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Why is Papua's human development lagging behind? A comprehensive study of education, health, and welfare

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Abstract

This study analyzes the determinants of the Human Development Index (HDI) in Papua Province, which continues to lag behind other regions and has not yet met the 2024 RPJMN target, consisting of expected and mean years of schooling as an education indicator, life expectancy as a health indicator, and per capita expenditure as a welfare indicator. The data used comes from BPS in the form of secondary data. This research method uses multiple linear regression analysis. Research shows that increasingly secure education, health, and welfare significantly increase HDI. These findings emphasize the importance of strengthening policies in the fields of education, health, and economic welfare to accelerate human development in Papua. The main contribution of this study is to provide up-to-date empirical evidence on human development disparities at the district/city level in Papua Province, as well as identify priorities for more targeted policy interventions.

Keywords:

HDI, human development, education, health, welfare

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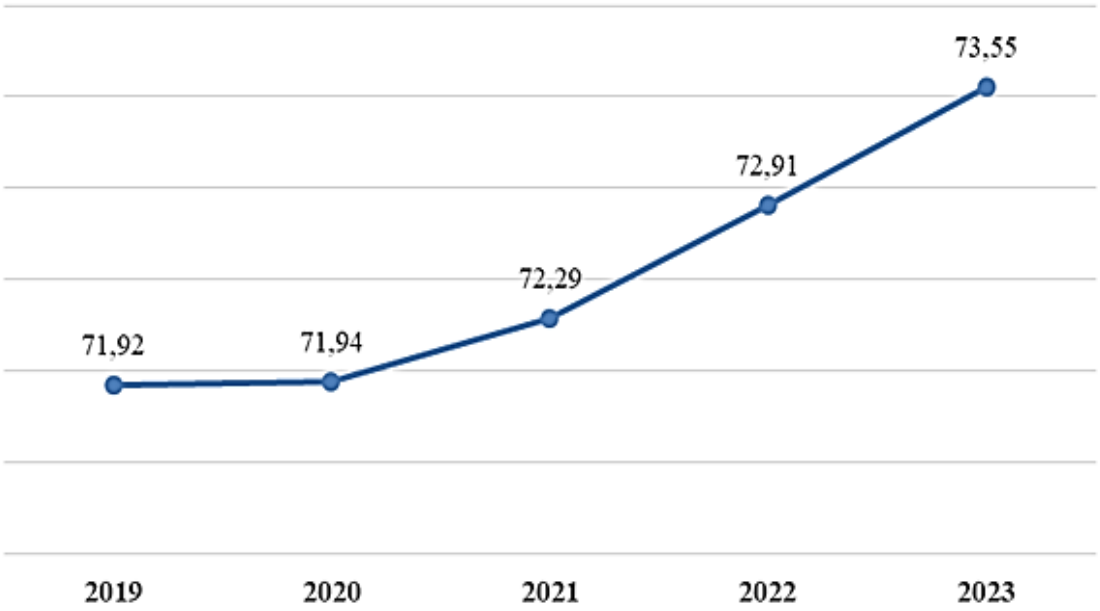
INTRODUCTION

Development is a multifaceted process involving massive transformations in people's attitudes, social structures, and national institutions to accelerate economic growth, reduce inequality, and overcome poverty (Todaro & Smith, 2024). To achieve these changes, the role of human resources is an important element in the implementation process. The achievement of development goals in a country or region can be realized by developing the ability and potential of human resources. Human development is an effort to expand individuals' opportunities to live healthy lives, achieve longevity, access education, and enjoy adequate living conditions (UNDP, 1990).

Human development is one of the important foundations in the vision of a Golden Indonesia 2045 (Bappenas, 2019a). This vision confirms that the main priority of Golden Indonesia 2045 is to improve the quality of human resources. President Joko Widodo revealed that one of Indonesia's goals for 2015-2085 is to have human resources with intelligence that surpasses other countries. Success in achieving high-quality human resources can be assessed through HDI. Based on Figure 1, Indonesia has an HDI of 73.55 in 2023. This figure increased by 0.64 points compared to the previous year, reflecting a positive trend that continues to grow yearly. A consistent upward trend in HDI indicates progress in three main dimensions: health, education, and a decent standard of living. A consistent increase in HDI indicates that a country has succeeded in expanding and improving the life choices of its citizens in various aspects, not only in the economic dimension but also in the social and general welfare dimensions. This progress includes improved access to education, better nutrition and healthcare, and more secure livelihoods. In addition, improvements in safety from crime and violence, satisfactory leisure time, political and cultural freedoms, and participation in community activities also contribute to achieving a higher HDI (Ul Haq, 1995).

