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THE INFLUENCE OF GRDP, MEAN YEARS OF SCHOOLING AND LIFE EXPECTANCY ON THE HUMAN DEVELOPMENT INDEX ACROSS REGENCIES AND MUNICIPALITIES OF BALI PROVINCE

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Abstract:
This study aims to analyze the influence of Gross Regional Domestic Product (GRDP) at constant prices, Mean Years of Schooling (MYS), and Life Expectancy at Birth (LEB) on the Human Development Index (HDI) in regencies/cities of Bali Province during the 2015–2024 period. This study is motivated by Bali's position as the province with the fifth-highest human development index nationally, supported by the tourism sector, yet it has not achieved the highest human development category at the provincial aggregate level. This research employs a quantitative approach using panel data regression methods. Secondary data were obtained from the Central Bureau of Statistics (BPS), with the Fixed Effect Model (FEM) selected as the most appropriate model through specification tests. The research findings indicate that Mean Years of Schooling and Life Expectancy have positive and significant effects on HDI. Conversely, GRDP does not significantly influence HDI. The simultaneous test demonstrates that all three independent variables collectively have a significant effect on HDI. The Adjusted R-square value of 0.988 indicates that the model explains 98.8% of HDI variation in Bali during the study period. These findings emphasize the importance of strengthening the education and health sectors as key strategies for enhancing human development, as well as the need for more effective economic equalization policies to ensure that economic growth delivers more inclusive impacts.

Keywords: GRDP, Mean Years of Schooling, Life Expectancy at Birth, HDI, Panel Data

INTRODUCTION

Human development is the primary foundation for social and economic progress in various countries or regions (UNDP, 2022). Global phenomena show that in practice, human development achievements are largely determined by the dynamics of socio-economic and health factors, with developing countries facing challenges in improving the Human Development Index (HDI) due to regional inequality and climate change (UNDP, 2022). At the national level, Indonesia is experiencing a gradual upward trend in the HDI, but significant variations remain between provinces and districts/cities, reflecting social issues such as disparities in education, health, and economic development (BPS, 2023). This change occurs in line with national development agendas such as the Sustainable Development Goals (SDGs), which target improving the quality of human life equitably (UNDP, 2022). The UNDP report (2022) indicates that Indonesia ranks 114th out of 193 countries in the Human Development Index (HDI), which is the global version of the HDI. Factors such as Gross Domestic Product (GDP), mean years of education, and life expectancy are the main components that influence the HDI (UNDP, 2022).

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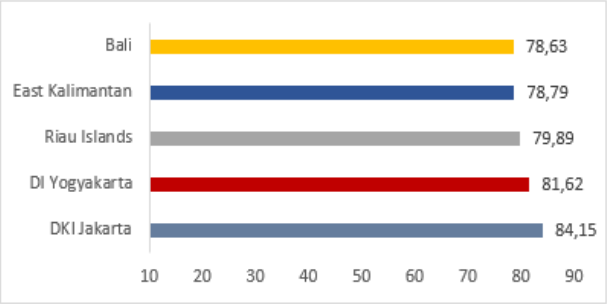

Source: BPS (2024)

Figure 1. 5 Provinces with the Highest Human Development Index in Indonesia in 2024

According to Figure 1 from the Central Statistics Agency (2024), Bali Province ranks fifth nationally in the Human Development Index (HDI) with a score of 78.63, below Jakarta (84.15), Yogyakarta (81.62), the Riau Islands (79.89), and East Kalimantan (78.79). This position shows that although Bali has a competitive advantage from the tourism sector, which contributes dominantly to the economic structure, its human development achievements have not been able to surpass those of the provinces that occupy the top rankings.

Tourism has been a key sector supporting Bali's economy for decades. This sector is essential for Bali's Gross Domestic Product (GRDP), accounting for approximately 50-60% of the province's total GRDP (BPS Bali Province, 2023; Suartika, 2022). The steady increase in international and domestic tourist arrivals has consistently driven Bali's economic growth. Data shows that the number of international tourist visits to Bali reached over 5 million people per year before 2020, with a total economic contribution reaching trillions of rupiah (Ministry of Tourism and Creative Economy, 2020).

