



Human Development's Impact on Economic Welfare in West Sumatra : An Analysis of Education, Health, and Employment Factors

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Abstract. *This study investigates the determinants of economic welfare in West Sumatra Province, focusing on the role of Human Development Index (HDI) components, namely Life Expectancy (LE), Expected Years of Schooling (EYS), Mean Years of Schooling (MYS), and Per Capita Expenditure (PCE). The analysis covers the period from 2017 to 2023 across 19 districts and cities, employing a quantitative approach with panel data regression using the Fixed Effect Model (FEM). Economic welfare is proxied by Gross Regional Domestic Product (GRDP) per capita, which is widely recognized as a reliable measure of regional prosperity. The findings reveal that although LE, EYS, and MYS show positive coefficients, their impact on economic welfare is statistically insignificant, suggesting that improvements in health and education require a longer time horizon to translate into measurable economic outcomes. In contrast, PCE demonstrates a strong and significant positive effect, indicating its critical role as a driving factor of regional welfare disparities. This outcome suggests that improvements in household consumption capacity directly enhance economic well-being more substantially than non-monetary HDI indicators within the studied context. The results highlight the importance of prioritizing income growth and expenditure-based interventions while maintaining long-term investment in health and education sectors to ensure inclusive and sustainable welfare. From a policy perspective, the government should strengthen programs that expand household purchasing power, while integrating them with education and healthcare development to achieve balanced and sustainable progress. This research contributes to the empirical literature by providing region-specific evidence on the interplay between HDI components and economic welfare, emphasizing the dominance of economic variables over social indicators in short- to medium-term welfare outcomes, and offering insights for future development strategies.*

Keywords: *economic welfare; education; growth; health; income.*

1. INTRODUCTION

West Sumatra Province, situated on the western coast of Sumatra Island, is renowned for its natural beauty and rich cultural heritage. Despite these advantages, the region continues to face substantial challenges in improving community welfare and achieving inclusive economic welfare. Economic welfare, often measured by the increase in Gross Regional Domestic Product (GRDP), remains a central indicator of regional development. However, welfare that is not supported by improvements in human quality often leads to inequality and unsustainable progress.

The Human Development Index (HDI), developed by the United Nations Development Programme (UNDP), serves as a composite indicator of development, emphasizing three key dimensions: health, education, and economic well-being. Specifically, the HDI is measured using components such as Life Expectancy (LE), Expected Years of Schooling (EYS), Mean Years of Schooling (MYS), and Per Capita Expenditure (PCE). Theoretically, improvements

in health and education should enhance labor productivity, innovation, and ultimately, economic performance. This view is supported by endogenous growth theory, which emphasizes the role of human capital in driving long-term economic development (Romer, 1990).

However, in the context of West Sumatra, empirical observations reveal a gap between theory and actual outcomes. Although indicators of education and health have improved over time, these improvements have not always translated into significant increases in economic welfare. Data from the Central Statistics Agency (BPS) show that despite a gradual rise in LE, EYS, MYS, the rate of economic welfare remains relatively stagnant in some regions. This suggests the presence of other influential factors such as infrastructure quality, sectoral economic structure, and regional policies, that may play a more dominant role in shaping economic outcomes.

Previous studies have produced mixed findings regarding the relationship between HDI components and economic welfare. For instance, Pal (2023) find a significant link between education and economic development, while other studies (e.g., Levin & Kelley, 1994; Wenzel & Beck-Peter, 2020) argue that education alone is insufficient without adequate institutional support and economic opportunity. Given these inconsistencies, further research is needed to analyze the relationship between HDI components and economic welfare, particularly in provinces such as West Sumatra where sectoral and spatial disparities are evident. This study aims to fill the research gap by conducting a panel data analysis of 19 districts and cities in West Sumatra from 2017 to 2023. The study utilizes the Fixed Effect Model (FEM) to examine the extent to which LE, EYS, MYS, and PCE contribute to economic welfare.

