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ANALYSIS OF FACTORS AFFECTING THE POVERTY RATE IN GORONTALO PROVINCE 2018–2023

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Abstract

Poverty remains one of the serious issues facing Gorontalo Province to this day. This study aims to identify the factors influencing poverty levels in Gorontalo Province during the period from 2018 to 2023. The factors examined in this study include population size, education level, economic growth, and the Human Development Index (HDI). This study employs a quantitative method using a panel data approach, which combines data from several regencies/cities in Gorontalo Province (cross-sectional data) with annual data from 2018 to 2023 (longitudinal data). The data used in this study are sourced from the Central Statistics Agency (BPS). The dependent variable in this study is the poverty rate, while the independent variables consist of population size (X1), education level (X2), economic growth (X3), and the Human Development Index (HDI) (X4). Data analysis was conducted using panel data regression with the selection of the best model among the Common Effects Model, Fixed Effects Model, and Random Effects Model. The results of this study are expected to demonstrate the extent of the influence of each of these variables on the poverty rate in Gorontalo Province, both individually and collectively. This study aims to provide a clear picture to the local government of Gorontalo Province as a basis for formulating appropriate policies to reduce poverty rates, particularly through improving the quality of education, ensuring equitable economic growth, and enhancing the Human Development Index across the entire Gorontalo region.

Keywords: Poverty Rate, Population, Education, Economic Growth, Human Development Index (HDI), Panel Data, Gorontalo Province

INTRODUCTION

Poverty remains a fundamental economic and social challenge in developing countries, including Indonesia. It is closely associated with social welfare and the effectiveness of regional development, as persistent poverty reflects inequalities in income distribution and access to essential resources (Tamasiga et al., 2023). Poverty can also restrict access to education and healthcare, limit employment opportunities, and perpetuate socioeconomic disadvantages across generations. Therefore, identifying the factors associated with poverty is essential for developing evidence-based policies that promote inclusive economic growth and improve public welfare (Miah et al., 2024).

Gorontalo Province continues to experience a relatively high poverty rate despite a gradual decline over time. According to Statistics Indonesia (BPS), the provincial poverty rate decreased from 16.81% in March 2018 to 15.15% in March 2023. However, the March 2023 figure remained 5.79 percentage points above the national poverty rate of 9.36% (BPS, 2018, 2023a, 2023b). This persistent disparity indicates that poverty reduction remains a substantial development challenge. Furthermore, the provincial average conceals considerable differences between urban and rural areas. In March 2023, the poverty rate reached 23.73% in rural areas, compared with 4.47% in urban areas (BPS, 2023b). These differences suggest that poverty in Gorontalo may be associated with unequal access to economic opportunities and variations in socioeconomic conditions across regions. Although poverty declined during the observation period, the remaining gap with the national average highlights the need to investigate the factors associated with poverty rather than conclude that existing government interventions have been ineffective solely on the basis of the poverty rate.

The relationship between poverty and socioeconomic conditions can be explained through several theoretical perspectives. First, Nurkse's vicious circle of poverty theory explains how low income can constrain savings and investment, resulting in low productivity and the persistence of poverty (Alvarez et al., 2022). Second, the human development approach emphasizes the importance of education, health, and living standards in improving individuals' capabilities and economic opportunities. The Human Development Index (HDI) reflects these dimensions and provides an indicator for examining the relationship between human development and poverty (Śmiech et al., 2025). Third, economic growth theory suggests that economic expansion can reduce poverty by increasing employment opportunities and household income, particularly when growth generates broadly distributed benefits. Fourth, Malthusian population theory suggests that population growth may intensify pressure on economic resources, employment opportunities, and public services when these do not expand sufficiently to meet increasing demand (Fonseca et al., 2024). These theoretical perspectives provide a basis for examining population size, education, economic growth, and HDI as potential determinants of poverty.

Previous empirical studies have investigated these relationships in different regional contexts. Aliyah and Susilawati (2024) found that HDI had a negative and significant effect on poverty, suggesting that improvements in human development may be associated with lower poverty rates. Similarly, Sevti and Minarti (2026) reported that economic growth negatively affected poverty, indicating that stronger economic performance may contribute to poverty reduction. Education is also expected to reduce poverty by improving individuals'

skills, productivity, and access to employment opportunities. In contrast, population growth may increase poverty when the availability of employment, infrastructure, and public services fails to keep pace with demographic changes. Consistent with this perspective, Kombong et al. (2023) identified a positive relationship between population size and poverty. Nevertheless, the strength and direction of these relationships may differ across regions because of variations in economic structures, labor markets, educational attainment, and the distribution of development benefits.