However, there is an interesting phenomenon that requires further study. Although Bali has a high per capita GRDP compared to the national average and is supported by a strong tourism sector, Bali's fifth-placed Human Development Index (HDI) indicates a gap between economic growth and human development (Mahadevan & Suardi, 2019). Several provinces ranked above Bali share various characteristics. DKI Jakarta, as the center of government, has a concentration of the best infrastructure and public services. DI Yogyakarta is known for its strong educational tradition and substantial investment in the higher education sector. East Kalimantan and the Riau Islands have relatively high levels of regional income from natural resource utilization and trade (BPS, 2024). It raises crucial questions about the effectiveness of Bali's tourism economic growth transformation in improving the quality of life of the community. The fundamental question that arises is: why has the economic advantage of the tourism sector not fully transformed into more optimal human development achievements?

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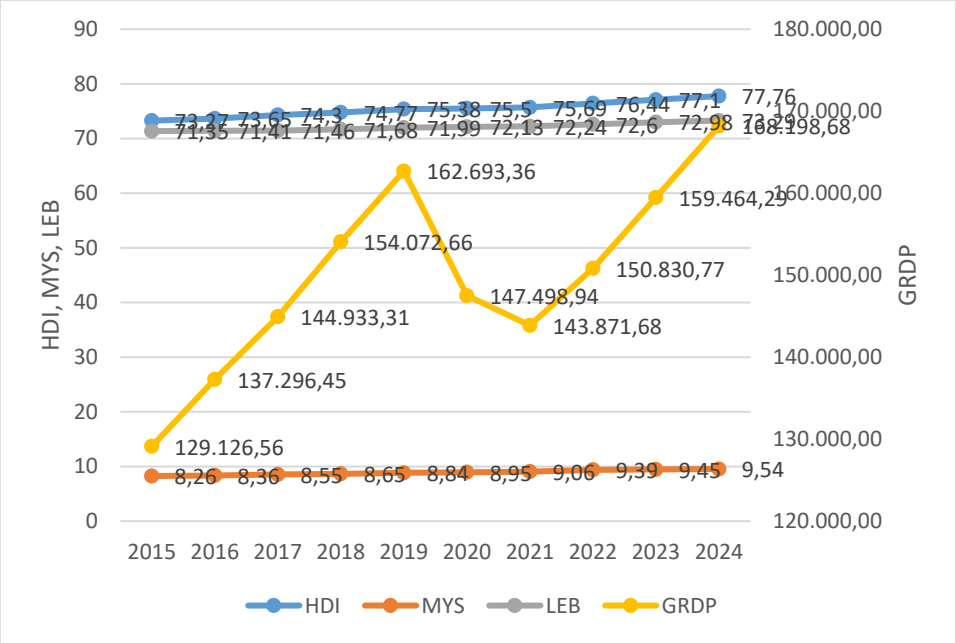

Source: BPS (2024)

Figure 2. Human Development Index, Gross Regional Domestic Product, Mean Years of Schooling, and Life Expectancy in Bali Province, 2015–2024

Figure 2 shows the differences in growth patterns. From a trend analysis perspective, Bali's GRDP shows a steeper slope, while the HDI curve increased more gradually over the same period. This difference in slope indicates that the increase in regional economic value has not been fully transmitted effectively into improvements in the quality of human development. This condition aligns with the view of Nazirah & Hasmarini (2024), who emphasized 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 rate of increase is relatively slower than GRDP growth. It indicates that tourism-based economic expansion has not fully driven an optimal increase in the 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).

Pratama et al.'s (2025) study revealed that the Mean Years of Schooling had an empirically insignificant negative correlation with the Human Development Index (HDI) in West Nusa Tenggara. Conversely, 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 (2024) showed that Gross Regional Domestic Product (GRDP) significantly contributed to the Human Development Index (HDI). However, Nazirah & Hasmarini's (2024) research differed, finding that GRDP had no significant impact on the HDI. This difference suggests that the influence of these variables varies across regions, depending on local characteristics, local policies, and the socio-economic conditions of the community.

