



## Analysis of Factors Associated with Malnutritions Among Children Under Five in East Kalimantan Province: A Secondary Data Study

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### Abstrak

Penelitian ini bertujuan menganalisis faktor-faktor yang berhubungan dengan malnutrisi pada balita di Provinsi Kalimantan Timur menggunakan data sekunder tahun 2021-2023. Variabel dependen adalah proporsi malnutrisi yang meliputi underweight, stunting, dan wasting, sedangkan variabel independen meliputi proporsi berat badan lahir rendah (BBLR), capaian imunisasi dasar lengkap (IDL), proporsi ibu hamil usia muda (<19 tahun), akses sanitasi, dan proporsi penduduk miskin. Analisis regresi linier berganda menunjukkan bahwa kelima variabel secara simultan berpengaruh signifikan terhadap proporsi malnutrisi ( $p=0,025$ ) dengan koefisien determinasi 39,5%. Capaian IDL merupakan variabel dengan pengaruh paling signifikan terhadap malnutrisi balita ( $p=0.02$ ). Hasil ini menegaskan pentingnya imunisasi, pencegahan kehamilan usia muda, peningkatan sanitasi, serta penanggulangan kemiskinan untuk mengurangi malnutrisi. Studi ini memberikan dasar kebijakan yang dapat meningkatkan intervensi gizi di wilayah tersebut.

### Abstract

*This study aims to analyze factors associated with malnutrition among children under five in East Kalimantan Province using secondary data from 2021-2023. The dependent variable is the proportion of malnutrition, including underweight, stunting, and wasting. Independent variables include the proportion of low birth weight (LBW), complete basic immunization (CBI) coverage, adolescent pregnancy (<19 years), sanitation access, and poverty rate. Multiple linear regression analysis found that these five variables simultaneously have a significant effect on malnutrition prevalence ( $p=0.025$ ) with a coefficient of determination of 39.5%. CBI coverage was identified as the most significant predictor of malnutrition ( $p=0.02$ ). These findings highlight the importance of immunization, prevention of adolescent pregnancy, improved sanitation, and poverty reduction to address malnutrition. The study provides a policy basis for enhancing nutrition intervention programs in the region.*

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## INTRODUCTION

Every child has the right to live, grow, and develop in a safe and supportive environment, free from violence and discrimination. They are entitled to adequate health services and social protection based on their physical, mental, and social needs, as mandated by national law. Ensuring these rights requires the commitment of all stakeholders. Eliminating child malnutrition is part of a global effort, reflected in the Sustainable Development Goals (SDGs) Goal 2: “End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.” Indonesia, as part of this global commitment, continues to prioritize reducing malnutrition among children to support their optimal growth and development. (Kementerian Kesehatan RI, 2019).

Nutritional problems among children under five remain a major challenge in improving public health in Indonesia. Early childhood is a critical and vulnerable period, during which rapid growth and development require adequate nutritional intake (Janah & Kartini, 2022). Malnourished children may face both short- and long-term consequences, including impaired physical and cognitive development, increased risk of chronic diseases in later life, and even death (Kementerian Kesehatan RI, 2019). Furthermore, malnutrition during this stage can negatively impact learning abilities and future productivity, ultimately affecting the quality of human resources. Therefore, prevention and management of nutritional problems in young children are essential to support overall health development and societal well-being (Soliman et al., 2021).

Globally, malnutrition among children under five remains a major challenge affecting the quality of human resources. According to (UNICEF, 2023), the global prevalence of stunting is 22.3%, while wasting stands at 6.8%, with most cases occurring in the South-Southeast Asia and Africa regions. In Indonesia, although stunting prevalence has decreased over the past decade, it remains relatively high. National survey data indicates that stunting prevalence declined from 37.6% in 2013 to 19.8% in 2024 (Kementerian Kesehatan RI, 2025).