Despite these findings, the relationships between socioeconomic factors and poverty remain context-dependent, and further investigation is needed to understand these relationships in Gorontalo Province (Zhang et al., 2023). Studies examining individual determinants separately may not fully capture the interconnected influences of demographic conditions, education, economic performance, and human development. Furthermore, findings from other regions may not adequately reflect Gorontalo's socioeconomic characteristics. The persistent gap between provincial and national poverty rates, together with the substantial disparity between rural and urban poverty, provides a relevant empirical context for examining these factors simultaneously. Accordingly, a comprehensive regional analysis is needed to determine which socioeconomic factors are significantly associated with poverty in Gorontalo.

This study addresses this research gap by examining population size, education, economic growth, and HDI simultaneously using panel data covering the 2018–2023 period. The analysis includes six regencies and municipalities in Gorontalo Province, combining cross-sectional observations across these regions with annual observations over six years. This approach enables the study to account for variation across regions and over time within a unified empirical framework. Unlike analyses that focus on a more limited set of explanatory variables, this study considers demographic, educational, economic, and human development indicators together. Its contribution lies in providing region-specific empirical evidence on the relationships between these factors and poverty in Gorontalo Province, rather than assuming that findings from other settings apply uniformly to the province.

Accordingly, this study aims to analyze the effects of population size, education level, economic growth, and HDI on poverty in Gorontalo Province during 2018–2023 using panel data regression. The findings are expected to contribute to the literature on regional poverty and provide empirical insights for the Gorontalo Provincial Government in formulating more targeted poverty alleviation policies. By identifying the factors significantly associated with poverty, the study may help inform policy priorities related to educational improvement, employment opportunities, and more equitable human and regional development.

RESEARCH METHOD

This study employs a quantitative approach using secondary panel data. Panel data combine cross-sectional observations across multiple regions with time-series observations over several periods (Liyew et al., 2024). The study covers six regencies/municipalities in Gorontalo Province, namely Gorontalo, Boalemo, Pohuwato, Bone Bolango, North Gorontalo, and Gorontalo City, over the 2018–2023 period. The dataset comprises 36 observations, representing six cross-sectional units observed over six years. The data were obtained from official publications and statistical databases provided by Statistics Indonesia

(BPS), particularly BPS-Statistics of Gorontalo Province. These sources were selected because they provide systematically collected and publicly accessible official statistics suitable for empirical analysis (Banaag et al., 2024; Cope et al., 2022).

The dependent variable is the poverty rate, while the independent variables comprise population size, education, economic growth, and the Human Development Index (HDI). The poverty rate (POV) is measured as the percentage of the population living below the official poverty line in each regency/municipality. Population size (POP) represents the total number of residents in each region. Education (EDU) is measured using mean years of schooling, expressed in years, to represent average educational attainment (Muliawan & Hasmarini, 2020). Economic growth (EG) is measured as the annual percentage growth rate of Gross Regional Domestic Product (GRDP) at constant prices. HDI represents human development across three dimensions: health, education, and a decent standard of living, expressed on a scale from 0 to 100 (Fauzan et al., 2022).

Panel data regression is used to examine the relationships between population size, education, economic growth, HDI, and poverty. This approach allows the analysis to incorporate both cross-sectional and temporal variation, potentially providing more informative estimates than analyses based exclusively on cross-sectional or time-series data (Sari & Setyowati, 2022). The empirical model is specified as follows:

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + e_{it}$$

Where:

KMK	*= Poverty rate in region i in year t*
β_0	*= Constant*
β_1–β_4	*= Regression coefficients of the independent variables*
JP	*= Population size in region i in year t*
PEND	*= Education level in region i in year t*
PE	*= Economic growth in region i in year t*
IPM	*= Human Development Index (HDI) in region i in year t*
ε_{it}	*= Error term*
i	*= Regency/municipality*
t	*= Year*

Three alternative specifications are considered: the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). The CEM assumes a common intercept across all regions and periods and estimates the pooled relationship using Ordinary Least Squares (OLS). The FEM allows region-specific intercepts to account for unobserved characteristics that remain constant over time. The REM treats unobserved individual-specific effects as random components and assumes that these effects are uncorrelated with the explanatory variables (Sari & Hasmarini, 2023).

