on cognitive development, health, and future economic potential (Yadika et al., 2019). According to the World Health Organization (WHO), almost 22% of children under the age of five worldwide suffer from stunting, with the majority being in developing countries. Stunting not only indicates nutritional problems but also has a serious impact on cognitive development, education, and future economic productivity (Renyoet et al., 2016). Stunting can have a serious long-term impact on the health and quality of life of children. Children who suffer from stunting tend to have lower intelligence, and motor developmental impairments and are susceptible to infectious diseases (Andarini et al., 2023).

In Indonesia, stunting remains a major problem, with a continuing high prevalence in many regions, including Cianjur District. According to the Indonesian Health Status Survey (SSGI) data, the prevalence of stunting in West Java will reach 24.5 percent by 2021 (Kemenkes, 2021). There are several factors that are causing stunting, including a lack of exclusive breastfeeding, access to clean drinking water and adequate sanitation facilities that households do not have, and the condition of a low-weight baby born safely (Apriyani et al., 2023).

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Although many factors can contribute to stunting, poverty is often seen as a key factor affecting the health and nutrition of children. Poverty provides a significant barrier to access to adequate nutrition, good sanitation, and quality health services. In addition, poor economic conditions may also affect the quality of education and support received by children at critical stages of development (Widyaningsih et al., 2021).

Cianjur District, located in West Java Province, offers a unique landscape for this study. With a combination of thriving urban areas and more remote rural communities, the region displays diverse economic and social dynamics. Poverty levels vary across the district, and the challenges of providing quality nutrition and health services are real. Cianjur district represents a real example of the challenges faced in tackling stunting and poverty in Indonesia.

This study aims to investigate the correlation between poverty rates and stunting in Cianjur District. Through correlational analysis, this study will measure to what extent poverty can be linked to stunting in this region. In the process, the research will help identify potential areas of intervention and provide recommendations for policies and practices that are more effective in reducing the prevalence of stunting.

With a focus on Cianjur District, the study will provide in-depth insight into the unique challenges of tackling stunting in a local context while also providing a broader understanding of how economic factors interact with children's health and development. This research is expected to be an important reference for policymakers, health practitioners, and researchers in the fields of public health, nutrition, and economic development.

METHOD

Research Design

This research uses correlational approaches and a quantitative design. The aim is to evaluate the relationship between poverty rates and the prevalence of stunting among children. This research will allow for extensive statistical analysis, identifying patterns and relationships between such variables.

Population and Sample

The study was conducted on a population of all children under five years of age. The sample used was a stratified random sample of the population, covering different regions and economic backgrounds to obtain a balanced representation, as seen in Table 1.

Table 1. Population data and sample research

Description	Population	Sample
Area	Cianjur District	Various districts in Cianjur
Age	0-5 years	0-5 years
Amount	227546	227546
Description	Population	Sample

Stunting data: Physical measurements of children by trained health workers and official health records are primary data.Poverty Data: Information from government censuses and household surveys on income, employment, and other economic factors is secondary data.

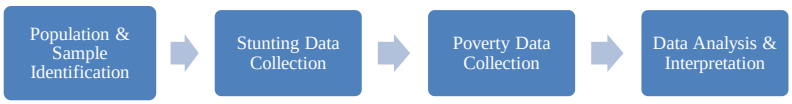

Figure 1. Data collection method

Data Analysis

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To measure the impact of poverty rates on the prevalence of stunting, a linear regression analysis was performed. The dependent variable in this analysis is the prevalence of stunting, while the independent variable is the poverty rate. Before the regression model was applied, tests had been carried out on assumptions such as normality and linearity.

This linear regression implementation is done using SPSS software, which provides special features for building, analyzing, and testing linear regression models.

Linear Regression

Linear regression uses linear regression to measure the causal relationship between the causal factor variable (X) and the consequence variable. The causal factor, often referred to as the predictor, and the effect variable, often referred to as the response, are represented by y (Katemba & Djoh, 2017). The resulting linear regression model can be represented by the following equation:

$$Y = \beta 0 + \beta 1.X + \epsilon$$

Description :
Y = stunting prevalence (variable dependent)
X = poverty rate (variable independent)
β0 = intercepts
β1 = the inclination for the poverty rate
ϵ = random error
These coefficients are estimated using the smallest squares method available in SPSS.

To add the betting details of other factors, we used the double linear regression formula. Double linear regression is used when we want to predict a bound variable (Y) based on more than one free variable (X). The common formula for double linear regression is:

$$Y = \beta 0 + \beta 1.X1 + \beta 2.X2 + \cdots + \beta n.Xn + \epsilon$$

Descriptions :

Y = the bound variable to be predicted.
β0 = constant or interceptor.
β1,β2,...,βn = the regression coefficient of each free variable. It shows how a change in one unit in Xi will affect Y, assuming the other free variable remains constant.
X1, X2,... Xn = free variable.
ε = error or residual; this represents a variation in Y not described by a free variable.

RESULT

Linear regression is a technique used to obtain a relationship model between one dependent variable and more than one independent variable. If only one independent variable is used in the model, then this technique is called simple linear regression, whereas if there are several independent variables, it is called double linear regression (multiple linear regression) (Harlan, 2018).