East Kalimantan Province, despite being known for its abundant natural resources, still faces significant challenges in addressing nutritional problems, particularly stunting and underweight. The 2024 Indonesian Nutrition Status Survey (SSGI) data indicates that the prevalence of stunting in East Kalimantan is 22.3%, while underweight prevalence is 18.4%. These figures are higher than the national prevalence rates of 19.8% for stunting and 16.9% for underweight (Kementerian Kesehatan RI, 2025). This finding suggests that economic factors are not the sole determinants of children's nutritional status; instead, there are other more complex factors that require further investigation.

Malnutrition in children under five is generally influenced by various multifactorial determinants, both directly and indirectly (Dassie et al., 2024). These factors include family socioeconomic status, maternal education level, child caregiving practices, access to health services, immunization status, infectious diseases, environmental sanitation, and household food adequacy (Faidul Jihad et al., 2022; Ghosh, 2020). Therefore, a comprehensive identification of these factors is essential to design targeted and

effective intervention strategies to significantly reduce the prevalence of malnutrition.

Malnutrition, both acute forms such as underweight and wasting and chronic forms like stunting, contributes to higher rates of illness, mortality, and impairments in physical and cognitive development (World Health Organization, 2025). These impacts extend beyond the individual level to affect the national economy through increased healthcare costs and reduced future productivity (Hartati et al., 2024). This situation creates a double burden on the health system and national development, requiring targeted interventions. Therefore, addressing and preventing nutritional problems must be conducted comprehensively and sustainably, involving multiple sectors to achieve optimal outcomes (Yigezu et al., 2024).

The use of secondary data offers an opportunity to conduct comprehensive, population-based epidemiological analyses. Besides being more efficient in terms of time and resources, this approach allows examination of multiple factors on a large scale, enabling stakeholders to make more precise policy adjustments, prioritize regions and target groups requiring intensive interventions, and improve the efficiency and effectiveness of stunting prevention and control programs. Based on this background, this study aims to analyze factors correlates with malnutrition among children under five in East Kalimantan Province through secondary data analysis. It is expected that the findings will contribute to the development of more targeted nutrition policies and intervention programs based on data and evidence.

## METHOD

This study employs an ecological design based on secondary data analysis using the East Kalimantan Provincial Health Profile data from 2021–2023, sourced from the East Kalimantan Provincial Health Office (Dinkes), as well as the East Kalimantan Regional Welfare Statistics and Expenditure Statistics from 2021–2024, both obtained from the East Kalimantan Provincial Statistics Agency (BPD). The data analyzed are aggregate population-based data. The unit of analysis consists of 10 districts/cities in East Kalimantan over the past three years, resulting in a total of 30 observations.

The dependent variable in this study is the proportion of malnutrition among children under five (Y), which combines the proportions of underweight, stunting, and wasting. Independent variables include the proportion of low birth weight (LBW) (X1), coverage of complete basic immunization (CBI) (X2), proportion of pregnant women under 19 years old (X3), proportion of households with access to adequate sanitation (X4), and proportion of the poor population (X5). Data analysis was performed using univariate (descriptive) and multivariate (multiple linear regression) methods with STATA software version 17.

## RESULT AND DISCUSSION

The univariate analysis results presented in Table 1 indicate that the average proportion of malnutrition among children under five (Y) across regencies/cities in East Kalimantan Province during 2021–2023 was 34.05%, ranging from a minimum of 20% to a maximum of 59.3%. The average proportion of low birth weight cases (LBW)

(X1) was 6.57%, with values ranging between 0.4% and 11.7%. The average coverage of complete basic immunization (CBI) (X2) was 92.49%, with a minimum of 61.9% and a maximum of 144.5%. The average proportion of young mothers giving birth (<19 years) (X3) was 23.72%, with values from 9.6% up to 36.6%. The average

proportion of households with adequate sanitation access (X4) was 83.84%, ranging from 33.6% to 117.3%. Meanwhile, the average proportion of the poor population (X5) was 7.31%, with the lowest value at 2.3% and the highest at 11.9%.