Figure 1. Indonesia's Human Development Index (HDI) 2019-2023

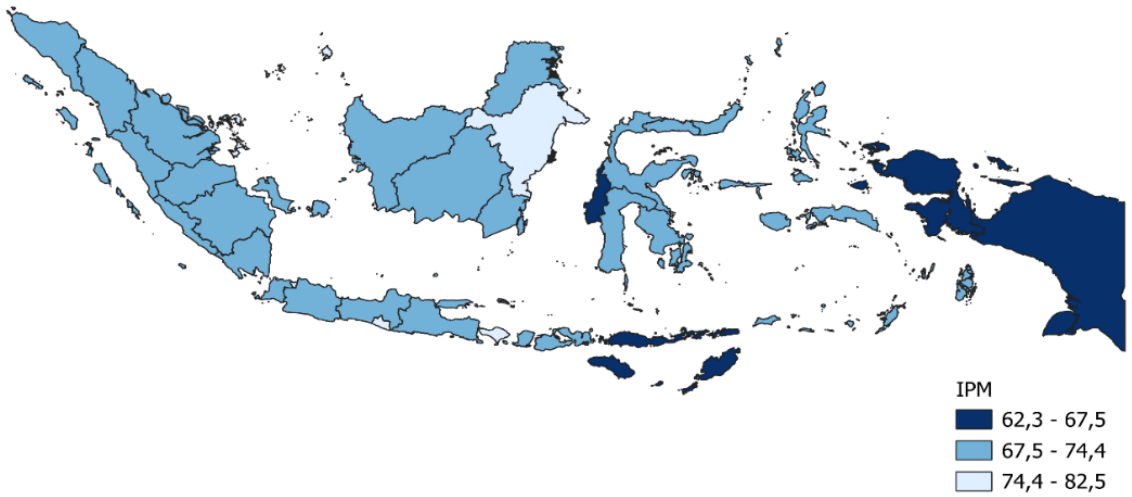


Source: BPS (processed)

Although Indonesia's HDI trend shows an increase, there are significant variations in HDI figures across provinces, indicating disparities in human development achievements between regions. Figure 2 shows the condition of human development in Indonesia. Most provinces in Indonesia have HDIs in the range of 67.5 to 74.4. Only East Kalimantan, Bali, DKI Jakarta, and DI

Yogyakarta have HDIs in the range of 74.4 to 82.5. On the other hand, the HDIs of West Sulawesi, NTT, West Papua, and Papua are in the range of 62.3 to 67.5, which is considered low (BPS, 2023).

Figure 2. Thematic Map of Human Development Index (HDI) in Indonesia in 2023



Source: BPS (processed)

Papua is one of the provinces with human development achievements that are still below the national level. Human development achievements reflect the extent to which citizens have the ability and freedom to make choices and achieve goals considered valuable in terms of economic growth or income and aspects of life that they consider important (Sen, 1999). HDI figures can measure human development achievements. Papua recorded the lowest HDI in Indonesia, with 62.25 in 2023 (BPS, 2023). This figure is still far from the national HDI of 73.55. This gap indicates inequalities in achieving human development and quality of life in Papua. The success of human development as measured by the HDI at the provincial level generally reflects achievements at the district/city level because the provincial HDI is the aggregated result of human development achievements in each district/city (BPS, 2022). Therefore, a high HDI at the district/city level is usually in line with a high provincial HDI and vice versa. Papua's low HDI indicates that the achievements of each district/city in Papua in human development also tend to be low. The 2020-2024 National Medium-Term Development Plan (RPJMN) sets the Papua HDI target 2024 between 63.94 and 67.24 (Bappenas, 2019b). However, in 2023, Papua's HDI was still 62.25, which is still below the target. This figure shows that Papua's HDI has not yet reached the set target. This non-achievement, coupled with the number of districts/cities in Papua with HDIs that are still below the provincial average, indicates several contributing factors. Exploring the variables that influence HDI in the region is important to gain better insight into human development inequality in Papua.

Several studies have analyzed the Human Development Index (HDI) using various variables across different regions. Fitriyah et al. (2021) examined HDI in West Java and Banten in 2020 using expected and mean years of schooling, life expectancy, and per capita expenditure as variables. Arum & Fitri (2023) analyzed HDI in Central Java in 2022 with the same set of variables. Legimin et al. (2023) studied HDI in NTT in 2020, focusing on education indicators, like expected and mean years of schooling, and welfare indicators, such as life expectancy. Aydoğan (2023) investigated the effect of expected and mean years of schooling, life expectancy, and per capita expenditure on HDI. Hazan (2012) explored the relationship between expected and mean years of schooling and life expectancy with HDI. Like the previous research, Anastashya et al.

