

Analysis of The Human Development Index in Jambi Province

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ABSTRACT

This study aims to analyze the influence of expenditure index, population density, poverty, unemployment, and investment on the human development index in regencies and cities in Jambi Province for the period 2018–2024. The research method used quantitative descriptive analysis. The research objects are regencies and cities in Jambi Province during the period 2018-2024. The analytical tool used is Panel Data regression. The results of the study indicate that expenditure index, population density, and poverty rate affect the human development index in regencies and cities in Jambi Province from 2018 to 2024, while unemployment rate and investment do not affect the human development index in regencies and cities in Jambi Province during the same period.

Keywords: *Expenditure Index, Population Density, Poverty, Unemployment, Investment, And Human Development Index.*

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1. INTRODUCTION

An increase in the Human Development Index (HDI) is often accompanied by economic growth, enabling a greater contribution to the economy. Moreover, inclusive economic development helps reduce poverty and social inequality. Improvements in the HDI not only contribute to stronger economic development but also enhance the quality of life for the population. Economic development is pursued not only at the national level but also within each region. Regional economic development is a process in which local governments and their communities manage regional resources and establish partnership patterns between local governments and the private sector to create employment opportunities and stimulate the growth of economic activities within the area (Arsyad, 2011).

Economic development is a continuous process aimed at improving a region's economy and the per capita income of its population over the long term. This process encompasses various initiatives, such as infrastructure investment, enhancement of education quality, and technological advancement. Long-term economic development impacts multiple aspects of life, including economic, social, and scientific development. Rising GDP and per capita income are expected to reduce poverty, improve societal welfare, and strengthen social stability. Sustainable economic development is essential for achieving continuous progress from year to year (Sukirno, 2014).

Economic development aims to improve the quality of human resources in a region. Annual population growth provides not only potential capital but also poses challenges for development. Focusing on enhancing human resource quality is crucial, as it yields positive impacts on public welfare (Todaro, 2014).

The Human Development Index (HDI) is influenced by three main indicators: health, education, and a decent standard of living. Health is reflected in life expectancy, which is affected by access to healthcare services, nutrition, and sanitation. Education is measured through average and expected years of schooling, depending on school availability, teaching quality, and families' socio-economic support. Meanwhile, a decent standard of living is determined by per capita expenditure, reflecting income levels, employment opportunities, and access to basic needs such as electricity and clean water. Additional factors including government policies, regional disparities, gender equality, and technological advancement also influence HDI achievement at both national and regional levels.

The slowdown in Human Development Index (HDI) growth is caused by several interrelated factors, such as unequal access to basic services, economic crises that reduce public purchasing power, and uneven education quality despite rising school participation rates. Furthermore, high stunting rates and health issues hinder improvements in healthy life expectancy, while natural disasters, pandemics, or social conflicts can disrupt the delivery of education and health services. In addition, poorly targeted public policy implementation reduces the effectiveness of national efforts to enhance human resource quality.

Numerous studies have examined factors influencing the Human Development Index. Ahmad & Resha (2023), Emilia & Hendriana (2021), Ugroseno (2023), Indah et al. (2023), Firly & Anitasari (2025), Agustian (2024), Liza et al. (2020), Yudi Antara & Eka Suryana (2020), Arisman (2018), and Souvik Dey et al. (2024) found that population density has a positive and significant effect on the HDI. Research by Emilia & Hendriana (2021), Anggy Elsa & Misfi (2024), Irpan (2022), Pingkan et al. (2024), Indah et al. (2023), Kasnelly & Jannatin (2021), Hierdawati & Ardy (2024), Bibit Waluyo et al. (2025), Firly & Anitasari (2025), Agustian (2024), Hendri & Irsad Lubis (2023), Kurnia Sari Dewi (2021), Jahtu Widya Ningrum et al. (2020), Novegya Ratih Primandari (2020), Liza et al. (2020), Abd Adim (2021), Faizin (2021), Luky Indriani & Muhammad Arif (2022), and Arisman (2018) examined unemployment as a factor influencing the HDI. Studies by Emilia & Hendriana (2021), Anggy Elsa & Misfi (2024), Irpan (2022), Pingkan et al. (2024), Indah et al. (2023), Kasnelly & Jannatin (2021), Hierdawati & Ardy (2024), Bibit Waluyo et al. (2025), Hendri & Irsad Lubis (2023), Kurnia Sari Dewi (2021), Jahtu Widya Ningrum et al. (2020), Magdalena Laode (2020), Anindya Rahardian Nugraeni (2021), Margareta Larasati et al. (2020), Liza et al. (2020), Luky Indriani & Muhammad Arif (2022), Brian Kipkoech et al. (2025), and Rivo Maulana et al. (2022) identified poverty as a determinant of HDI. Research by Armin et al. (2025), Lisa et al. (2025), Jahtu Widya Ningrum et al. (2020), and Magdalena Laode (2020) examined government

policy—specifically expenditure as a factor affecting HDI. Studies by Alanoud Al-Maadid et al. (2025) and Xinyan Lian et al. (2023) found that investment influences HDI.