**Table 1.** Statistical Description of Variables

Variable	N	Mean	SD	Min	Max
Malnutrition among children under five (Y)	30	34.05	8.49	20	59.3
LBW (X1)	30	6.57	2.63	0.4	11.7
CBI Coverage (X2)	30	92.49	17.9	61.9	144.5
Young mothers giving birth (<19 years) (X3)	30	23.72	7.12	9.6	36.6
Access to an adequate sanitation (X4)	30	83.84	17.57	33.6	117.3
Poor population (X5)	30	7.31	2.78	2.3	11.9

The multivariate analysis in this study utilized linear regression, specifically multiple linear regression, to examine the effects of several independent variables on a single dependent variable. Key assumptions that must be met for this analysis include: (a) independent variables should not be correlated with each other; (b) residuals must be independent; (c) residuals have constant variance; and (d) residuals are normally distributed.

One crucial assumption before conducting multiple linear regression is that the independent variables are not correlated with each other. If this assumption is violated, it results in a condition called multicollinearity. Multicollinearity can be detected by examining the Tolerance value or the Variance Inflation Factor (VIF). According to Table 2, none of the variables have a Tolerance value below 0.10 or a VIF value above 10, indicating that multicollinearity is not present in this model.

**Table 2.** Multicollinearity Test (VIF)

Variabel	Tolerance	VIF
LBW (X1)	0.795	1.26
CBI Coverage (X2)	0.912	1.10
Young mothers giving birth (<19 years) (X3)	0.265	3.76
Access to an adequate sanitation (X4)	0.857	1.17
Poor population (X5)	0.288	3.46

There are three assumptions that must be satisfied regarding the residuals ( $\epsilon$ ) in a multiple linear regression model. The first assumption is that residuals must be independent; if this assumption is violated, it results in autocorrelation. According to the autocorrelation test results using the Breusch-Godfrey LM Test shown in Table 3, the p-value was 0.899 ( $p > 0.05$ ), indicating that autocorrelation does not occur and the residuals are independent.

The second assumption is that residuals must have constant variance; violation of this assumption is called heteroscedasticity. The heteroscedasticity test using the Glejser Test, also presented in Table 3, showed a p-value of 0.465 ( $p > 0.05$ ), indicating no heteroscedasticity and that residual variance is constant.

The final assumption is that residuals should be normally distributed, which is tested through a normality test. Based on the results of the Shapiro-Wilk test in Table 3, the p-value was 0.069 ( $p > 0.05$ ), thus residuals are considered normally distributed.

**Table 3.** Statistical Description of Variables

Uji Autokorelasi	Uji Heterokedastisitas	Uji Normalitas
LM Test		Shapiro
Breusch		-Wilk
Godfrey	Uji Glejser	$p=0.06$
$p=0.899$	$p=0.465$ ( $p>0.05$ )	9
( $p>0.05$ )	Tidak terjadi	( $p>0.05$ )
Tidak	Heteroskedastisitas	)
terjadi	(residual memiliki	Terdistr
Autokorelasi	varians tetap)	ibusi
		normal

All assumptions have been met, allowing the analysis to proceed with the estimation of the multiple linear regression model. The estimation results are presented in Table 4. In multiple linear regression analysis, two tests are conducted: the F-test and the t-test. The F-test, also known as the simultaneous test, is used to determine the overall significance of the regression model; if the null hypothesis ( $H_0$ ) is rejected, it indicates that the regression model is valid and the independent variables jointly have a significant effect on the dependent variable. The t-test, or partial test, assesses the significance of each independent variable individually; rejecting  $H_0$  means the independent variable has a significant impact on the dependent variable.

According to Table 4, the F-test showed a p-value of 0.025 ( $p < 0.05$ ), indicating that Low Birth Weight (LBW), Complete Basic Immunization (CBI),

Young Pregnant Mothers, Access to Sanitation, and Poor Population simultaneously have a significant effect on the proportion of malnutrition among children under five in East Kalimantan Province. The coefficient of determination ( $R^2$ ) is 39.5%, meaning these variables explain 39.5% of the variation in malnutrition proportion among under-five children, while the remainder is influenced by other factors. Also, from the partial t-test, it was found that CBI (Complete Basic Immunization) Coverage is the variable with the most significant effect on malnutrition proportion, with a p-value of 0.020 ( $p < 0.05$ ).