Model selection is conducted using the Chow, Hausman, and Lagrange Multiplier (LM) tests. The Chow test determines whether the FEM is more appropriate than the CEM, with a probability value below 0.05 supporting the FEM. The Hausman test distinguishes between the FEM and REM; a probability value below 0.05 supports the FEM, whereas a value above 0.05 supports the REM, subject to the test's underlying assumptions

(Qurannisya, 2026). The LM test compares the REM with the CEM, with a probability value below 0.05 indicating a preference for the REM over the CEM. These tests are interpreted collectively according to the relevant model comparisons to determine the most appropriate specification.

Following model selection, hypothesis testing is conducted using the partial (t)-test, simultaneous (F)-test, and coefficient of determination ((R^2)). The (t)-test evaluates whether each independent variable has a statistically significant association with the poverty rate, while the (F)-test assesses the joint significance of the explanatory variables. A probability value below 0.05 is used as the criterion for statistical significance. The coefficient of determination indicates the proportion of variation in the poverty rate explained by the explanatory variables in the estimated model. Its interpretation depends on the selected panel specification, particularly when fixed or random effects are included.

RESULTS AND DISCUSSION

This study used panel data consisting of 36 observations obtained from six regencies/municipalities in Gorontalo Province over the 2018–2023 period. The six cross-sectional units consisted of Gorontalo Regency, Boalemo Regency, Pohuwato Regency, Bone Bolango Regency, North Gorontalo Regency, and Gorontalo City. Before estimating the regression model, panel data model selection was conducted to determine the most appropriate estimation method:

Chow Test

The Chow test was conducted to determine whether the Common Effect Model (CEM) or Fixed Effect Model (FEM) was more appropriate for the data. The results are presented in Table 1.

Table 1.
Chow Test Results

Effects Test	Statistic	d.f.	Probability
Cross-section F	24.124027	(5, 26)	0.0000
Cross-section Chi-square	62.270949	5	0.0000

Source: Data processed using EViews 12 (2026).

Table 1 shows that the probability value of the cross-section F is 0.0000, which is lower than the significance level of 0.05. Therefore, the null hypothesis is rejected, indicating that the Fixed Effect Model is preferable to the Common Effect Model. Subsequently, the Hausman test was performed to determine whether the Fixed Effect Model or Random Effect Model was more appropriate.

Hausman Test

The Hausman test was conducted to select between the Fixed Effect Model (FEM) and Random Effect Model (REM). The results are presented in Table 2.

Table 2.
Hausman Test Results

Test Summary	Chi-square Statistic	Chi-square d.f.	Probability
Cross-section random	43.846371	4	0.0000

Source: Data processed using EViews 12 (2026).

As shown in Table 2, the probability value of the Hausman test is 0.0000, which is lower than 0.05. Therefore, the null hypothesis is rejected, indicating that the Fixed Effect Model is more appropriate than the Random Effect Model. Based on the Chow and Hausman tests, the Fixed Effect Model was selected as the final panel data regression model in this study.

Fixed Effect Model Estimation

The estimation results of the Fixed Effect Model are presented in Table 3.

Table 3.
Fixed Effect Model Estimation Results

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	36.392610	5.364915	6.783445	0.0000
JP	0.004473	0.001527	2.929855	0.0063
PEND	-5.471387	0.598329	-9.144449	0.0000
PE	0.116519	0.062452	1.865734	0.0716
IPM	0.317680	0.144034	2.205585	0.0350

Source: Data processed using EViews 12 (2026).

Based on the estimated coefficients presented in Table 3, the panel regression equation can be formulated as follows:

$$KMKit = 36.392610 + 0.004473JPit - 5.471387PENDit + 0.116519PEit + 0.317680IPMit + \varepsilon it$$

The equation shows that population (JP), economic growth (PE), and the Human Development Index (IPM) have positive regression coefficients, whereas education (PEND) has a negative coefficient. This indicates that, holding other variables constant, increases in JP, PE, and IPM are associated with an increase in the poverty rate, while an increase in PEND is associated with a decrease in the poverty rate. However, the direction of the coefficients does not by itself indicate statistical significance. Therefore, the significance of each independent variable is subsequently assessed using the partial *t*-test.