(2023) conducted a study on HDI in Indonesia, identifying influencing variables, including education, health, and welfare indicators.

Although numerous studies have examined the determinants of the Human Development Index (HDI) in Indonesia, few have explicitly focused on the role of education, health, and welfare indicators as key dimensions of human development, especially in regions with pressing development challenges such as Papua. Papua consistently records the lowest HDI in the country, with severe disparities across districts/cities, limited access to quality education and healthcare, and substantial economic inequality. Given the fundamental role of these three dimensions in shaping human development, there is a need for a more focused empirical analysis that incorporates these indicators to understand the HDI gap in Papua better. Therefore, this study aims to analyze how education, health, and welfare indicators represented by expected and mean years of schooling, life expectancy, and per capita expenditure influence the HDI at the district/city level in Papua Province.

This study contributes to the existing literature by offering a novel focus on the interplay between education, health, and welfare in Papua, three critical yet underexplored aspects that contribute to the region's lagging human development. Through multiple linear regression analysis at the district/city level, this study provides up-to-date empirical evidence and practical insights to inform more targeted and inclusive policy interventions for accelerating human development in Papua.

LITERATURE REVIEW

Human Development Index (HDI)

The United Nations Development Programme (UNDP) established the Human Development Index (HDI) as an indicator to measure the success of human development in various countries or regions. HDI is a measure that assesses human development progress based on three main dimensions, namely long and healthy life, broad knowledge, and decent living standards (UNDP, 2024). UNDP updated the HDI methodology by replacing its components with mean years of schooling, life expectancy, per capita expenditure, and expected years of schooling in 2010. The Central Bureau of Statistics (BPS) follows the UNDP version of the HDI indicators but adjusts several aspects. For example, for a decent standard of living, UNDP uses gross national income per capita, while BPS uses adjusted expenditure per capita (BPS, 2014).

These components represent different key aspects of human development. Expected and mean years of schooling serve as education indicators, reflecting the average years individuals have spent in formal education and the expected duration of schooling for children entering the system (UNDP, 2024). The educational attainment of students in Papua is still low, even their reading ability lags behind other provinces, namely ranking second from the bottom in Indonesia (Robertson et al., 2018; Saifullah & Yawan, 2022). Life expectancy at birth represents the health indicator, indicating a population's overall well-being and longevity (UNDP, 2024). Poor health has profound impacts on vulnerable groups such as infants, pregnant women, and the elderly. In Papua, the problem of malnutrition in children is still high, and access to reproductive health services for women and pregnant women is also minimal (Raihannabil, 2024; (Raihannabil et al., 2024). Meanwhile, per capita expenditure indicates welfare, reflecting economic capability and access to essential goods and services necessary for a decent standard of living (UNDP, 2024). However, welfare in Papua remains low due to economic disparity and poor infrastructure, which limit household consumption and access to basic needs (Wulandari & Pramesti, 2021). Economic disparity can have far-reaching impacts, such as when households are unable to afford adequate food, leading to child malnutrition that ultimately undermines both health and educational outcomes (Raihannabil & Wicaksono, 2024).

Related Research

Fitriyah et al. (2021) found that expected and mean years of schooling, life expectancy, and per capita expenditure variables significantly influenced HDI. Then, research by Arum & Fitri (2023) stated that expected and mean years of schooling, life expectancy, and per capita expenditure influenced HDI. In research by Legimin et al. (2023), the variables that significantly affect HDI are mean, expected years of schooling, and life expectancy. Meanwhile, Aydoğan (2023) analyzed the effect of expected and mean years of schooling, life expectancy, and per capita expenditure on HDI, with results stating that these variables influence the increase in HDI. Research by Hazan (2012) resulted in a positive correlation between life expectancy, mean, and expected years of schooling to HDI. An increase in these three variables affects the high HDI rate, emphasizing the importance of health and education factors in human development. Another study was conducted by Anastashya et al. (2023) to identify the variables that influence HDI in Indonesia. The study found that HDI is significantly influenced by expected and mean years of schooling, life expectancy, and per capita expenditure.