Research by Jahtu Widya Ningrum et al. (2020), Magdalena Laode (2020), Anindya Rahardian Nugraeni (2021), Novegya Ratih Primandari (2020), Margareta Larasati et al. (2020), Islamiatus Izzah & Martha Hendarti (2021), Luky Indriani & Muhammad Arif (2022), Arisman (2018), and Daniel Mburamatatare et al. (2025) demonstrated that economic growth affects HDI. Other factors influencing HDI include inflation, labor force participation, dependency ratio, and wage levels, as examined by Anindya Rahardian Nugraeni (2021), Herman (2021), Faizin (2021), Islamiatus Izzah & Martha Hendarti (2021), and Luky Indriani & Muhammad Arif (2022).

From these studies, several factors influencing the Human Development Index have been identified, including population density, population growth, unemployment, poverty, investment, government expenditure policy, inflation, dependency ratio, labor force, and wage levels.

A research gap exists regarding certain variables previously examined as independent variables namely population density, unemployment, poverty, investment, and expenditure index. The expenditure index is a component used to measure household income and expenditure from the household perspective, covering income distribution, income in kind, and received and paid income transfers. As an income- or expenditure-based poverty measurement tool, the expenditure index is not itself an indicator for HDI calculation; rather, per capita expenditure serves as the relevant HDI component. Thus, no existing research has specifically examined the effect of the expenditure index on the Human Development Index.

Based on the above discussion, the Human Development Index in Jambi Province has experienced fluctuations. This is due to factors such as high population density, which can lead to elevated unemployment and poverty rates in a region, thereby reducing public welfare. However, optimal development distribution through expanded investment and improved living standards via increased welfare reflected in the expenditure index can raise incomes and contribute to human development. The higher the quality of human resources in a region, the more effectively regional disparities can be reduced. Given the importance of the expenditure index, population density, poverty, unemployment, and investment on the Human Development Index, this study will be conducted under the title: "Analysis of the Human Development Index in Jambi Province.

2. LITERATURE REVIEW

2.1. Human Development Index Dependent Variable

According to the United Nations Development Programme (UNDP), the level of a region's development index can be described through several factors: longevity and health, assessed from a health perspective; literacy rate, school participation, and average years of schooling to measure development performance from an educational standpoint; and the community's ability to purchase basic necessities to meet daily needs, evaluated based on average per capita expenditure. The index value ranges from 0 to 100. The UNDP's definition of the Human Development Index (HDI), or Indeks Pembangunan Manusia (IPM), states that HDI is one of the approaches used to measure the level of human development. Since 1990, the UNDP has consistently conducted research on the HDI and published an annual series in a publication titled Human Development Report, as an effort to assess a country's human development achievements. Although it does not yet capture all aspects of development, the HDI is considered sufficiently capable of measuring the fundamental dimensions of human development that reflect the basic capability status of the population (UNDP, 2009).

2.2. Independent Variable

2.2.1. Expenditure

The theory of development and government expenditure was also developed by Rostow and Musgrave, who linked government spending to distinct stages of economic development namely the early, intermediate, and advanced stages. In the early stage of economic development, the proportion of investment is substantial, as the government must provide essential infrastructure such as education, healthcare, transportation facilities, and other public services. During the intermediate stage, government investment remains necessary to accelerate economic growth and enable economic take-off; however, the role of private investment gradually expands. In the advanced stage, economic development and government activity shift from infrastructure provision toward expenditures on social programs, such as old-age welfare schemes and public health services (Suparmoko, 2018).

2.2.2. Population Density

Population density is a condition that is said to increase when the number of people in a certain space becomes greater compared to the area of that space (Rahman, 2023). Population density is the comparison between the number of people and the area of land they inhabit (Mantra, 2010). Population density is an indicator of the pressure of the population in an area. Density in an area compared to the land area occupied is expressed by the number of people per square kilometer.

2.2.3. Poverty

Poverty, in general, can be defined as a condition in which individuals, households, or families are unable to adequately meet their basic living needs. However, various institutions and stakeholders have established specific criteria for determining who qualifies as poor (Kuncoro, 2014). Broadly speaking, the occurrence of poverty is caused by both external and internal factors affecting the population. Based on its causes, poverty can be classified into two types: absolute poverty and structural poverty. Absolute poverty refers to poverty resulting from internal factors within the population itself—such as low educational attainment, limited skills, cultural practices, and similar constraints. Structural poverty, on the other hand, arises from external factors, particularly limited access to economic resources, which in turn leads to low household income (Kuncoro, 2014).

