

THE INFLUENCE OF GROSS REGIONAL DOMESTIC PRODUCT, MEAN YEARS OF SCHOOLING AND LIFE EXPECTANCY ON THE HUMAN DEVELOPMENT INDEX IN BALI PROVINCE (2015-2024)

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Abstract:

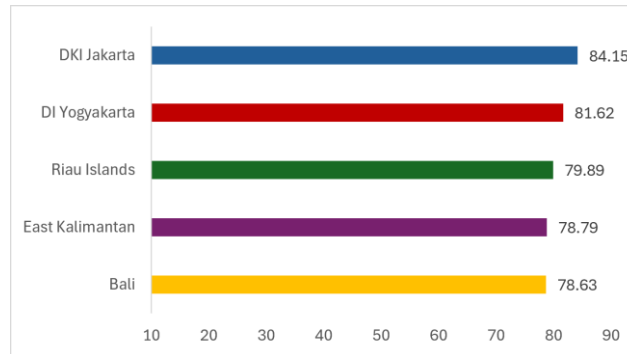
This study aims to analyze the influence of Gross Regional Domestic Product (GDP) at constant prices, Average School Year (MYS), and Life Expectancy at Birth (LEB) on the Human Development Index (HDI) in districts/cities in Bali Province during the period 2015–2024 with a total of 90 observations. This study uses a quantitative approach using the panel data regression method. Secondary data was obtained from the Central Statistics Agency (BPS), with the Fixed Effect Model (FEM) selected as the most appropriate model based on the results of model specifications through chow test and thirist test. The findings of the study show that Average School Year and Life Expectancy have a positive and significant effect on HDI. In contrast, GRDP does not significantly affect HDI. Simultaneous tests showed that all three independent variables simultaneously had a significant effect on HDI. The adjusted R-squared value of 0.987 indicates that the model explains 98.7% of the variation in HDI in Bali during the study period. The results of this study show that the increase in the human development index in Bali province is more determined by investment in the education and health sectors, so local governments need to prioritize expanding access to education and strengthening basic health services. The finding that GDP does not have a significant influence on HDI indicates the need for a more inclusive fiscal policy so that the benefits of development can be felt equally by all levels of society.

Keywords: GRDP, Mean Years of Schooling, Life Expectancy, HDI, Bali Province, Panel Data

INTRODUCTION

Human development is the main foundation of social and economic progress in various countries or regions that aim to improve the quality of life of the community through improving health, education, and decent living standards (United Nations Development Programme, 2022). In the global context, improving the quality of human resources is an important concern because it is related to productivity, welfare, and sustainability of a country's development, in line with the agenda *Sustainable Development Goals (SDGs)*, which targets to improve the quality of human life evenly (UNDP, 2022). The Human Development Index (HDI) is one of the indicators widely used to evaluate the quality of development because it can provide a more comprehensive picture of the level of community welfare (Rino & Ilmadi, 2024).

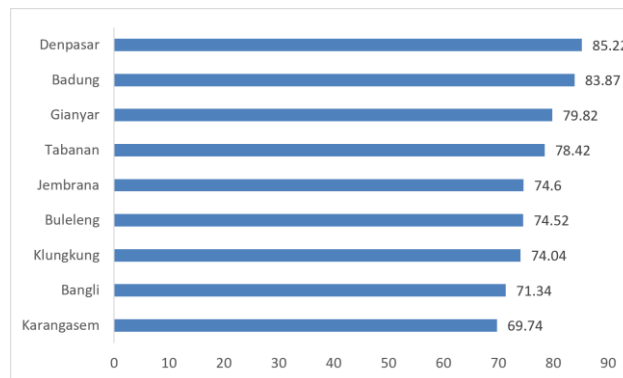




Source: BPS (2024), processed by the authors

Figure 1. Provincial Ranking Based on the Human Development Index Value in Indonesia in 2024

Based on Figure 1, Bali Province ranks fifth nationally in the Human Development Index (HDI) with a score of 78.63, below Jakarta (84.15), Yogyakarta (81.62), Riau Islands (79.89), and East Kalimantan (78.79) (BPS Provinsi Bali, 2024). The Central Statistics Agency states that the human development index (HDI) is a composite indicator that has values ranging from 0 to 100 that are used to measure the level of human development achievement in an area. The higher the HDI value, the better the level of human development achievement in the region. Based on the classification, HDI is grouped into four categories, namely low (HDI < 60), medium (60 ≤ HDI < 70), high (70 ≤ HDI < 80), and very high (HDI ≥ 80) (Badan Pusat Statistik, n.d).