METHOD

This study applied descriptive and inferential analysis. Descriptive analysis involved using thematic maps and bar graphs to understand each variable thoroughly. Meanwhile, multiple linear regression was used for inferential analysis. The reason for using multiple linear regression is that the study employs cross-sectional data from districts and cities in Papua for a single year, not a panel across time. Hence, panel regression techniques such as fixed or random effects were not applicable. Moreover, the analysis focuses on a single time point because earlier HDI figures were calculated using a different methodology. In contrast, this study adopts the most recent HDI calculation method to ensure consistency and comparability across regions. The multiple linear regression model can be written as follows.

$$HDI_i = \beta_0 + \beta_1 LE_i + \beta_2 EYS_i + \beta_3 MYS_i + \beta_4 PCE_i + \varepsilon_i \quad (1)$$

where:

HDI_i = Human Development Index for the i-th regency/city,
β_0 = constant,
$\beta_1, \beta_2, \beta_3, \beta_4$ = regression coefficients,
LE_i = Life Expectancy for the i-th regency/city,
EYS_i = Expected Years of Schooling for the i-th regency/city,
MYS_i = Mean Years of Schooling for the i-th regency/city,
PCE_i = Per Capita Expenditure for the i-th regency/city,
ε_i = random error of Y for the i-th regency/city.

Data and Data Sources

The Central Bureau of Statistics of Papua Province is the official website used as a secondary data source in this study, which includes information from 29 districts/cities in the province. The variables used in the analysis are shown in Table 1.

Table 1. Description of Research Variables

Variable	Description	Unit	Source
HDI	Human Development Index (HDI) by Regency/City in Papua	-	BPS Papua
LE	Life Expectancy by Regency/City in Papua	Year	BPS Papua
EYS	Expected Years of Schooling by Regency/City in Papua	Year	BPS Papua
MYS	Mean Years of Schooling by Regency/City in Papua	Year	BPS Papua
PCE	Per Capita Expenditure by Regency/City in Papua	1000 Rupiahs	BPS Papua

Classical Assumption Test

The regression parameter estimation in this study applies the Ordinary Least Square (OLS) method to ensure that the regression coefficient obtained is the best linear and unbiased estimate (BLUE). For the parameter estimation results to be valid, it is necessary to fulfill several assumptions, such as normality, homoscedasticity, non-autocorrelation, and non-multicollinearity. This study tests these classical assumptions, except for the non-autocorrelation assumption, because this study does not use time series data. Meanwhile, testing the non-autocorrelation assumption is done when time series data is used (Stock & Watson, 2018).

a. Normality

Normality needs to be tested to determine the normality of the residual distribution in the regression model (Stock & Watson, 2018). This study applies the Shapiro-Wilk test statistic to test the normality of residuals due to its higher detection power of deviations from normality, especially for small to medium sample sizes (Montgomery et al., 2012). The hypothesis in this test is to use:

H_0: $\varepsilon_i \sim N$ (0, σ^2)

H_1: $\varepsilon_i \nsim N$ (0, σ^2)

If the p-value is below the 5% significance level, H_0 is rejected, indicating that the normality assumption is unmet.

b. Homoscedasticity

The homoscedasticity test aims to determine whether the variability of residuals in a regression model remains constant across observations (Stock & Watson, 2018). This study uses Park's statistical test to test the constancy of residual variances because it effectively identifies heteroscedasticity despite its simple procedure (Kennedy, 2008). The following hypotheses were used in this test:

H_0: $v(\varepsilon_i) = \sigma^2$ (Homoscedastic)

H_1: At least one $v(\varepsilon_i) \neq \sigma^2$ with $i = 1, 2, \dots, n$ (Heteroscedastic)

If the p-value is below the 5% significance level, then H_0 is rejected, indicating that the assumption of homoscedasticity is not met.

c. Non-Multicollinearity

The assumption of non-multicollinearity needs to be checked to determine whether there is a strong linear relationship between predictor variables in a model. The variance inflation factor (VIF) is used to test for non-multicollinearity. VIF assesses the extent to which the variability of regression coefficients increases due to multicollinearity. If the VIF exceeds 10, it indicates multicollinearity between predictor variables (Stock & Watson, 2018).

Simultaneous Test

A simultaneous test with the F test is used to assess the significance of the overall linear regression model (Kutner et al., 2016). The following hypothesis is used in this test:

H_0: $\beta_1 = \beta_2 = \cdots = \beta_k = 0$

H_1: At least one $\beta_j \neq 0$ $(j = 1, 2, \dots, k)$

If the p-value is below the 5% significance level, then H_0 is rejected. This indicates that at least one predictor variable significantly affects the response variable, allowing further tests, such as partial tests, to be carried out.

