



Human Development Index Trends: A Path Toward Sustainable Development

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Abstract. Human capital is a vital component in achieving sustainable development, particularly in enhancing the quality of life and public welfare. This study investigates the influence of health facilities, population density, and education on the Human Development Index (HDI) in Manggarai Regency, East Nusa Tenggara, Indonesia. Employing a mixed-method approach, the research integrates quantitative data analysis with qualitative insights from institutional and demographic records between 2017 and 2021. Using a semi-logarithmic regression model, the findings reveal that education has the most significant positive impact on HDI, while population density also contributes positively, albeit to a lesser extent. Conversely, health facilities were found to have no significant effect on HDI, indicating the need for revitalization in the health sector. These results suggest that strengthening the education sector and managing population distribution are critical for advancing human development in the region. The study recommends increased investments in education infrastructure and urban planning, as well as strategic improvements in healthcare service delivery.

Keywords: Human Development Index, education, health facilities, population.

1 Introduction

Human capital plays a pivotal role in achieving sustainable development, which aims to establish a healthy and productive society. The enhancement of human capabilities is a fundamental prerequisite for the effective implementation of development across economic, political, social, and cultural dimensions. The Human Development Index (HDI) serves as a comprehensive metric to evaluate progress in human development by assessing access to education, healthcare, and income. In the Indonesian context, HDI is not only a benchmark for assessing government performance but also a strategic instrument for determining the allocation of General Allocation Funds (DAU). In Manggarai Regency, the HDI demonstrated a gradual increase between 2017 and 2021; however, this improvement has been accompanied by challenges such as fluctuations in population numbers and variations in population density, which influence the equity and accessibility of public services.

Despite the upward trend in HDI, improvements in service quality and accessibility remain uneven across the region. Health infrastructure, for instance, has shown minimal development,

and disparities in service distribution persist, contributing to public dissatisfaction. Likewise, the shifting demographic landscape presents further challenges for the local government's ability to provide adequate and equitable public services. In the education sector, while the number of schools has increased, disparities in access to educational facilities—particularly in rural and remote areas—remain unresolved. This suggests that although numerical progress in HDI has been achieved, the substantive quality and inclusiveness of human development still require substantial improvement to meet the objectives of sustainable and equitable regional development.

2 Literature Review

The Human Development Index (HDI) is a crucial indicator of societal well-being, encompassing health, education, and income dimensions (Istiqomah et al., 2025). Research suggests that health facilities and education significantly influence HDI (Hutabarat et al., 2023; Boruah & Baishya, 2024). However, findings on the impact of health facilities are mixed, with some studies showing no effect (Nelsi et al., 2024) and others demonstrating a positive influence (Istiqomah et al., 2025). Education consistently emerges as a significant factor affecting HDI (Nelsi et al., 2024; Hutabarat et al., 2023). Additionally, population density and poverty have been found to impact HDI, with poverty showing a negative correlation (Nelsi et al., 2024; Istiqomah et al., 2025). The number of health workers and educational infrastructure are identified as key determinants positively influencing HDI (Hutabarat et al., 2023). These findings emphasize the importance of investing in social infrastructure, particularly in health and education, to improve human development outcomes (Boruah & Baishya, 2024).

Population density and urbanization have significant impacts on the Human Development Index (HDI). While higher urban population percentages generally correlate positively with HDI values, rapid urban population growth and concentration in the largest cities can negatively affect HDI (Tripathi, 2019). The relationship between population density and environmental quality is less clear, with some research finding an insignificant positive impact (R. Aulia et al., 2024). Studies on Middle Eastern countries have explored the link between population growth and HDI components like life expectancy, education, and income (Zgheib et al., 2006). In Organization of Islamic Cooperation (OIC) member countries, health, education, and labor force factors influence HDI, with urban population moderating the effects of health and workforce on HDI (Hasna Fauziana & Ratnasari, 2023). These findings suggest that balanced urbanization and improved urban services are crucial for enhancing HDI, particularly in developing countries (Tripathi, 2019).

Education plays a significant role in influencing the Human Development Index (HDI). Studies have shown a positive and significant relationship between education and HDI, emphasizing the importance of investing in the education sector to improve quality of life and welfare (Andi Jam'an et al., 2024). The impact of education on health outcomes, a component of HDI, is more pronounced in countries with higher human development (Anne L F van der Kooi et al., 2013). However, research indicates that government spending on education may not always

have a significant effect on HDI, possibly due to allocation issues (Astri Winarti & E. Purwanti, 2014). Other factors, such as health expenditure and poverty levels, also contribute to HDI (Ira Julistia et al., 2025). The relationship between education and HDI is complex, involving multiple factors and varying across different development contexts. Integrating Islamic economic principles in HDI improvement strategies has been suggested, emphasizing balanced material and spiritual development (Ira Julistia et al., 2025).