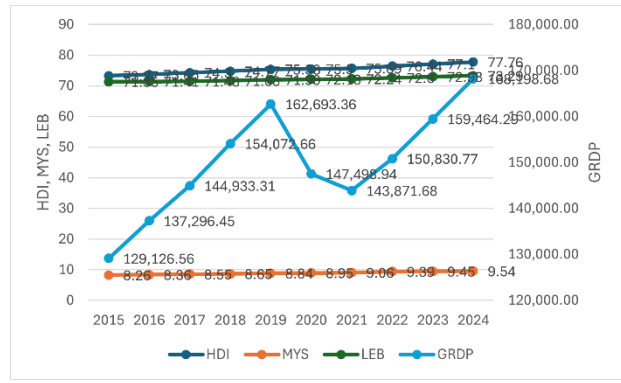


Source: BPS (2024), processed by the authors

Figure 2. Human Development Index (HDI) of Regencies/Cities in Bali Province in 2024

The distribution of HDI values in Figure 2 shows that the HDI of Denpasar city was recorded at 85.22, while Karangasem district only reached 69.74, so there was a difference of 15.48 index points (BPS Provinsi Bali, 2025). This difference indicates that the achievement of human development has not occurred fully evenly throughout the Bali region. The findings are in line with research that states the sustainability of inequality between districts/cities in Bali even though HDI shows an increase every year (Putri et al., 2022).

Tourism is the main sector that drives Bali's economy and has a significant contribution to the formation of regional GRDP through its relationship with various economic sectors, such as accommodation, transportation, trade, and other services (BPS Provinsi Bali, 2025). The number of tourist visits to Bali reached 6.3 million visits in 2019 (BPS Provinsi Bali, 2020).



Source: BPS Bali Province (2024), processed by the author

Figure 3. Development of Human Development Index, Mean Years of Schooling, Life Expectancy at Birth, and Gross Regional Domestic Product of Bali Province in 2015–2024

The data in Figure 3 shows a difference in growth patterns, Bali's GRDP shows a steeper slope, while the HDI curve increases more gradually over the same period. The difference in development patterns between Bali's GRDP and HDI indicates that regional economic growth may not be fully followed by an optimal improvement in the quality of human development. This condition is in line with studies Nazirah and Hasmarini (2024), which confirms that the relationship between GRDP growth and human development is not always linear. The mean years of schooling in Bali Province shows a gradual increase, but the increase is relatively slower than the growth of GRDP. This shows that tourism-based economic development has not fully encouraged an increase in the optimal duration of public education (Todaro & Smith, 2015). Meanwhile, life expectancy shows a relatively stable trend with a very gradual increase, reflecting that improvements in health quality are long-term and do not directly follow the dynamics of short-term economic growth (Sen, 1999).

Bali Province ranks fifth nationally with an HDI value of 78.63 which is included in the high category according to the BPS classification. However, there is still a gap in human development between districts/cities (BPS Provinsi Bali, 2024). The difference in HDI achievement between the city of Denpasar and Karangasem district shows that economic growth reflected in the increase in GRDP has not been fully followed by an equal improvement in the quality of human development. This condition indicates that the distribution of development benefits to the welfare of the community has not been optimal (Putri et al., 2022).

The study by Manurung and Hutabarat (2021) revealed that the mean years of schooling did not have a significant effect on the Human Development Index (HDI) in 34 Indonesian provinces. Instead, research by Mahya and Widowati (2021) and Raffi (2025) found that the same variable had a significant positive impact in Central Java and Surabaya. Research by Firmansyah and Wasil (2024) found that the Gross Regional Domestic Product (GRDP) contributes significantly to the Human Development Index (HDI). However, research Nazirah and Hasmarini (2024) on the other hand, it was found that GRDP did not have a significant impact on HDI. These differences suggest that the influence of these variables varies across regions, depending on local characteristics, local policies, and socio-economic conditions of communities.

Most previous research focused on specific areas, such as Borneo (Zarkasi et al., 2021), Papua (Suhendi & Astuti, 2023), and Central Java (Mahya & Widowati, 2021). However, an in-depth specific study analyzing the impact of gross regional domestic product (GRDP), mean years of



schooling, and life expectancy on the Human Development Index (HDI) at the district/city level in Bali Province using the latest data from 2015-2024 is still very limited. The province of Bali has the unique characteristics of being an area with an economy that relies heavily on the tourism sector, which sets it apart from other areas studied earlier.