Partial Test

Partial tests are applied to each predictor variable to evaluate whether each variable partially influences the response variable (Kutner et al., 2016). This test aims to determine which predictor variables have a partially significant effect on the regression model. Testing is done using the t-test. The hypothesis in this test, namely using:

$H_0: \beta_k = 0$
$H_1: \beta_k \neq 0$

If the p-value is below the 5% significance level, then H_0 is rejected, which indicates that partially, there is an effect of the kth predictor variable on the significant response variable.

Coefficient of Determination

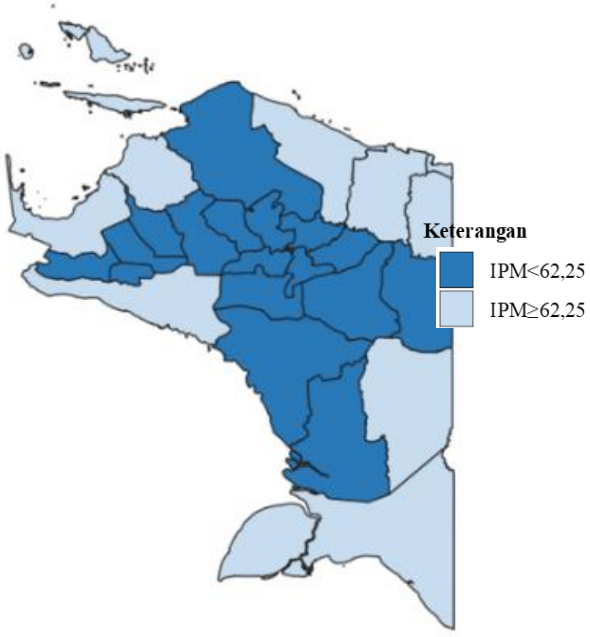
The coefficient of determination (R^2) is a statistical measure that describes the proportion of variation in the response variable that can be explained by the predictor variables in the regression model (Kutner et al., 2016). The range of values for the coefficient of determination is 0 to 1. The higher the coefficient of determination (the closer to one), the better the quality of the regression model because the model can explain more variation or information in the response variable (Montgomery et al., 2012). Researchers used R^2_{adj} in this study. The coefficient of determination with R^2_{adj} considers the number of predictor variables in the model and reduces the R^2 value if adding new variables does not significantly improve the model (James et al., 2021).

RESULTS AND DISCUSSION

Overview of the Human Development Index (HDI) in Papua Province in 2023

Figure 3 displays a thematic map of the HDI in Papua Province for 2023, indicating the differences in HDI between districts/cities, both below and above the province's HDI of 62.25. The figure shows that there are more districts/cities in Papua with HDIs below 62.25 than those with HDIs above this level. The HDI of around 58% of districts/cities in Papua is still lower than the provincial HDI, indicating that most areas in Papua have an HDI below 62.25. Districts/cities with HDIs below the provincial figure are generally located in the central part of the island. This indicates that the equality of human development between regions in Papua is still not optimal. According to BPS data, Nduga Regency has the lowest HDI in Papua, at 35.19, far below the provincial HDI. In contrast, Jayapura City recorded the highest HDI in Papua, with 81.14, far above the provincial and national HDI. This illustrates the uneven achievement of human development in various districts/cities in Papua.

Figure 3. Thematic Map of Human Development Index (HDI) in Papua Province by 2023