Table 2. Model Summary

Model	R	R Square	Adjusted R Square	Std. Erorr of the Estimate
1	0.584	0.341	0.339	24.389

Based on Table 2, the R-value (correlation coefficient) is 0.584, which means 58.4% of the related variables have a moderate relationship between the independent variable (poor population) and the dependent variable (stunting). Whereas R square is 0.341, which means 34.1% of the variability in the

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stunting rate can be explained by the poor population variable of 34.1%, whereas the remaining 65.9% is explained by other factors not included in the model. The adjusted R square is 0.339, which means 33.9%, which gives an adjustment to the R square based on the number of predictors in the standard model. The error of the estimate shows how far the average prediction is from the actual value in this study, which is 24.389.

In other studies, it was noted that the factors associated with stunting in the village of Panduman are the age of the mother when she was pregnant, her nutritional status during pregnancy, her exclusive breastfeeding history, protein intake, infectious disease status, immunization status, mother's education, father's work, and economic status. (Ariati, 2019). Causes of stunting are some of the factors of both parent, child, and household environment. Parental factors play a very important role in paying attention to the child's development and supporting efforts to address nutritional problems in children. Preventing malnutrition in a child begins with the mother's health, which is vital for the future health of the child. The child's development in the mother's womb is very influential if the mother is malnourished (Chirande et al., 2015).

Another study indicated that mothers who underwent prenatal care less than three times and did not report their pregnancy to a doctor, nurse, or midwife may be at risk of stunting their children. Regular ANC visits can detect early pregnancy risks in the mother of the fetus, especially related to nutritional problems (Aguayo et al., 2016). While other research based on the testing of the hypothesis performed factors that have a significant influence on the occurrence of stunting in the news Posyandu Kasih Mother in Pukesmas Airtiris, Kampar is the nutritional status of weight based on age (Safitri et al., 2022).

According to (Agustin & Rahmawati, 2021) survey, 76% of stunting families have incomes below the regional minimum wage, while 36% of non-stunting families are below the UMR. Statistically, family income is related to stunting incidents (p = 0.004) (OR = 0.178; 95% CI 0.052 to 0.607). Conclusion: Family income is related to stunting incidents. Families with incomes less than the Minimum Wage (Agustin & Rahmawati, 2021).

Annova (Analysis of Varian)

Analysis of variance (ANOVA) is a comparative test used to test the mean (average) difference of data over two groups.

Table 3. Annova Analysis Results

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	109955.944	1	109955.944	184.849	.000b
Residual	212953.779	358	594.843		
Total	322909.722	359			

In this study, the F value was 184,849, which is very significant (sig. = 0.000). Table 3 shows that the regression model created is a good fit for the data. A large F value indicates that the variability described by the model is greater than the error variability.

Coefficient Analysis

Table 4. Coeffisient

Model	B	Std. Error	Beta	t	Sig.
Constant	-15.365	3.003		-5.117	.000
Poor Population	0.143	.010	.584	13.596	.000

In Table 4, the resulting intercept value (constant) is -15.365. It shows the average stunting value when the poor population is 0. The coefficient for the poor population is 0.143. This means that for every 1 unit increase in the poor population, stunting increases by 0.143 units, assuming other variables are fixed. This coefficient is significant at the level of 0.000. The beta value (standard coefficient) for

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the poor population is 0.584. It shows the relative strength of a variable in predicting dependent variables in standard units of deviation.

DISCUSSIONS

Correlation analysis is a method to assess the strength and direction of the relationship between poverty and stunting. A correlation analysis was conducted to assess the strength and direction of the relationship between poverty and stunting. Correlation gives information about how far two variables move together, if one of them changes, the other tends to change in the same or opposite direction (Yadika et al., 2019). The results of the correlation analysis are interpreted in the context of the research.

Based on the results of the analysis, the significant variables associated with the number of stunting news stories after the modeling to determine the factors that influence stunting news in West Java are the complete basic immunization, the place of food management, and the condition of the poor population. Model (Manaf et al., 2022). Pearson Correlation Pearson's correlation value between "poor population" and "stunting" is 0.584. This suggests that there is a moderately positive correlation between these two variables. That is, as the poverty rate rises, the prevalence of stunting also tends to increase, and vice versa. Sig. (2-tailed) is the significance value (p-value) for this correlation, which is 0.000, which is less than 0.01 (or 1%). It shows that the correlation between "poor population" and "stunting" is statistically significant at a 99% confidence rate. In another study conducted in East Java, the result of a double linear regression analysis showed that independent variables (ANC visits, early lactation initiation, chronic malnutrition of mothers) that were studied had a sufficient influence on the occurrence of stunting, i.e., 45.30%. While the remaining 54.70% can be explained by other factors not studied in this study (Mamlua'atul Mufidah et al., 2023).

CONCLUSION

This research has provided important insights into the relationship between poverty and stunting in the Cianjur District. By understanding the impact of poverty levels on the prevalence of stunting, this research paves the way for more targeted and effective interventions to reduce stunting in a local context. However, the study also underscores the complexity of the problem and suggests that its solution requires a more comprehensive and multisectoral approach. It not only reduces poverty but also improves access to health services, education, sanitation, and nutrition. Success in tackling stunting will have a broad positive impact, ranging from a child's cognitive development and health to productivity and future economic potential. In this respect, this research contributes not only to Cianjur District but also to a global understanding of the relationship between stunting and poverty, as well as the best strategies to tackle it. More research and collaboration between governments, researchers, health practitioners, and other sectors is needed to develop and implement effective and sustainable solutions. With shared commitment and a coordinated approach, we can work together to create a healthier and more prosperous future for children in Cianjur District.

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