**Table 4.** Linear Regression Estimates

Variable	Model		
	B	T	p-value
Intercept	54.563	5.36	0.000
LBW (X1)	0.846	1.47	0.154
CBI Coverage (X2)	-0.196	-2.50	0.020*
Young mothers giving birth (<19 years) (X3)	0.274	0.75	0.462
Access to an adequate sanitation (X4)	-0.070	-0.85	0.404
Poor population (X5)	-1.165	-1.29	0.208
F (p-value)	4.89 (0.025)		
R-Square ( $R^2$ )	0.395 = 39.5%		

The multiple linear regression model for malnutrition incidence among children under five in Indonesia in 2021 is presented as follows. The coefficients for Low Birth Weight (LBW, X1) at 0.846 and Young Pregnant Mothers (X3) at 0.274 indicate a positive relationship with the proportion of malnutrition, meaning that an increase in LBW and young pregnancy rates is associated with a rise in malnutrition

proportion. In contrast, the coefficients for Complete Basic Immunization (CBI, X2) at -0.196, Sanitation (X4) at -0.070, and Poverty (X5) at -1.165 demonstrate a negative relationship, indicating that increases in CBI, sanitation coverage, and poverty rates correspond to a decrease in malnutrition proportion.

$$y = 54.563 + 0.846X1 - 0.196X2 + 0.274X3 - 0.070X4 - 1.165X5 + \varepsilon$$

The multivariate analysis results reveal that Low Birth Weight (LBW), Complete Basic Immunization (CBI), Young Pregnant Mothers, Access to Sanitation, and Poor Population simultaneously have a significant impact on the proportion of malnutrition among children under five in East Kalimantan Province. Malnutrition in children is a common global issue that can lead to both short and long term irreversible adverse health effects. It is not a simple condition caused by a single factor but rather a multifactorial disease (Akhade et al., 2019). A similar study by Warsidah et al., (2023) concluded that four factors simultaneously influence stunting rates in West Kalimantan: giving birth for the first time under the age of 20, early marriage, complete immunization coverage for children under five, and access to sanitation (p-value=0.000; R<sup>2</sup>=80.4%).

Based on the correlation coefficient, the proportion of Low Birth Weight (LBW) infants has a positive relationship with the proportion of malnutrition, indicating that an increase in the proportion of LBW is associated with a higher proportion of malnutrition among children under five. This finding is consistent with studies reported in Adityaningrum et al., (2021) and Hermawan et al., (2023), which also found

a positive correlation between LBW and stunting incidence. According to UNICEF (2023), approximately 19.8 million newborns, or an estimated 14.7 percent of all babies born globally that year, suffered from low birth weight. Countries with high LBW prevalence tend to have high rates of stunting as well (UNICEF, 2023). Children born with low birth weight typically experience slower growth and development compared to those born with normal weight. This situation worsens if LBW infants do not receive adequate energy and nutrient intake, proper caregiving, and frequently suffer from infectious diseases, which ultimately increases their risk of poor or inadequate nutritional status (Akil et al., 2023).

The study results indicate that the correlation coefficient for Complete Basic Immunization (CBI) achievement is negative, signifying an inverse relationship between CBI coverage and the proportion of malnutrition; as CBI coverage increases, the proportion of malnutrition decreases. This finding aligns with previous studies, such as those reported by (Warsidah et al., 2023) and Mulyani et al. (2023) which found significant associations between full immunization status and stunting prevalence among children under five in various regions of Indonesia. Complete immunization improves child health, thereby contributing to better nutritional status (Trisnawati & Maksum, 2024). Children who are not immunized lack sufficient immunity against certain infectious diseases, making them more susceptible to illness that can lead to poor nutritional status. This is due to the close relationship between infectious diseases and the immune system, which ultimately impacts the child's nutritional condition (Tripathy et al., 2023). Moreover, statistical

analysis shows that CBI coverage is the most significant factor influencing malnutrition in young children. The finding that incomplete immunization is associated with a higher risk of stunting underscores the importance of achieving high immunization coverage to promote child growth and development (Mulyani et al., 2023)