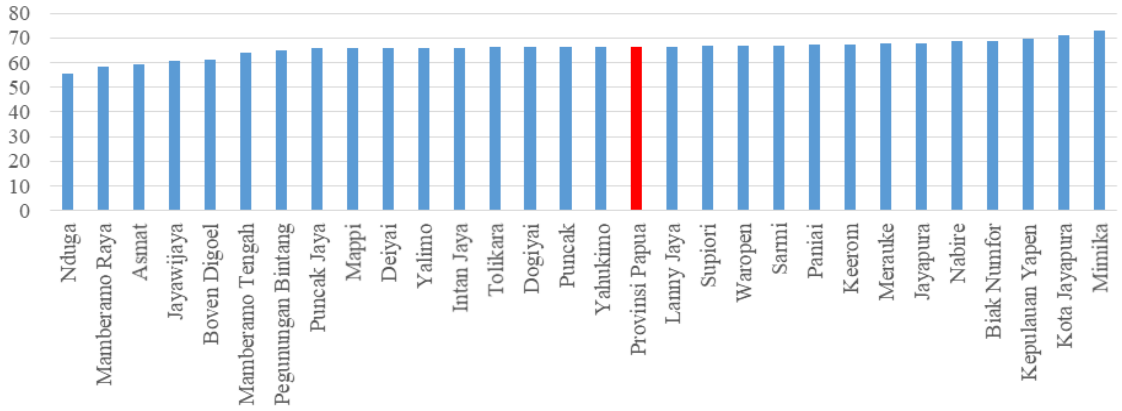


Source: processed by QGIS

Overview of Life Expectancy in Papua Province in 2023

Life expectancy is an indicator that measures the average estimated number of years a person is expected to live. Figure 4 illustrates the life expectancy in 2023 for each district/city in Papua Province, starting with the lowest to the highest HDI. In 2023, the life expectancy in Papua Province reached 66.44, indicating that life expectancy ranges from 66 to 67 years. Nduga Regency has the lowest AHH, which is 55.72, meaning that life expectancy in this area is around 55 to 56 years, which is still less than the provincial figure. In contrast, Mimika Regency has the highest life expectancy with 72.83, meaning that life expectancy in this area is around 72 to 73 years.

Figure 4. Life Expectancy in Papua Province by Regency/City in 2023

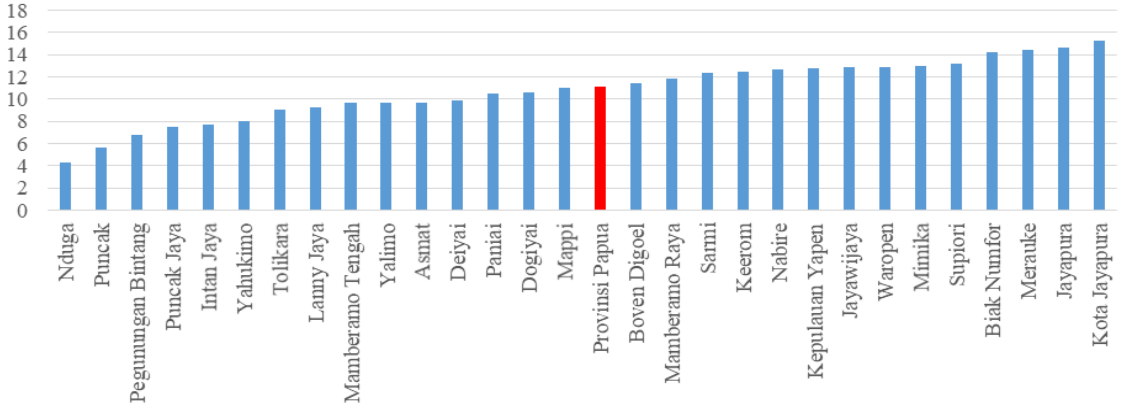


Source: processed by Excel

Overview of Expected Years of Schooling in Papua Province in 2023

Expected years of schooling is an indicator that describes the expected length of education that children of a certain age will be able to achieve in the future. Figure 5 shows the expected years of schooling in 2023 for all districts/cities in Papua Province, starting from the lowest to the highest. The expected years of schooling in Papua Province in 2023 is 11.15, meaning that children in the province are expected to complete around 11 to 12 years of education. Nduga district has the lowest expected years of schooling of 4.33, indicating that children in this district are only expected to complete around 4 to 5 years of education. This is very far below the provincial average. In contrast, Jayapura City's expected years of schooling is the highest at 15.26, indicating that children in this city are expected to complete around 15 to 16 years of education.