Simultaneous Test (*F*-Test)

The simultaneous test was conducted to determine whether population, education, economic growth, and the Human Development Index jointly affect the poverty rate. The results are presented in Table 4.

Table 4.
Simultaneous F-Test Results

Statistic	Value
F-statistic	253.4797
Prob. (F-statistic)	0.0000

Source: Data processed using EViews 12 (2026).

The *F*-statistic is 253.4797 with a probability value of 0.0000. Since the probability value is lower than 0.05, the independent variables simultaneously have a statistically significant effect on the poverty rate in Gorontalo Province during 2018–2023.

Coefficient of Determination

The coefficient of determination was used to evaluate the explanatory power of the regression model. The results are presented in Table 5.

Table 5.
Coefficient of Determination

Statistic	Value
R^2	0.970333
Adjusted R^2	0.966505

Source: Data processed using EViews 12 (2026).

The R^2 value of 0.970333 indicates that 97.03% of the variation in the poverty rate can be explained by population, education, economic growth, the Human Development Index, and the fixed regional effects incorporated in the model. The remaining 2.97% is explained by factors outside the estimated model. Meanwhile, the adjusted R^2 value is 0.966505 or 96.65%.

Partial Test (*t*-Test)

The partial *t*-test was conducted to examine the individual effect of each independent variable on the poverty rate. The results are presented in Table 6.

Table 6.
Partial t-Test Results

Variable	Coefficient	t-Statistic	Probability	Result
JP	0.004473	2.929855	0.0063	Positive and significant
PEND	-5.471387	-9.144449	0.0000	Negative and significant
PE	0.116519	1.865734	0.0716	Not significant at 5%
IPM	0.317680	2.205585	0.0350	Positive and significant

Source: Data processed using EViews 12 (2026).

Table 6 shows that population (JP) has a positive and significant effect on the poverty rate, with a probability value of 0.0063. Education (PEND) has a negative and significant effect, with a probability value of 0.0000. Economic growth (PE) has a probability value of 0.0716, indicating that it does not have a significant effect at the 5% significance level. Meanwhile, the Human Development Index (IPM) has a positive and significant effect on the poverty rate, with a probability value of 0.0350.

Discussion

Effect of Population on Poverty

The results show that population (JP) has a positive and significant effect on the poverty rate in Gorontalo Province, with a coefficient of 0.004473 and a probability value of 0.0063. This finding indicates that an increase in population tends to be followed by an increase in the poverty rate, *ceteris paribus*. The result suggests that population growth may become a socioeconomic burden when it is not accompanied by adequate employment opportunities, income growth, and access to productive economic activities.

In the context of Gorontalo Province, population growth can increase competition in the labor market and place greater pressure on public services, including education, health care, housing, and infrastructure. When the expansion of employment opportunities is slower than population growth, a larger proportion of the population may remain unemployed or engaged in low-productivity employment, increasing their vulnerability to poverty. This finding is consistent with the Malthusian population perspective, which argues that excessive

population growth can reduce welfare when the availability of economic resources does not increase proportionally. The result is also in line with Sartika et al., (2026), who found that population size has a positive relationship with poverty when population growth is not supported by sufficient economic opportunities and employment creation. Therefore, poverty alleviation policies in Gorontalo should not only focus on controlling population growth but also on improving labor absorption and expanding productive employment opportunities.

Effect of Education on Poverty

Education (PEND), as measured by mean years of schooling, has a negative and significant effect on the poverty rate, with a coefficient of -5.471387 and a probability value of 0.0000. This result indicates that an increase in educational attainment is associated with a reduction in poverty. Holding other variables constant, a one-year increase in mean years of schooling is associated with a decrease in the poverty rate of approximately 5.471 percentage points.

This finding confirms the important role of education in improving individual economic capacity. Higher educational attainment can increase knowledge, skills, productivity, and access to better employment opportunities. Individuals with higher levels of education generally have greater opportunities to obtain more stable employment and higher income, thereby reducing the risk of falling into poverty. The result is consistent with human capital theory (Purnama et al., 2024), which views education as an investment that enhances individual productivity and earning capacity over the long term.