Most previous studies have focused on specific regions, such as West Nusa Tenggara (Pratama et al., 2025), Kalimantan (Zarkasi et al., 2021), Papua (Suhendi & Astuti, 2023), and Central Java (Mahya & Widowati, 2021). However, specific studies that in-depth analyze the impact of gross regional domestic product (GRDP), Mean Years of Schooling, and life expectancy on the Human

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Development Index (HDI) at the district/city level in Bali Province using the most recent data from 2015-2024 are still very limited. Bali Province has unique characteristics as a region with an economy heavily dependent on the tourism sector, which distinguishes it from other previously studied regions.

Based on the phenomena and problems described above, and considering the gaps in results from various previous studies, variables such as gross regional domestic product at constant prices, Mean Years of Schooling, and life expectancy are determinants for identifying the effectiveness of development in a region. These indicators will be analyzed in this study, focusing on which variables most dominantly influence human development, particularly at the district and city levels in Bali Province. Furthermore, the results of this study are expected to serve as a basis for decision-making by regional/city governments in Bali Province in designing development policies aimed at improving the overall and sustainable welfare of the community.

Human Capital Theory. According to Becker (1964), human capital plays a central role in the dynamics of regional economic development. His concept emphasized that systematic efforts to develop human capacity, whether through formal education, health care, or skills training programs, are the primary determinants driving increased labor productivity and accelerating economic growth in a region.

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

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

Based on data from the Central Statistics Agency (2024), the Human Development Index (HDI) is calculated using three main components, namely: (1) Health Component, represented by Life Expectancy (LEB) at birth, which indicates the level of health and availability of health services; (2) Education Component, assessed by Mean Years of Schooling (MYS), which describes the accessibility and quality of education in the community; and (3) Standard of Living Component, which is calculated using adjusted per capita expenditure, reflecting the purchasing power and economic strength of the community.

Gross Regional Domestic Product. Gross Regional Domestic Product (GRDP) calculated at constant prices is an indicator that measures a region's actual output, 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 volume, compared to measurements using current prices. This view aligns with standard explanations of GRDP in general, as well as the distinction between constant and current prices, which specifically highlight the importance of eliminating the effects of inflation for a more accurate evaluation of regional economic performance (Mukti & Soraya, 2024).

Economic growth, measured by national income, results in increased funding allocated to the community to drive human development progress in health, education, and quality of life. Gross Regional Domestic Product (GRDP) indicates a region's economic capacity, which plays a crucial role in increasing the Human Development Index (HDI), as regional economic strength serves as the

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basis for allocating government budgets to various human development programs (Fernando & Yustie, 2025). Applying constant prices allows for a more valid evaluation of actual increases in economic capacity, unaffected by inflation, which may create an inaccurate illusion of growth (Mankiw, 2019).

Mean Years of Schooling. The indicator generally used to calculate the Average Years of Schooling (AYS) refers to the average number of years of formal education attained by residents aged 25 years and over in a region. This indicator describes the level of education attained by a population and is a key component in calculating the Human Development Index (BPS, 2024). A high MYS indicates that the population has a good opportunity to participate in the education system and complete higher levels of education.

Aurora & Asmara (2024) emphasize that mean years of schooling (MYS) not only strengthen an individual's potential for more prospective employment opportunities but also foster a more rational mindset in decision-making related to family health and economics. Thus, increasing mean years of schooling contributes directly to the education dimension of the HDI while also 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 an individual can expect to live from birth, based on observed mortality patterns at birth in a given population. Conceptually, 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 (life expectancy at birth) (Cahyanti et al., 2021).

Life expectancy (LEB) contributes directly to the health aspect of the Human Development Index (HDI) because the length of life and the 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.

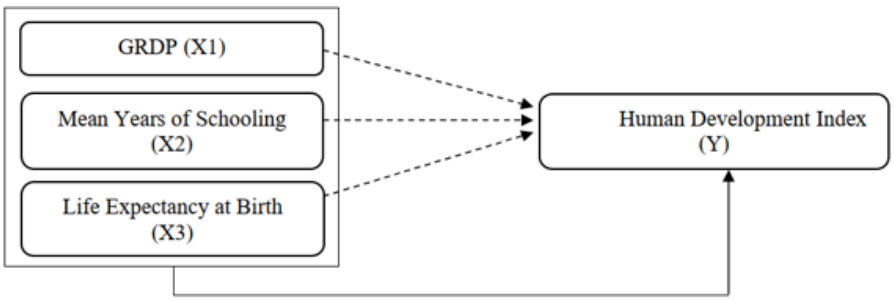

Figure 3. Conceptual Framework.