Based on the phenomena and problems described above, and considering the gap in the results of various previous studies, variables such as gross regional domestic product at constant prices, mean years schooling, and life expectancy are decisive for identifying the effectiveness of development in a region. These indicators will be analyzed in this study, focusing on which variables are most dominant in influencing human development, especially at the district and city levels in Bali Province. Furthermore, the results of this research are expected to be the basis for decision-making by local/city governments in Bali Province in designing development policies that aim to improve the welfare of the community as a whole and sustainably.

LITERATURE REVIEW

Human Capital Theory.

Human Capital Theory stated by Becker (1964), explaining that investment in education and health can improve the quality of human capital. Education that is reflected through an increase in average length of schooling and health conditions reflected in life expectancy can increase people's productivity so as to encourage economic growth as reflected in GDP. Furthermore, the improvement of education, health and the economy contributes to the improvement of human development.

In the context of human development, education and health have complementary functions. Education facilitates the development of practical insights and competencies relevant to the demands of the workforce, thereby better preparing individuals to actively participate in sustainable economic development. Meanwhile, optimal health allows individuals to remain productive and contribute to economic activity for a longer period of time (Syafitri & Setiawati, 2025).

Human Development Index.

The Human Development Index (HDI) is a composite measurement tool developed by the United Nations Development Programme (*United Nations Development Programme*) to evaluate the extent of human development progress in a region. HDI not only considers economic growth, which is reflected in the increase in GDP, but also highlights a quality of life dimension that includes three fundamental dimensions: health, education, and adequate standard of living (UNDP, 1990).

The Human Development Index is not only used to measure human development achievements, but also to evaluate the success of development in improving people's welfare. Higher HDI values indicate that residents have greater opportunities to obtain education, enjoy a healthy life, and achieve a better standard of living. HDI is the basis for planning and evaluation of development at both the national and regional levels (BPS, 2021).

Gross Regional Domestic Product.

Gross Regional Domestic Product (GRDP) calculated at constant prices is an indicator that measures the actual output of an area, adjusted to eliminate the effects of inflation. This adjustment is made using a specific year as a reference, making GRDP more accurate in reflecting real economic growth and changes in production volumes, compared to measurements using current prices. This view is in line with the standard explanation of GRDP in general, as well as the difference between constant prices and prevailing prices, which in particular highlights the importance of eliminating the effects of inflation for a more precise evaluation of regional economic performance (Mukti & Soraya, 2024).



Economic growth, measured by national income, results in increased funds allocated to communities to encourage human development progress in the areas of health, education, and quality of life. Gross Regional Domestic Product (GRDP) indicates the economic capacity of a region, which plays an important role in increasing the Human Development Index (HDI), as the economic strength of the region serves as the basis for allocating government budgets for various human development programs (Fernando & Yustie, 2025). Applying constant prices allows for a more valid evaluation of the actual increase in economic capacity, unaffected by inflation, which can create an inaccurate illusion of growth (Mankiw, 2019).

Mean Years Schooling.

The indicator that is generally used to calculate the Mean Years of Schooling (MYS) refers to the average number of years of formal education achieved by the population aged 25 years and above in an area. This indicator describes the level of education attained by a population. A high mean years of Schooling indicates that the population has a good chance of participating in the education system and completing a higher level of education (BPS, 2022).

Aurora and Romance (2024) emphasizes that mean years of schooling (MYS) not only strengthens an individual's potential for more prospective employment opportunities but also fosters a more rational mindset in decision-making related to family health and the economy. Thus, the increase in the mean years of schooling contributes directly to the HDI education dimension while having a multiplier effect on the health and economic dimensions.

Life expectancy at Birth.

Life expectancy at Birth (LEB) is an estimate of the average number of years a person is expected to reach from birth based on mortality patterns in a population. Conceptually, the LEB reflects the health dimension of a population and serves as a key component in calculating the Human Development Index (HDI) through its aspects related to life expectancy and health (Cahyanti et al., 2021).

Life Expectancy at Birth (LEB) contributes directly to the health aspects of the Human Development Index (HDI) because longevity and sustainability of life are highly dependent on the quality of health services, disease prevention efforts, and environmental conditions that support a person's survival (Supandi et al., 2022).

Conceptual Framework.