The finding also supports previous empirical evidence showing that higher educational attainment is associated with lower poverty. In the case of Gorontalo Province, the relatively strong negative coefficient suggests that improvements in educational attainment may constitute an important instrument for poverty reduction. Therefore, policies aimed at increasing school participation, reducing dropout rates, extending the average years of schooling, and improving the relevance of education to labor-market needs are expected to strengthen poverty alleviation efforts.

Effect of Economic Growth on Poverty

Economic growth (PE) has a positive coefficient of 0.116519 with a probability value of 0.0716. At the 5% significance level, this result indicates that economic growth does not have a statistically significant effect on the poverty rate in Gorontalo Province during the 2018–2023 period. Thus, changes in economic growth during the observation period were not sufficient to explain changes in poverty after controlling for the other variables included in the model.

The insignificant effect suggests that economic growth does not automatically translate into poverty reduction. The benefits of economic expansion may be concentrated in certain sectors, regions, or income groups and may not be distributed evenly among low-income households. Therefore, an increase in regional output does not necessarily improve the welfare of poor households when the growth process is not accompanied by sufficient employment creation and income distribution.

The observation period also includes the economic disruption associated with the COVID-19 pandemic, which may have contributed to fluctuations in economic activity and weakened the relationship between economic growth and poverty. In addition, the impact of economic growth on poverty may require time before improvements in production and investment are transmitted into employment and household income. This result differs from

(Akib et al., 2025), who found a negative relationship between economic growth and poverty. The difference may reflect variations in regional characteristics, observation periods, model specifications, and economic structures. Consequently, the findings of this study indicate that the quality and inclusiveness of economic growth are more important than growth alone in reducing poverty in Gorontalo Province.

Effect of the Human Development Index on Poverty

The Human Development Index (HDI) has a positive and significant effect on the poverty rate, with a coefficient of 0.317680 and a probability value of 0.0350. This result indicates that, after controlling for population, education, economic growth, and regional fixed effects, an increase in HDI is associated with an increase in the poverty rate during the observation period. This finding differs from the general theoretical expectation that higher human development should contribute to lower poverty.

This positive relationship should be interpreted cautiously because HDI is a composite indicator covering health, education, and standard-of-living dimensions. An increase in HDI does not necessarily mean that all components improve equally or that the benefits are distributed evenly across population groups. Moreover, education is included separately in the model through mean years of schooling, even though education is also a component of HDI. This conceptual overlap may affect the partial coefficient of HDI when both variables are estimated simultaneously. Therefore, the positive coefficient should not be interpreted as evidence that improvements in human development directly increase poverty, but rather as a conditional relationship within the model specification used in this study.

This result differs from Rahman et al., (2022), who found that HDI has a negative and significant effect on poverty. The difference may arise from variations in regional characteristics, observation periods, model specifications, and the inclusion of education as a separate explanatory variable. The finding suggests that improvements in human development in Gorontalo should be accompanied by more equitable economic opportunities, stronger household purchasing power, and greater labor-market absorption so that improvements in HDI can contribute more effectively to poverty reduction.

CONCLUSION

This study examines the effects of population size, education, economic growth, and the Human Development Index (HDI) on poverty in Gorontalo Province during 2018–2023 using panel data regression. The Fixed Effect Model (FEM) was selected based on the Chow and Hausman tests. The independent variables jointly have a statistically significant effect on poverty ($F = 253.4797$; $p < 0.001$), with an R^2 of 0.9703. Partially, population size has a positive and significant effect on poverty ($p = 0.0063$), whereas education has a negative and significant effect ($p < 0.001$). Economic growth has no statistically significant effect at the 5% significance level ($p = 0.0716$), while HDI exhibits a positive and significant relationship with poverty ($p = 0.0350$). These findings highlight the importance of improving educational attainment, expanding employment opportunities, and ensuring that human development gains translate into more equitable economic welfare. The positive relationship between HDI and poverty also warrants further investigation to understand regional disparities and the potential influence of other socioeconomic factors. Future research could incorporate additional variables and extend the observation period to provide a more comprehensive understanding of poverty dynamics in Gorontalo Province.

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