Based on the conceptual framework in Figure 3, it can be seen that the Gross Regional Domestic Product (X1) variable shows a partial influence on the Human Development Index (HDI), Mean Years of Schooling (X2) also has a partial impact on the Human Development Index (HDI), Life Expectancy at Birth (X3) partially influences the Human Development Index (HDI), and overall, the variables of poverty, GRDP, mean years of schooling, and Life Expectancy at Birth together influence the Human Development Index (HDI) simultaneously in Bali province.

Hypothesis.

1. H0: GRDP is suspected of not having a significant influence on the Human Development Index in Bali Province.

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H1: GRDP is suspected to have a significant influence on the Human Development Index in Bali Province.

2. H0: Mean Years of Schooling is not expected to have a significant influence on the Human Development Index in Bali Province.
   H1: Mean Years of Schooling is suspected to have a significant influence on the Human Development Index in Bali Province.
3. H0: Life expectancy is not thought to have a significant influence on the Human Development Index in Bali Province.
   H1: Life expectancy is thought to have a significant influence on the Human Development Index in Bali Province.
4. H0: GRDP, Mean Years of Schooling, and Life Expectancy are suspected to have no significant influence on the Human Development Index in Bali Province.
   H1: GRDP, Mean Years of Schooling, and Life Expectancy are suspected to jointly have a significant influence on the Human Development Index in Bali Province.

METHODS

This study uses a quantitative empirical method as the primary methodology, known as an objective technique that includes data collection, in-depth analysis, and the application of statistical tests to test hypotheses, with the final findings presented numerically (Hardani, 2021). Meanwhile, this study uses a causal associative quantitative empirical method, with the aim of describing and examining the relationships and influences that occur between two or more variables, based on hypothesis testing. The data used are 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 was accessed from the official publication of the Bali Central Statistics Agency. In this study, the independent variables include Gross Regional Domestic Product (X1), Mean Years of Schooling (X2), and Life Expectancy (X3).

Meanwhile, the dependent variable is the Human Development Index (HDI) symbolized as (Y). In the panel data multiple regression model, researchers must choose the best model among three options: Common Effect, Fixed Effect, and Random Effect. This selection is based on the results of the Chow test, the Haustman test, and the Lagrange Multiplier test. Specifically, the Lagrange Multiplier test is necessary if the Chow test indicates a tendency toward the Common Effect Model, while the Hausman test points toward the Random Effect Model. In principle, in multiple linear regression analysis using the Ordinary Least Squares (OLS) approach, testing classical assumptions is a statistical requirement that must be met. However, in panel data regression, some of these classical assumption tests are not applied. According to Gujarati, as cited in Basuki and Prawoto (2019), the classical assumption tests relevant to panel data regression only include multicollinearity and heteroscedasticity tests. The panel data-based multiple regression formula in this research is shown as follows:

$$Yit = b_0 + b_1 lnX1_{it} + b_2 lnX2_{it} + b_3 lnX3_{it} + e_{it}$$

Information:
Yit = Human Development Index
b0= Constant
b1, b2, b3= Independent Variable Coefficient

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lnX1= Logarithm of GRDP
lnX2= Logarithm of Mean Years of Schooling
lnX3= Logarithm of Life Expectancy
i= Cross-section
t = Time series
e= Erorr terms

RESULTS AND DISCUSSION

Descriptive Analysis.