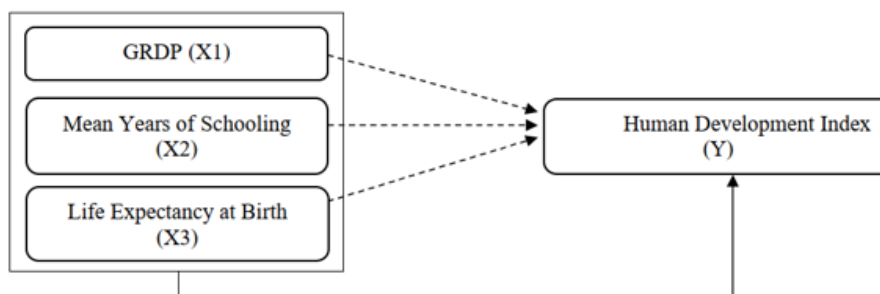


Figure 4. Conceptual Framework.

Hypothesis.

1. H0: GRDP has no significant effect on the Human Development Index in Bali Province.
H1: GRDP has significant effect on the Human Development Index in Bali Province.
2. H0: Mean Years of Schooling has no significant effect on the Human Development Index in Bali Province.
H1: Mean Years of Schooling has significant effect on the Human Development Index in Bali Province.
3. H0: Life expectancy has no significant effect on the Human Development Index in Bali Province.
H1: Life expectancy has significant effect on the Human Development Index in Bali Province.
4. H0: GRDP, Mean Years of Schooling, and Life Expectancy have no significant effect on the Human Development Index in Bali Province.
H1: GRDP, Mean Years of Schooling, and Life Expectancy have significant effect on the Human Development Index in Bali Province.

METHODS

This study uses a quantitative approach that emphasizes systematic data analysis and the use of statistical tests to test research hypotheses in numerical form (Hardani et al., 2020). Based on its objectives, this study is causal associative research that aims to test hypotheses regarding the relationship or influence of independent variables on dependent variables (Sugiyono, 2022). The data used is secondary data in the form of panel data that combines time series information from 2015 to 2024 with cross-regional data covering districts and cities in Bali Province. The data is accessed from the official publication of the Central Statistics Agency of Bali. In this study, independent variables include Gross Regional Domestic Product (X1), Mean Years of Schooling (X2), and Life Expectancy at Birth (X3). Meanwhile, the dependent variable is the Human Development Index (HDI) which is denoted as (Y). The multiple regression formula based on panel data in this study is shown as follows:

$$\ln HDI_{it} = \alpha + \beta_1 \ln GRDP_{it} + \beta_2 \ln MYS_{it} + \beta_3 \ln LEB_{it} + \epsilon_{it}$$

Description:

- α = Constant
- $\beta_1, \beta_2, \beta_3$ = Independent Variable Coefficients
- $\ln HDI$ = Logarithm of the Human Development Index
- $\ln GRDP$ = Logarithm of GRDP
- $\ln MYS$ = Logarithm of Mean Years of Schooling
- $\ln LEB$ = Logarithm Life Expectancy at Birth
- i = Cross section data of districts/cities
- t = Data Time Series 2015 - 2024
- ϵ_{it} = error term

Log transformation is used to stabilize data variance, reduce the potential for heteroscedasticity, and the regression coefficient becomes easier to interpret as the level of elasticity (Wooldridge, 2016). In a multiple regression model of the panel data, the researcher must choose the best model among three options: *the Common Effect Model (CEM)*, *the Fixed Effect Model (FEM)*, and *the Random Effect Model (REM)*. The selection of the panel data model is based on the results of the Chow test, the Hausman test, and the Lagrange Multiplier test. Next, a classical assumption test was carried out which focused on the multicollinearity and heteroscedasticity test. The autocorrelation test was not carried out because the model used was a regression of panel data so that the Durbin-



Watson test could not be applied directly because it had limitations in the application of the test. Meanwhile, the normality test is not carried out because residual normality is not a requirement to obtain an estimator that is the Best Linear Unbiased Estimator (BLUE). However, the results of the model are still assessed from the statistical significance test. Hypothesis testing was carried out using a t-test to test for partial influences, an F test to test simultaneous influences, and a determination coefficient (R^2) to measure the model's ability to explain dependent variables (Gujarati & Porter, 2009).

RESULTS AND DISCUSSION

Descriptive Analysis.