The novelty of this research lies in its comprehensive approach to analyzing the multidimensional impact of HDI components over a seven-year period using district-level panel data, providing a more granular understanding of regional development dynamics. Unlike previous studies that focus predominantly on national or provincial averages, this research captures inter-district heterogeneity and offers specific policy insights tailored to local development needs. Ultimately, the study seeks to contribute to modern development theory by highlighting the nuanced and sometimes indirect role of human development in promoting economic welfare, particularly in developing regions with complex socio-economic structures.

2. THEORITICAL REVIEW

Economic development is a multidimensional process aimed at improving community welfare through economic growth, reducing inequality, and alleviating poverty (Calista et al.,

2024; Lestari et al., 2021). While economic growth often serves as a primary indicator of development success, it does not fully reflect individual well-being (Lestari et al., 2021). For this reason, the Human Development Index (HDI) is widely used to assess the broader aspects of welfare by incorporating human capital dimensions, namely health, education, and income, as key contributors to long-term, inclusive growth (Calista et al., 2024; Rosdaniah, 2023).

The HDI itself is a composite measure calculated as the average of three main indices: the health index, the education index, and the standard of living index (Mariano et al., 2021). Among these, health is recognized as both a fundamental human right and a public service closely tied to societal welfare (Ardinata, 2020; Felany, 2021). Governments hold the responsibility to ensure equitable, accessible, and high-quality healthcare for all citizens, including vulnerable populations (Felany, 2021; Sopiana & Sodik, 2021). Health services contribute not only to the development of human resources but also play a vital role in poverty alleviation and sustainable economic growth (Sopiana & Sodik, 2021). However, public health outcomes are shaped by multiple factors, ranging from environmental conditions and individual behavior to healthcare service availability (Sopiana, 2021). Consequently, the state is obliged to implement human rights principles that uphold the right to health as part of its commitment to citizen welfare (Ardinata, 2020).

In the context of the HDI, LE at birth is commonly used as a proxy for health quality and human development (Faqihudin, 2010; Talakua et al., 2017). This indicator reflects the effectiveness of health systems and public health strategies in a given region (Pratiwi & Budyanra, 2020). To enhance LE, effective and strategic allocation of health budgets is essential. Targeted financial support to regional governments, collaboration with private healthcare providers, and policies to reduce mortality rates are among the recommended strategies to address disparities and improve health outcomes (Sari et al., 2019).

Alongside health, education represents a key pillar of human development and a driving force of economic transformation. Various theories and empirical studies confirm the significant role of education in national development (Nugroho, 2014). Investment in human capital, particularly through education, is one of the most powerful instruments to stimulate inclusive and sustainable growth (Rohimah, 2021). The competence and quality of educators are critical to shaping future generations capable of contributing to economic progress (Rahmaningtyas, 2024). Moreover, education fosters not only economic but also socio-cultural and political advancement (Cikka, 2020). Nonetheless, Indonesia continues to face substantial obstacles in educational investment, particularly in terms of infrastructure limitations, inadequate funding, and socio-cultural barriers (Rahmaningtyas, 2024). Still, initiatives such

as teacher mentorship and professional development offer promising opportunities for improvement (Cikka, 2020; Rohimah, 2021).

Several recent studies provide insight into key educational indicators that influence human development in Indonesia. Manurung & Hutabarat (2021), Navoleon & Muljanto (2023), and Anam & Yulianto (2024) emphasize the importance of EYS and MYS in measuring educational achievements and regional development outcomes. EYS estimates the number of years a 7-year-old child is expected to attend school, while MYS reflects the average number of years completed by individuals aged 15 and above, excluding repeat years (Karimah et al., 2024). Empirical data show that both EYS and MYS, along with PCE, have a substantial impact on HDI performance (Anam & Yulianto, 2024; Manurung & Hutabarat, 2021). However, challenges such as poverty, limited infrastructure, and complex socio-political dynamics hinder access to quality education—especially in rural and remote areas (Navoleon & Muljanto, 2023). These findings suggest that while educational indicators are critical to human development, addressing structural barriers remains imperative for inclusive progress.