Table 1. Statistic Descriptive

Statistics	GRDP	MYS	LEB	HDI
Mean	9.528249	2.117682	4.285474	4.308796
Median	9.607694	2.115024	4.286444	4.304133
Maximum	10.53655	2.444952	4.333296	4.434970
Minimum	8.212324	1.690096	4.240175	4.169452
Std. Dev	0.665856	0.191243	0.025892	0.072212
Observations	90	90	90	90

Source: Processed by Researchers (2026)

Based on the descriptive statistics table, this study involved a total of 90 observations. For the GRDP variable, the lowest value was recorded at 8.212324, and the highest value reached 10.53655, with a standard deviation of 0.665856 and an average of 9.528249. As for the average years of schooling variable, the average was 2.117682, and the standard deviation was 0.191243, with a range of values from 1.690096 to 2.444952. The life expectancy variable showed a standard deviation of 0.025892 and an average of 4.285474, with a minimum value of 4.240175 and a maximum of 4.333296. Meanwhile, the HDI variable has a range of values between 4.169452 and 4.434970, with an average of 4.308796 and a standard deviation of 0.072212.

Panel Model Selection. The specific results of this study, the Chow test shows the probability for the cross-section F and cross-section chi-square are both <0.05, so the null hypothesis is rejected, and the FEM model is selected. Furthermore, the Hausman test states the probability for the random cross-section is also less than 0.05, which indicates the rejection of the null hypothesis and the selection of the FEM model. Thus, both the Chow test and the Hausman test consistently conclude that the Fixed Effect Model is a more appropriate model for this study, as listed in the following table:

Table 2. Model Selection Test Result

Testing	Probability	Hypothesis	Selected Model
Chow Test	0.00	H0 Rejected	FEM
Hausman Test	0.00	H0 Rejected	FEM

Source: Author's Calculation (2026)

Panel Data Regression Analysis.

Table 3. Fixed Effect Model

Variable	Coefficient	Std. Error	t-value	p-value
C	1.660	0.445	3.727	0.000
GRDP(Xl)	0.005	0.003	1.560	0.123

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MYS (X2)	0.270	0.024	11.327	0.000
LEB (X3)	0.473	0.112	4.228	0.000
R-squared:	0.989	F-statistic:		644.861
Adjusted R-squared:	0.988	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:

$$HDI = 1{,}660 + 0.005Ln*GRDP + 0.270Ln*MYS + 0.473Ln*LEB$$

Hypothesis Testing, t-test (Partial). The regression model generated from the Fixed Effect Model (FEM), as listed in Table 3, the analysis results show that the Regional Domestic Product (GRDP) variable produces a p-value of (0.123 > 0.05). It means that Gross Regional Domestic Product (GRDP) does not have a significant partial effect on the Human Development Index (HDI). Furthermore, the Average Years of Schooling variable shows a probability of (0.000 < 0.05), so that Average Years of Schooling has a partial effect on the HDI. Similarly, the Life Expectancy variable has a probability of (0.000 < 0.05), so that this variable is also proven to have a significant partial effect on the HDI.

F Test (Simultaneous). Based on the simultaneous test in Table 3, the F-statistic probability is (0.000 < 0.05). It indicates that the variables of Gross Regional Domestic Product (GRDP), average years of schooling, and life expectancy together have a significant influence on the Human Development Index (HDI) in the Bali region during the period 2015 to 2024.

Coefficient of Determination (Adjusted R-squared). Adjusted R value²applied when the analysis involves more than one independent variable, as explained by Basuki and Prawoto (2019). In the regression results using the Fixed Effect Model (FEM), the Adjusted R value is²of 0.988, meaning the three independent variables contribute 98.8% to explaining the variation in the HDI. Meanwhile, the remaining 1.2% is influenced by other variables not included in the study, given data limitations and the study's focus on the three main independent variables.

Classical Assumption Test. The regression model was tested using two classical assumptions, namely the multicollinearity and heteroscedasticity tests. To assess multicollinearity using the method (Variance Inflation Factor), the VIF can be seen from the correlation coefficient between variables. If the value is lower than 10.00, the model is proven to have passed the multicollinearity test. As for the heteroscedasticity test, if the probability value exceeds 0.05, the model is proven to be free from heteroscedasticity.

Table 4. Multicollinearity Test

Variable	VIF
GDRP (X1)	2.127
MYS (X2)	5.943
LEB (X3)	7.511

Source: Author's Calculation (2026)

The analysis in Table 4 shows that the independent variables show no multicollinearity issues at all. This finding is supported by the Variance Inflation Factor (VIF) calculation, where the values

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for all independent variables are below 10. Overall, the regression model demonstrates no significant correlation between the independent variables.