Figure 5. Expected Years of Schooling in Papua Province by Regency/City in 2023

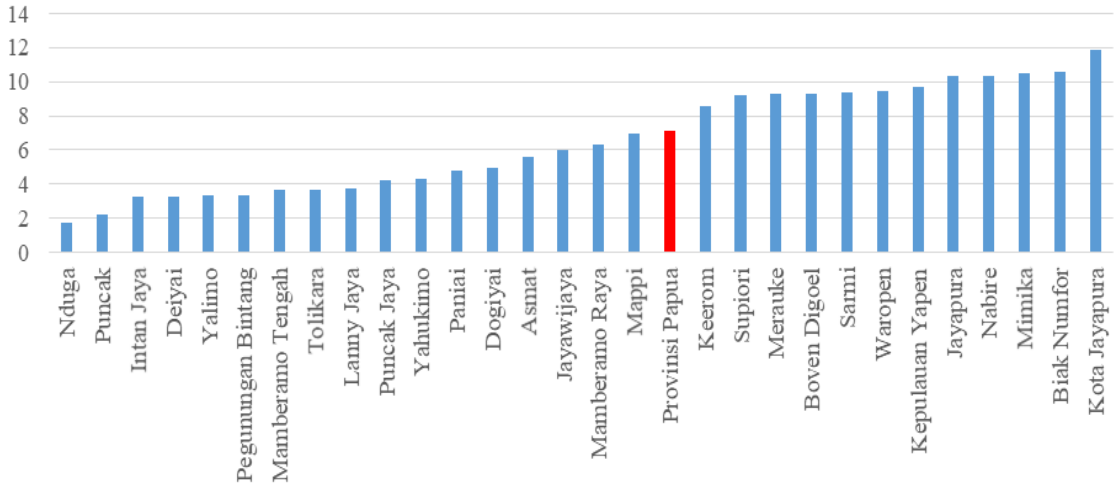


Source: processed by Excel

Overview of Mean Years of Schooling in Papua Province in 2023

Mean years of schooling is an indicator that measures the average total years that the population over 15 has spent in formal education. Figure 6 shows the mean years of schooling in 2023 for each district/city in Papua Province, starting from the lowest to the highest number. The mean years of schooling in Papua Province in 2023 is 7.15, indicating that in this province, the population aged 15 years and above has average total years of education achieved of around 7 to 8 years. Nduga District has the lowest mean years of schooling of 1.71, which means that the average number of years of schooling in this area is only around 1 to 2 years, which is still far below the provincial figure. In contrast, Jayapura City has the highest mean years of schooling at 11.84, which means that the population aged 15 years and above in this city has an average length of schooling of around 11 to 12 years.

Figure 6. Average Years of Schooling in Papua Province by Regency/City in 2023

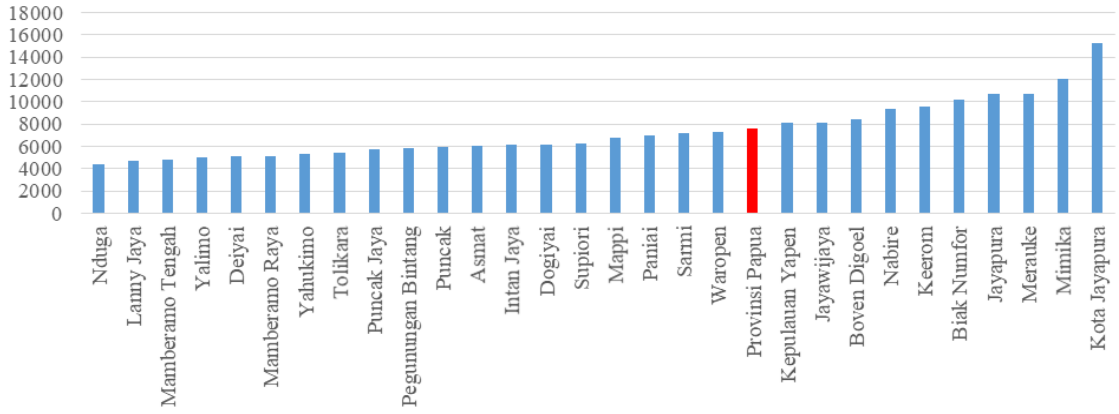


Source: processed by Excel

Overview of Per Capita Expenditure in Papua Province in 2023

Per capita expenditure is an indicator that measures the average amount of actual expenditure per individual. Figure 7 illustrates per capita expenditure in 2023 for all districts/cities in Papua Province, from the lowest to the highest. Per capita expenditure in Papua Province 2023 reached 7562 (thousand rupiah). Nduga Regency has the lowest per capita expenditure, at 4352 (thousand rupiah), which is still far less than the provincial per capita expenditure. In contrast, Jayapura City has the highest per capita expenditure, at 15272 (thousand rupiah).

Figure 7. Per Capita Expenditure in Papua Province by Regency/City in 2023



Source: processed by Excel

Regression Equation

Multiple linear regression analysis obtained a regression model that can be expressed in the following equation:

$$\widehat{HDI} = -2{,}262 + 0{,}473LE + 1{,}352EYS + 1{,}394MYS + 0{,}001PCE \qquad (2)$$

Classical Assumption Test

a. Normality

Table 2. Shapiro-Wilk Test Results

Shapiro-Wilk		Decision
Statistics	**p-value**	Accepted H_0
0.958	0.294	

Source: processed by SPSS

This research used the Saphiro-Wilk test to test the assumption of residual normality, which obtained a p-value of 0.294. Because the p-value obtained exceeds the specified significance level of 5%, the residuals are normally distributed, so the normality assumption can be considered fulfilled.

b. Homoscedasticity

Table 3. Park Test Results

Variable	p-value	Decision
$\ln LE$	0.067	Accepted H_0
$\ln EYS$	0.959	Accepted H_0
$\ln MYS$	0.246	Accepted H_0
$\ln PCE$	0.564	Accepted H_0