The third component of HDI, the standard of living, is commonly measured through real PCE, which serves as a proxy for purchasing power and reflects economic capability (Siswanto, 2019; Alviani et al., 2021; Yektiningsih, 2018). Purchasing Power Parity (PPP) illustrates the extent to which individuals and households can access goods and services based on their income (Yusuf & Nurmalah, 2016). Numerous studies show a strong correlation between HDI and its individual components, particularly LE and PCE (Bisai et al., 2022; Fauziyyah et al., 2022). An increase in HDI is often associated with lower poverty rates and higher income levels, reinforcing its role as a comprehensive tool for assessing human development and economic welfare (Bisai et al., 2022). Evidence from Banten Province reveals that PCE alone contributed 97.2% to the overall increase in HDI, highlighting its dominant role in shaping development outcomes (Permana et al., 2019). Similarly, case studies and panel data analyses affirm that LE, EYS, MYS, and PCE collectively influence HDI and, by extension, the broader development trajectory of a region (Alviani et al., 2021; Yektiningsih, 2018).

Together, these findings underscore the intertwined nature of health, education, and income in determining human development outcomes and their cumulative impact on regional economic performance. Although improvements in health and education remain vital, their direct contributions to economic welfare often require complementary policies addressing infrastructure, employment, and governance. As such, understanding the relative influence of each HDI component offers valuable insights for crafting effective, evidence-based strategies aimed at fostering sustainable and inclusive development.

This study proposes the following hypotheses to examine the influence of Human Development Index (HDI) components on economic welfare in West Sumatra Province:

1. H_{01} : LE has no significant effect on economic welfare in West Sumatra Province.
2. H_{a1} : LE has a significant effect on economic welfare in West Sumatra Province.
3. H_{02} : EYS has no significant effect on economic welfare in West Sumatra Province.
4. H_{a2} : EYS has a significant effect on economic welfare in West Sumatra Province.
5. H_{03} : MYS has no significant effect on economic welfare in West Sumatra Province.
6. H_{a3} : MYS has a significant effect on economic welfare in West Sumatra Province.
7. H_{04} : PCE has no significant effect on economic welfare in West Sumatra Province.
8. H_{a4} : PCE has a significant effect on economic welfare in West Sumatra Province.
9. H_{05} : All four HDI components jointly have no significant effect in West Sumatra Province.
10. H_{a5} : All four HDI components jointly have a significant effect in West Sumatra Province.

3. METHODS

This research adopts a quantitative approach by applying panel data regression techniques. To determine the most appropriate econometric model, a series of specification tests were conducted to ensure the reliability and accuracy of the analysis. The Chow Test was utilized to compare the Common Effect Model (CEM) with the Fixed Effect Model (FEM), while the Hausman Test was employed to distinguish between the Random Effect Model (REM) and the FEM. Results from both tests identified the Fixed Effect Model as the most suitable for this study.

The analysis is based on secondary data sourced from the Central Statistics Agency (BPS) of West Sumatra Province. The dataset includes observations from 19 districts and municipalities over the period from 2017 to 2023, combining cross-sectional data across regions and time-series data over several years. This results in a balanced panel structure.

To further validate the regression model, classical assumption tests were performed. Multicollinearity was tested using the Variance Inflation Factor (VIF), confirming that no strong linear relationships exist between the independent variables. Additionally, the assumption of homoscedasticity was evaluated through residual pattern analysis, with results indicating that the variance of residuals remains constant across observations.