Table 5. Heteroscedasticity Test

Variable	Coefficient	Std. Error	t-statistic	p-value
C	0.117	0.246	0.474	0.637
GRDP(Xl)	-0.002	0.001	-1.564	0.121
MYS (X2)	0.006	0.007	0.818	0.416
LEB (X3)	-0.024	0.062	-0.389	0.699

Source: Author's Calculation (2026)

Based on Table 5, it can be observed that the probability values for each independent variable, namely GRDP, average length of education, and life expectancy, are all above 0.05. The test results confirm that the model is free from heteroscedasticity problems.

The Influence of GRDP at Constant Prices on the Human Development Index (HDI). Based on the test results, GRDP did not show a significant positive effect on the HDI of regencies/cities in Bali from 2015 to 2024. This study's results align with research by Handayani and Woyanti (2021), who analyzed panel data from 35 regencies/cities in Central Java for the 2011-2019 period. They found that GRDP had a positive but insignificant effect on the HDI due to the unequal distribution of income among the community. Denpasar City recorded the highest HDI, while regencies like Karangasem were at a much lower level (BPS Bali Province, 2024). Tourism-dominated GRDP growth was concentrated in tourist areas such as Denpasar, Badung, and Gianyar, while other regencies had limited access to these economic benefits.

The results of this study also align with the main findings of Natalia (2018), who found that high tourism-based GRDP had no positive effect on the Human Development Index (HDI) in Greater Malang. In Bali, the tourism sector tends to generate low-wage, seasonal jobs and does not encourage skill development in the workforce. Bali's tourism sector tends to create low-to-medium-skilled jobs (hotel attendants, drivers, and vendors) that do not require significant increases in the MYS. It explains the background finding that "tourism-based economic expansion has not yet fully driven an optimal increase in the duration of public education" (Rosyidi, 2021).

The Influence of Average Length of Schooling on the Human Development Index (HDI). The findings of this study indicate that average years of schooling have a significant positive effect on the Human Development Index (HDI) of districts/cities in Bali from 2015 to 2024. These findings support the findings of Nazira and Hasmarini (2024) who stated that average years of schooling are a key determinant of driving improvements in the Human Development Index in Bali, as education builds human resource strength as a crucial asset for sustainable development. Furthermore, research by Handayani and Woyanti (2021) on districts/cities in Central Java also shows a significant positive relationship between average years of schooling and the HDI, emphasizing the role of education in advancing the well-being of society by strengthening individual potential and providing easier access to social services.

The results of this study demonstrate that, despite the gradual increase, average 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 average 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,

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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 has a significant positive effect on the Human Development Index (HDI) of Bali's regencies/cities in 2015-2024. The results of this study are in line with Simanjuntak et al. (2024), who emphasized that life expectancy has a positive and significant effect on the Human Development Index (HDI). It is because life expectancy reflects the overall level of community health, which plays an important role in supporting increased welfare. LEB reflects the aggregate health conditions of the community, which are influenced by access to health services, nutritional quality, sanitation, and the living environment. An increase in LEB indicates that people have a longer productive life, which allows for the accumulation of knowledge, experience, and greater economic contributions throughout their lives (Rasnino & Zulham, 2022; Heykal et al., 2024). Sen (1999) emphasized that health is one of the fundamental capabilities that enables individuals to achieve the life functions they value.

With optimal health, people are able to 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 the HDI.

CONCLUSION

Panel data regression analysis proves that Average Years of Schooling and Life Expectancy significantly increase the Human Development Index (HDI), indicating that investment in the education and health sectors is a major determinant in improving the quality of human development in Bali Province during the period 2015-2024. In contrast, GRDP does not have a significant positive effect on the HDI, which shows that economic growth does not directly increase the human development index in the Bali region, even though it is driven by the dominant tourism sector.

Further research should explore other variables suspected of influencing the Human Development Index and extend the observation period to more than 10 years. Regency/city governments in Bali are advised to prioritize investment in education and health with adequate budget allocations, design tourism policies that provide broader access and benefits to local communities, and strengthen the linkages between the tourism sector and the local economy to drive higher rankings in the national HDI.

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