3 Research Methodology

Research Design and Location

This study applies a mixed-method research design, combining both quantitative and qualitative approaches. The quantitative approach is used to analyze numerical data on the Human Development Index (HDI), educational indicators, and population density, while the qualitative approach is employed to explore descriptive information related to public health facilities and social-demographic dynamics. The research was conducted in Manggarai Regency, East Nusa Tenggara, Indonesia.

Operational Definition of Variables

The independent variables in this study include health facilities, population density, and education, while the dependent variable is the Human Development Index (HDI). Health facilities are measured through the availability of hospitals, health centers (Puskesmas), auxiliary health centers (Pustu), village maternity posts (Polindes), and village health posts (Poskesdes). Population density is assessed based on population growth, birth rates, and residential land availability. Education indicators include the number and quality of schools, educational attainment, and basic competencies. HDI is measured through three main dimensions: longevity, knowledge, and a decent standard of living.

Population and Sampling

The population in this study includes all residents of Manggarai Regency, totaling 315,041 people. The sample size was determined using the Slovin formula with a 10% margin of error, resulting in a minimum sample of 100 respondents selected to represent the target population.

Data Collection and Sources

This study uses secondary data obtained from official sources, such as the Central Bureau of Statistics (BPS) and the regional departments of health and education. Quantitative data includes HDI scores, population statistics, and the number of educational institutions from 2017 to 2021.

Qualitative data consists of descriptive records related to the availability and distribution of healthcare and education services. Data collection techniques include document review, direct observation, and semi-structured interviews using guided questionnaires.

Data Analysis Techniques

The data were analyzed using a semilog linear regression model to determine the effect of independent variables on the HDI. Prior to regression, classical assumption tests were conducted, including the normality test (Kolmogorov-Smirnov), multicollinearity test (using Tolerance and Variance Inflation Factor), and heteroscedasticity test (Glejser test). The regression equation is structured as follows:

$$Y = C + \ln X_1 + \ln X_2 + \ln X_3 + e,$$

where Y is the HDI, X_1 is health facilities, X_2 is population density, X_3 is education, C is the constant, and e is the error term.

To test the research hypotheses, the study used the t-test (to examine the partial effect of each independent variable), F-test (to test simultaneous significance), and the coefficient of determination (R^2 and Adjusted R^2) to assess the explanatory power of the model.

4 Results And Discussion

This study analyzed the effects of health facilities, population density, and education on the Human Development Index (HDI) in Manggarai Regency. The research was based on a sample of 100 respondents, with demographic characteristics varying by age, gender, education level, and occupation. Preliminary classical assumption tests confirmed that the regression model met the conditions of normality, no multicollinearity, and partial heteroscedasticity—specifically on the education variable. The semilog linear regression analysis revealed that among the three independent variables, only education had a statistically significant effect on HDI.

Regression results indicated that education had the strongest positive effect on HDI, with a coefficient of 0.289 and a *t*-value of 2.547 ($p < 0.1$). This suggests that a 1% increase in educational attainment leads to a 0.289% rise in HDI. Population density also showed a positive effect ($\beta = 0.175$), with a *t*-value of 1.786 ($p < 0.1$), suggesting its influence on development, likely due to concentrated infrastructure and public service access. However, health facilities were not found to be a significant predictor of HDI, likely due to stagnant facility growth from 2017 to 2021. The model's R^2 value was 0.564, indicating that 56.4% of HDI variation could be explained by the three variables analyzed.

The findings confirm that human capital, particularly through education, plays a vital role in improving quality of life in Manggarai. While population density also correlates positively with HDI, it requires effective management to avoid service overload. Meanwhile, despite the

availability of health infrastructure, its stagnant development has diminished its impact on HDI. These results emphasize the need for targeted investments and balanced resource distribution to enhance regional human development outcomes.

5 Conclusion And Recommendation

This study concludes that education and population density have a significant positive effect on the Human Development Index in Manggarai Regency, while the effect of health facilities remains statistically insignificant. The most influential factor is education, suggesting that improvements in access, quality, and educational attainment are crucial to accelerating human development in the region.

It is recommended that the local government increase budget allocations for the education sector, including teacher quality and infrastructure. In addition, managing population distribution and improving urban planning will help maximize the benefits of population density. Finally, the health sector must be revitalized with long-term investments to ensure that health services can effectively contribute to human development outcomes.

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