This study explores the relationship between economic welfare, proxied by Gross Regional Domestic Product (GRDP) per capita and four explanatory variables: LE, EYS, MYS, and PCE. The applied panel regression model is expressed in the following form:

$$Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \epsilon_{it} \quad (1)$$

Where:

Y = GRDP per Capita

X1 = LE

X2 = EYS

X3 = MYS

X4 = PCE

α = Constant

$\beta_1, \beta_2, \beta_3, \beta_4$ = Coefficients of the independent variables

ϵ = Error term

i = Number of districts/cities (19 districts/cities)

t = Time period (2017–2023)

4. RESULTS AND DISCUSSION

Result

The Chow Test was conducted to determine the optimal model between the Common Effect Model (CEM) and the Fixed Effect Model (FEM) by analyzing the p-value from the cross-sectional Chi-square statistic. The test produced a p-value of 0.0000, which is below the 0.05 significance threshold, suggesting that the Fixed Effect Model is more suitable than the Common Effect Model for this analysis.

Table 1. Chow Test Results.

Redundant Fixed Effects Tests

Equation: Untitled

Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	51.793254	(18,110)	0.0000
Cross-section Chi-square	299.074993	18	0.0000

Source: Eviev

Following this, the Hausman Test was utilized to compare the Random Effect Model (REM) with the Fixed Effect Model (FEM) in order to identify the more suitable model. The test yielded a p-value of 0.0000, which is below the 0.05 significance level, thereby confirming

that the Fixed Effect Model is the most appropriate choice for the panel data regression in this study.

Table 2. Hausman Test Results.

Correlated Random Effects - Hausman Test

Equation: Untitled

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	76.562057	4	0.0000

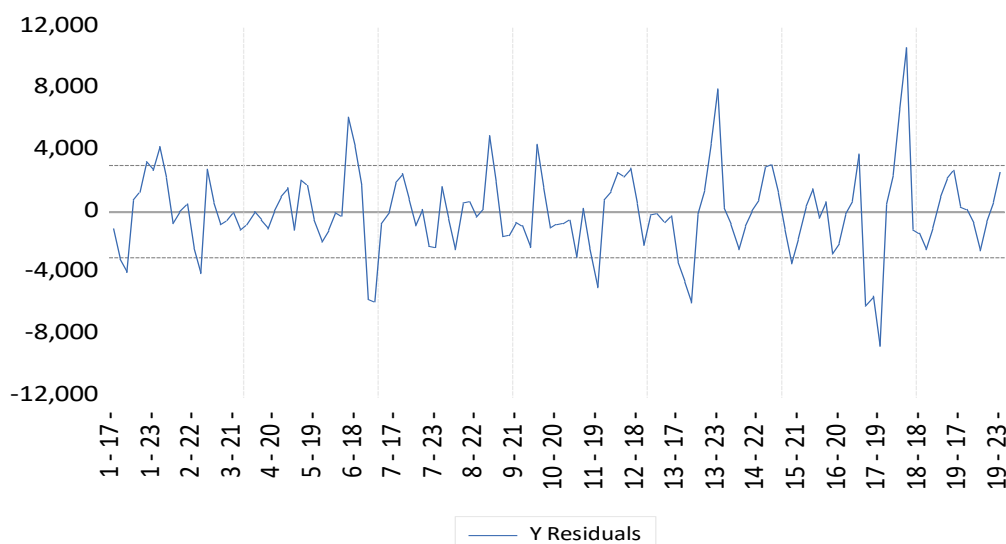
Source: EvIEWS 13 Output

To evaluate multicollinearity, the Variance Inflation Factor (VIF) method was applied, with VIF values below 10 indicating no significant multicollinearity among the independent variables. The results also showed that no correlation coefficients exceeded 0.85, further confirming the absence of multicollinearity. Moreover, heteroscedasticity was tested through residual analysis, which demonstrated a random distribution with no residuals surpassing ± 500 , thereby satisfying the assumption of homoscedasticity.

Table 3. Multicollinearity Test Results.

	X1	X2	X3	X4
X1	1	0.7343910694911	0.8273468833543	0.7715730975115
		268	596	575
X2	0.73439106949112	1	0.8131335299739	0.7184004968204
	68		29	508
X3	0.82734688335435	0.8131335299739	1	0.7742139222128
	96	29		388
X4	0.77157309751155	0.7184004968204	0.7742139222128	1
	75	508	388	

Source: EvIEWS 13 Output



Source: Eviews 13 Output

Figure 1. Heteroscedasticity Test Result.