Source: processed by SPSS

The homoscedasticity test is carried out using the Park test, which results in all predictor variables having a p-value that exceeds the specified significance level, which is 5%. Thus, the residual variance is constant (homoscedastic), which means that the homoscedasticity assumption can be considered fulfilled.

c. Non-Multicollinearity

Table 4. Non-Multicollinearity Test

Variable	VIF	Decision
LE	1.483	Non-Multicollinearity
EYS	5.268	Non-Multicollinearity
MYS	3.563	Non-Multicollinearity
PCE	7.250	Non-Multicollinearity

Source: processed by SPSS

The VIF value is used to test the presence or absence of multicollinearity. According to Table 4, all predictor variables have VIF values less than 10. This means there is no multicollinearity between predictor variables, so the assumption of no multicollinearity has been met.

Simultaneous Test

Table 5. Simultaneous Test

F	p-value	Decision
1505.083	0.000	Reject H_0

Source: processed by SPSS

The simultaneous test results, as listed in Table 5, show an F-test statistic of 1505.083. This value is higher than the F-table's 2.70. The resulting p-value is 0.000, smaller than the 5% significance level, so rejecting H_0 is the decision. Thus, at least one predictor variable significantly affects the HDI.

Partial Test

Table 6. Partial Test

Variable	p-value	Decision
LE	0.000	Reject H_0
EYS	0.000	Reject H_0
MYS	0.000	Reject H_0
PCE	0.000	Reject H_0

Source: processed by SPSS

The partial test results show that the p-value for the four predictor variables is smaller than the 5% significance level, so rejecting H_0 is the decision. Thus, expected and mean years of schooling, life expectancy, and per capita expenditure significantly affect the HDI.

Coefficient of Determination

The coefficient of determination calculated using R^2_{adj} produces a figure of 0.995. This figure indicates that 99.5% of HDI variability can be explained by expected and mean years of schooling, life expectancy, and per capita expenditure. Other variables outside the model explain the remaining 0.5% of HDI variability.

Interpretation of Regression Equation

The constant in the regression model has a negative value of -2.262. This negative sign means an opposite relationship exists between the predictor and response variables. A negative constant value is not a problem as long as a zero value for the response variable is impossible (Montgomery et al., 2012). A zero life expectancy is impossible in demographic studies because death occurs after a certain age (Vaupel, 2010). Zero mean years of schooling is rare due to mandatory primary education in many countries and global efforts to expand access to education (Hanushek & Woessmann, 2020). Education is an important investment in human capital that provides economic and social benefits (Becker, 1994). Therefore, expected years of schooling are also usually unlikely to be zero. In an economy, there are essential consumption needs that each individual must meet, so spending cannot be zero, even for those with low incomes (Keynes, 2018).

The coefficient obtained for the life expectancy variable is 0.473, which indicates that each one-year increase in life expectancy will increase HDI of 0.473 units with other variables constant as assumptions. The coefficient for the expected years of schooling variable is 1.352, meaning that each one-year increase in expected years of schooling will cause HDI to increase by 1.352 units, assuming other variables remain constant. For the mean years of schooling variable, the coefficient is 1.394, which means that an increase in HDI of 1.394 units occurs if the

mean years of schooling increase by one year, assuming other variables are constant. In addition, every 1 (thousand rupiah) increase in per capita expenditure will increase HDI by 0.001 units with other variables constant as assumptions. This study has consistent results with the findings of Anastashya et al. (2023) which showed that expected and mean years of schooling, life expectancy, and per capita expenditure significantly affect HDI. This study is consistent with the results of Susanti & Saumi (2022), who found that expected and mean years of schooling, life expectancy, and per capita expenditure significantly and positively influence HDI.

CONCLUSION

The analysis shows that expected and mean years of schooling, life expectancy, and per capita expenditure significantly influenced HDI in Papua Province in 2023. Thus, human development in Papua remains lagging due to inadequate and uneven education, healthcare, and community welfare. Limited access to quality education, low life expectancy, and economic disparities contribute to the region's slow progress in improving HDI. Based on these findings, the government should prioritize programs such as providing scholarships for students in remote areas, improving education infrastructure, and enhancing healthcare services, especially for maternal and child health. Additionally, welfare programs that increase economic opportunities, such as training and microcredit for local businesses and poverty alleviation initiatives, are crucial for boosting economic welfare.

This study does not consider spatial heterogeneity, so Ordinary Least Square (OLS) is used as a parameter estimation method using multiple linear regression analysis. Therefore, further research can consider whether or not there is spatial heterogeneity between districts/cities in Papua Province so that spatial effects can accompany that model formation.

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