Table 1. Descriptive Statistics

Statistics	GRDP	MYS	LEB	HDI
Mean	9.528	2.118	4.285	4.309
Median	9.608	2.115	4.286	4.304
Maximum	10.537	2.445	4.333	4.435
Minimum	8.212	1.690	4.240	4.169
Std. Dev	0.666	0.191	0.026	0.072
Observations	90	90	90	90

Source: All variables have been transformed into natural logarithmic (ln) form;
Processed by the Authors (2026)

Based on the descriptive statistics in Table 1, this study uses 90 observations. Gross Regional Domestic Product (GRDP) has a mean value of 9.528, with a minimum value of 8.212 and a maximum value of 10.537. The standard deviation of 0.666 indicates substantial variation across provinces. Mean Years of Schooling (MYS) records a mean value of 2.118, ranging from 1.690 to 2.445, with a standard deviation of 0.191. Life Expectancy at Birth (LEB) has a mean value of 4.285, with values ranging from 4.240 to 4.333 and a standard deviation of 0.026. Human Development Index (HDI) exhibits a mean value of 4.309, with a minimum value of 4.169 and a maximum value of 4.435. The standard deviation of 0.072 indicates relatively limited variation in HDI across provinces.

Panel Model Selection.

The model specification tests in table 2 & 3 shows that the probability values of the Chow test and Hausman test are both below 0.05. Therefore, the null hypotheses are rejected, and the Fixed Effect Model (FEM) is selected as the most appropriate model for this study.

Table 2. Chow Test

Effect Test	Statistic	d.f	Prob.
Cross-section F	5.478	[8,78]	0.000
Cross-section Chi- square	40.126	8	0.000

Source: Author's Calculation (2026)

Table 3. Hausman Test

Test Summary	Chi-Sq. Statistics	Chi-Sq. d.f	Prob.
Cross-section random	17.404	3	0.000

Source: Author's Calculation (2026)



Panel Data Regression Analysis.

Table 4. Fixed Effect Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.628	0.449	3.628	0.001
ln(GRDP)	0.005	0.003	1.521	0.132
ln(MYS)	0.269	0.024	11.245	0.000
ln(LEB)	0.481	0.113	4.266	0.000
R-squared:	0.988	F-statistic:	636.795	
Adjusted R-squared:	0.987	Prob(F-statistic):	0.000	

Source: Author's Calculation (2026)

Table 3 above shows the panel data regression analysis of the FEM model, which is explained in the following equation model:

$$\ln\text{HDI} = 1.628 + 0.005 \ln\text{GRDP} + 0.269 \ln\text{MYS} + 0.481 \ln\text{LEB}$$

Partial Hypothesis Testing (t-Test).

Based on the Fixed Effect Model (FEM) results in Table 3, GRDP has a p-value of 0.132, which is greater than 0.05. Thus, GRDP has no significant partial effect on HDI. Mean Years of Schooling has a p-value of 0.000, indicating a positive and significant effect on HDI. Life Expectancy at Birth also has a p-value of 0.000, indicating a positive and significant effect on HDI.

Simultaneous Hypothesis Testing (F-Test).

Based on the simultaneous test in Table 3, the probability value of the F-statistic is 0.000, which is below 0.05. This indicates that GRDP, Mean Years of Schooling, and Life Expectancy at Birth simultaneously have a significant effect on HDI in Bali Province during 2015–2024.

Coefficient of Determination (Adjusted R-squared).

Adjusted R-squared is used when the analysis involves more than one independent variable (Basuki & Prawoto, 2019). In the FEM results, the adjusted R-squared value is 0.987, indicating that 98.7% of HDI variation can be explained by GRDP, Mean Years of Schooling, and Life Expectancy at Birth. The remaining 1.2% is explained by other variables outside the model.

Classical Assumption Test.

The regression model was evaluated using multicollinearity and heteroscedasticity tests. Multicollinearity was assessed using the Variance Inflation Factor (VIF), where a VIF value below 10 indicates that the model is free from serious multicollinearity. Heteroscedasticity was assessed using probability values; values above 0.05 indicate that the model is free from heteroscedasticity.

Table 5. Multicollinearity Test

Variable	VIF
ln(GRDP)	2.127
ln(MYS)	5.943
ln(LEB)	7.511

Source: Author's Calculation (2026)



The results in Table 4 show that all independent variables have VIF values below 10. Therefore, the regression model does not indicate serious multicollinearity among the independent variables.

Table 6. Heteroscedasticity Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.117	0.246	0.474	0.637
ln(GRDP)	-0.002	0.001	-1.564	0.121
ln (MYS)	0.006	0.007	0.818	0.416
ln(LEB)	-0.024	0.062	-0.389	0.699

Source: Author's Calculation (2026)

Based on Table 5, the probability values for GRDP, Mean Years of Schooling, and Life Expectancy at Birth are all above 0.05. Therefore, the model is considered free from heteroscedasticity problems.