The Fixed Effect Model regression results indicate a constant coefficient of -144,420.30 thousand rupiahs. The coefficient for LE (X1) was positive at 35.12, implying that a one-year increase in LE is associated with an increase of approximately 35.12 thousand rupiahs in GRDP per capita, although this effect is not statistically significant. EYS (X2) and MYS (X3) had positive coefficients of 2,227.44 and 2,685.89 thousand rupiahs, respectively, but neither was statistically significant. Conversely, PCE (X4) had a positive and statistically significant effect with a coefficient of 12.49, indicating that higher PCE significantly raises GRDP per capita.

Table 4. Fixed Effect Model Regression Output.

Dependent Variable: Y

Method: Panel Least Squares

Date: 04/10/25 Time: 13:24

Sample: 2017 2023

Periods included: 7

Cross-sections included: 19

Total panel (balanced) observations: 133

Variable	Coefficient			
	nt	Std. Error	t-Statistic	Prob.
C	-144420.3	77172.88	-1.871387	0.0639
X1	35.12388	1481.344	0.023711	0.9811
X2	2227.437	2246.456	0.991534	0.3236

X3	2685.892	2386.535	1.125436	0.2629
X4	12.48553	1.715531	7.277936	0.0000
Effects Specification				
Cross-section fixed (dummy variables)				
		Mean dependent		47631.2
R-squared	0.960982	var		9
Adjusted R-squared				13827.5
	0.953178	S.D. dependent var		6
		Akaike info		19.0013
S.E. of regression	2992.064	criterion		1
				19.5011
Sum squared resid	9.85E+08	Schwarz criterion		5
		Hannan-Quinn		19.2044
Log likelihood	-1240.587	criter.		2
				0.69917
F-statistic	123.1447	Durbin-Watson stat		5
Prob(F-statistic)	0.000000			

Source: Eviews 13 Output

The regression equation is:

$$Y = -144420.301881 + 35.1238751402 \cdot X1 + 2227.43699893 \cdot X2 + 2685.89150684 \cdot X3 + 12.4855252375 \cdot X4 \quad (2)$$

Interpretations:

1. If all independent variables are zero, the GRDP per capita would be -144,420.30 (in thousand rupiahs).
2. An increase of one year in LE increases GRDP per capita by approximately 35.12 thousand rupiahs, although the effect is not statistically significant.
3. An increase of one year in EYS increases GRDP per capita by about 2227.44 thousand rupiahs, but not significantly.
4. An increase of one year in MYS increases GRDP per capita by about 2685.89 thousand rupiahs, yet also not significantly.
5. An increase of one unit in PCE significantly increases GRDP per capita by about 12.49 thousand rupiahs.

The coefficient of determination (R-squared) of 0.960982 indicates that approximately 96.1% of the fluctuations in economic welfare can be accounted for by the explanatory variables included in the model, while the remaining 3.9% is influenced by other unobserved factors. The F-statistic value of 123.1447, accompanied by a significance level of 0.0000 ($p < 0.05$), confirms that the variables LE, EYS, MYS, and PCE, when considered together, significantly affect economic welfare. Nevertheless, individual significance tests using the t-statistic reveal that only PCE has a statistically meaningful effect, whereas the other three indicators, although showing positive coefficients, do not exhibit a statistically significant impact on economic welfare in West Sumatra Province over the 2017–2023 period.

Discussion

The Fixed Effect Model (FEM) regression analysis yields important insights into the determinants of economic welfare in West Sumatra Province over the period 2017–2023. This study focuses on key elements of the Human Development Index, specifically LE, EYS, MYS, and PCE, to evaluate their respective effects on regional economic welfare, proxied by GRDP per capita.