Pregnancy at a young age (<19 years) has a positive association with the occurrence of malnutrition, meaning that as the proportion of young mothers increases, the incidence of malnutrition tends to rise as well. This finding aligns with studies such as Sofiyulloh & Rahmaniati (2024) and Warsidah et al. (2023), which report a correlation between early marriage and adolescent pregnancy (under 20 years old) with high stunting rates in West Kalimantan and East Java. Adolescent pregnancy increases the demand for energy and nutrients, creating competition between the mother and fetus for adequate nutrition, which may negatively affect their health (Astuti et al., 2022). The incidence of stunting is influenced not only by maternal age at delivery but also by many other factors such as knowledge, social, and economic conditions (Sofiyulloh & Rahmaniati, 2024). Physical and emotional immaturity of young mothers, limited access to resources and education, as well as the increased risks associated with early pregnancy and childbirth are significant contributing factors.

The study also demonstrated that the proportion of households with access to adequate sanitation is inversely associated with the incidence of malnutrition, indicating that improvements in sanitation access contribute to reductions in malnutrition among children under five. Similar findings have been reported by

previous studies (Dewi et al., 2024) and (Maliga et al., 2022), which identified poor sanitation as an indirect determinant of stunting through its association with infectious diseases. In theory, Water, Sanitation, and Hygiene (WASH) interventions can affect key factors influencing an individual's nutritional status, including immediate causes such as food intake and overall health, as well as indirect causes related to the physical environment (Patlán-Hernández et al., 2022). Practices such as open defecation are strongly linked to increased incidence of diarrhea, which negatively impacts child growth and development, potentially leading to stunting and even mortality (Paramasatya & Wulandari, 2023).

In contrast, the study found an inverse relationship between the proportion of the poor population and the prevalence of malnutrition among children under five, indicating that an increase in the poverty rate was associated with a decrease in malnutrition prevalence. This finding contradicts existing theories and several previous studies (Adityaningrum et al., 2023) and Muthahharah & Islamiah (2025), which assert that malnutrition (stunting and wasting) is positively correlated with family economic status, where families with low or unstable income have reduced purchasing power for nutritious food, thereby increasing the risk of undernutrition. The discrepancy in results may be attributed to the presence of social assistance programs and targeted nutritional interventions aimed at impoverished families, which potentially help reduce malnutrition rates. Additionally, non-poor populations might exhibit unhealthy dietary patterns, which could elevate the risk of poor nutritional status. Furthermore, variations in the quality and availability of secondary data,

as well as the selection of variables, may have influenced the study's outcomes.

## CONCLUSION

The study results indicate that low birth weight (LBW), complete basic immunization (CBI), adolescent pregnancy, access to sanitation, and population poverty simultaneously have a significant effect on the proportion of malnutrition among children under five in East Kalimantan Province. The model's coefficient of determination ( $R^2$ ) is 39.5%, implying that 39.5% of the variation in malnutrition prevalence among children under five is explained by these factors, while the remaining variation is influenced by other variables. Among these, complete basic immunization (CBI) was found to have the most significant impact on the proportion of malnutrition in children under five in East Kalimantan.

Based on the results, it is recommended that health programs in East Kalimantan prioritize strengthening basic immunization coverage, maternal health services, sanitation, and poverty reduction strategies, as these factors significantly influence child malnutrition. Complete Basic Immunization (IDL) was identified as the most influential factor, highlighting the need for increased immunization outreach and community awareness. Since the model explains only 39.5% of malnutrition variation, future research should investigate other variables such as parental education, feeding practices, and household food security, using more comprehensive data and longitudinal approaches.

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