The Influence of GRDP at Constant Prices on the Human Development Index (HDI).

The test results show that GDP has a positive but not significant effect on HDI in districts/cities of Bali Province during 2015-2024. These findings are consistent with Handayani and Woyanti (2021), who found that GDP has a positive but insignificant effect on HDI in Central Java due to uneven economic growth throughout the community. The economic structure in tourism driven Bali tends to be concentrated in areas such as Denpasar, Badung, and Gianyar, while other districts may receive fewer direct benefits. This condition indicates that the increase in economic activity reflected in GDP does not necessarily directly improve the quality of human development (Yuendini et al., 2020).

According to Lewis (1954), economic development in developing countries often creates a dualism between the modern sector and the traditional sector. In the context of Bali, tourism is thriving as a modern sector, but many people are still working in the informal sector and doing low-wage jobs. This condition shows the characteristics of the enclave economy, namely economic benefits that are concentrated in certain areas and investors (Shaw & Shaw, 1999). In addition, employment data for February 2024 shows that 50.34% of the working population is still in the informal sector. This condition indicates that some Balinese people are still working in sectors that generally have less stable income levels and limited protection. As a result, the benefits of economic growth reflected in the increase in GDP do not automatically encourage an increase in HDI (BPS Bali Province, 2024).

The Influence of Mean Years of Schooling on the Human Development Index (HDI).

The findings indicate that Mean Years of Schooling has a positive and significant effect on HDI in Bali Province during 2015-2024. This result supports Nazirah and Hasmarini (2024), who identified education as an important determinant of HDI improvement in Bali. It is also consistent with Handayani and Woyanti (2021), who found a significant positive relationship between Mean Years of Schooling and HDI in Central Java.

The results of this study demonstrate that, despite the gradual increase, mean years of schooling remain a key determinant that significantly drives the increase in the HDI. It strengthens the argument that the educational dimension has a direct and measurable impact on human development. The significant influence of mean years of schooling can be explained through three main mechanisms. First, increased duration of education improves the knowledge dimension component in the HDI calculation, causing the HDI curve to move moderately upward. Second,



higher education increases labor productivity, expands access to quality jobs, and increases people's purchasing power (Todaro & Smith, 2015). Third, educated people have a better awareness of health, nutrition, and healthy lifestyles, which contributes to an improved quality of life (Becker, 1964).

The Influence of Life Expectancy on Human Development Index (HDI).

Based on statistical testing, Life Expectancy at Birth has a positive and significant effect on HDI in Bali Province during 2015–2024. This result is consistent with Simanjuntak et al. (2024), who emphasized that life expectancy significantly contributes to HDI because it reflects the overall quality of public health.

With optimal health, people can live lives with higher productivity and play an optimal role in human development. Therefore, increasing life expectancy directly influences improvements in the Human Development Index (HDI) as an indicator of the social and economic progress of a region or country. As identified in the research background, life expectancy shows a relatively stable trend with a very gradual increase, reflecting that improvements in health quality are long-term and do not directly follow the dynamics of short-term economic growth (Sen, 1999). The results of this study validate these observations and prove that despite the gradual increase, life expectancy still has a significant influence on HDI.

CONCLUSION

The results of the panel's data regression showed that the Average School Year and Life Expectancy at Birth significantly increased the HDI in Bali Province during 2015–2024. These findings show that investment in education and health is a key determinant of the quality of human development. In contrast, GDP has no significant influence on HDI, indicating that economic growth, particularly tourism-driven growth does not automatically impact better human development outcomes.

The Bali Provincial Government needs to maintain an allocation of at least 20% of the education budget and a minimum of 10% of the health budget of the APBD to improve the quality of human development. In addition, the integration of local micro, small, and medium enterprises in the tourism supply chain needs to be strengthened through the use of local products in hotels, restaurants, homestays, and tourist villages to support more inclusive and sustainable tourism in accordance with the RPJMD and *Bali Sustainable Tourism Roadmap*, while encouraging the creation of formal jobs and the improvement of workforce skills.

This study was limited to three independent variables, namely GDP, Average School Year, and Life Expectancy at Birth, in analyzing HDI. In addition, research is carried out in districts/cities in the province of Bali that have tourism-based economic characteristics, so that the generalization of research results in other regions with different economic structures needs to consider the characteristics of each region. The next research is expected to expand the research variables by including other relevant variables, a longer observation period, and expand the scope of research through interprovincial comparisons so as to produce a more comprehensive analysis.



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