The analysis indicates that although LE, EYS, and MYS each have positive coefficients, their effects on economic welfare are not statistically significant. This finding suggests that improvements in health and education, while vital for human development, have not yet translated into direct economic benefits within the timeframe and regional context of West Sumatra. Several factors could explain this pattern. First, the insignificance of LE could be attributed to disparities in healthcare infrastructure and access across different regions. Urban areas like Padang City benefit from better healthcare facilities, trained medical personnel, and more extensive healthcare programs compared to rural areas such as Solok Selatan or Mentawai Islands. This uneven distribution of health services means that improvements in LE do not uniformly enhance labor productivity or economic output across the province. Moreover, the increase in LE does not necessarily equate to an increase in healthy life years, which could directly affect a region's productive capacity. Second, the positive but insignificant impact of EYS and MYS highlights challenges in the quality and relevance of education. While enrollment rates and average years of schooling have increased, the education system may not yet produce graduates with skills that align with the demands of the labor market. Poor infrastructure, a shortage of qualified teachers, outdated curricula, and limited access to higher education and vocational training are persistent barriers in many districts outside major cities. These conditions limit the potential of education to drive productivity gains and economic innovation in the short term. These findings are consistent with previous studies, such as those

by Nugroho (2014) and Rohimah (2021), who emphasized that education and health improvements alone are insufficient unless accompanied by reforms that enhance the quality of human capital and align it with economic needs. Furthermore, the work of Navoleon and Muljanto (2023) showed that access inequality and regional disparities significantly dampen the positive impacts of human development components on economic outcomes.

In contrast, PCE exhibits a positive and statistically significant effect on economic welfare. This result underscores the critical role of purchasing power and household consumption in driving regional economic performance. Higher PCE reflects greater access to goods and services, stimulates local business activities, and encourages investments in productive sectors such as trade, tourism, and services. It also suggests that increasing disposable income can have an immediate and tangible effect on regional economic output, which aligns with Keynesian theories emphasizing the role of aggregate demand in driving welfare. This pattern is particularly relevant for West Sumatra, where sectors such as tourism, culinary industries (e.g., the famous rendang industry), and creative industries are highly sensitive to fluctuations in consumer spending. For instance, rising tourism activities around Lake Maninjau, Bukittinggi, and coastal areas have generated employment and income opportunities that directly contribute to GRDP growth.

Nevertheless, the reliance on consumption-driven growth poses risks if not balanced with investments in human capital and infrastructure development. Without sustained improvements in education, health, and productive capacity, economic welfare may become vulnerable to external shocks, such as inflationary pressures or global market fluctuations. Therefore, although the short-term driver of economic welfare is clearly linked to purchasing power, long-term sustainable economic welfare in West Sumatra requires an integrated approach. Investments in health and education must not only aim to increase access but also prioritize quality, relevance, and regional equity. Infrastructure development, particularly in transportation, healthcare, and education sectors, should be accelerated to bridge regional disparities. In addition, the province should strengthen its efforts in sectoral diversification. Overreliance on traditional sectors (such as agriculture or government services) could hinder economic resilience. Strategic development of sectors such as tourism, agro-industry, halal industries, and digital economy initiatives could help harness the province's demographic and cultural potential while creating high-value jobs for the younger generation. Finally, fostering innovation, entrepreneurship, and skills development through coordinated government programs, private sector engagement, and community participation will be crucial to translating human development improvements into tangible and sustainable economic outcomes.

5. CONCLUSION

This study shows that, simultaneously, all components of the Human Development Index (HDI) have a significant impact on economic welfare in West Sumatra. However, only PCE has a positive and significant effect, while the education and health variables (LE, EYS, and MYS) although positive, are not statistically significant. These findings reflect that improvements in education and health have not yet fully translated into economic welfare. This is due to the mismatch between educational output and labor market needs, as well as the unequal distribution of facilities. Future development policies should better integrate investments in education and health with productive economic sectors and focus on improving the quality and equity of basic services to foster more inclusive job creation. Future research is recommended to expand the variables used, such as institutional quality and infrastructure factors, and employ more complex models with a longer observation period to gain a deeper understanding of the dynamics between human development and economic welfare.

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