2.2.4. Unemployment

According to Statistics Indonesia (Badan Pusat Statistik/BPS, 2022), within labor force indicators, unemployment refers to individuals who are currently not working but are actively seeking employment or preparing to start a new business, as well as those who have already been accepted for a job but have not yet commenced work. Based on BPS definitions, open unemployment (*pengangguran terbuka*) is measured using the concept of the entire labor force seeking employment whether seeking their first job or having previously been employed. Workers classified as underemployed (*setengah penganggur*) include those still seeking full-time or additional part-time work, as well as individuals working fewer hours than desired. Voluntary underemployment refers to underemployed workers who are not actively seeking additional work or are unwilling to accept other employment opportunities. Involuntary underemployment applies to underemployed individuals who continue to seek additional work or are willing to accept other employment. Workers are categorized as severely underemployed (*setengah penganggur parah*) if they fall under the underemployment category and work fewer than 25 hours per week.

2.2.5. Investment

According to (Dumairy, 2014), investment is the addition of capital goods in a net positive manner. A person who purchases capital goods but for the purpose of replacing capital goods that must be in the production process is not considered an investment, but is called a replacement purchase of capital goods. This purchase of capital goods constitutes investment for the future. Investment is expenditure aimed at increasing or maintaining the stock of capital

goods. The stock of capital goods consists of factories, machines, offices, and other durable products used in the production process. Capital goods also include residential housing and inventories. Investment is expenditure added to these components of capital goods according to Dornbush and Fischer in (Dumairy, 2014).

3. METHODOLOGY

Data analysis was conducted using quantitative descriptive analysis. The analysis period was from 2018 to 2024. The research objects were the regencies and cities in Jambi Province. The analytical tool used was panel data regression. To identify and analyze the effects of expenditure index, population density, poverty, unemployment, and investment on the Human Development Index of regencies and cities in Jambi Province during the 2018-2024 period, the panel data regression equation is as follows:

$$HDI_{it} = \beta_0 + \beta_1 EI_{it} + \beta_2 PD_{it} + \beta_3 PR_{it} + \beta_4 UER_{it} + \beta_5 INV_{it} + e_{it}$$

Description:

- HDI : Human Development Index (Index)
- EI : Expenditure Index (Index)
- PD : Population Density (People/Km²)
- PR : Poverty Rate (%)
- UER : Open Unemployment Rate (%)
- INV : Investment (Rp)
- β_0 : Constant
- $\beta_1 - \beta_5$: Regression Coefficients
- i : Cross-section data of 11 regencies and cities in Jambi Province
- t : Time Series (2018 – 2024)
- e : error term (Residual Error)

The first hypothesis test conducted is the F-statistic test, which is essentially used to show whether all the independent variables included in the model collectively have an effect on the dependent variable (Damodar, 2015). The second is the t-statistic test, which is used to test the significance level of each coefficient of each regression using the t-test (Damodar, 2015). Furthermore, it is also carried out to observe the coefficient of determination, which measures how well the model can explain the variation of the dependent variables. The value of this coefficient ranges from zero (0) to one (1). The higher the value of the coefficient, the more capable the independent variables are in explaining the variation in the dependent variables.

4. FINDINGS AND DISCUSSION

The aim is to understand and analyze the influence of expenditure index, population density, poverty, unemployment, and investment on the human development index in regencies and cities in Jambi Province using panel data regression calculations with time series data through annual data for the period 2018-2024, while the cross-section refers to the data objects, namely 11 regencies and cities in Jambi Province, consisting of Batang Hari, Bungo, Merangin, Muaro Jambi, Sarolangun, West Tanjung Jabung, East Tanjung Jabung, Tebo, and Kerinci regencies, as well as Jambi City and Sungai Penuh. Based on the model selection test, the FEM model was chosen as the best and used to analyze the data.

Table 1
Estimation Results of the Fixed Effect Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	13.83752	3.683712	3.756408	0.0004
EI?	0.822061	0.045502	18.06665	0.0000
PD?	0.001088	0.000359	3.027353	0.0036
PR?	-0.336243	0.110630	-3.039362	0.0035

UER?	0.074676	0.048795	1.530421	0.1311
INV?	-1.27E-14	1.34E-13	-0.094909	0.9247
Fixed Effects (Cross)				
BTH--C	1.331098			
BNG--C	-3.793416			
MRN--C	-0.384283			
MJ--C	2.090192			
SRN--C	-3.003971			
TJB--C	0.573617			
TJT--C	-1.071129			
TB--C	-1.362113			
KJ--C	0.849406			
KSP--C	3.387302			
KCI--C	1.383296			
Effects Specification				
Cross-section fixed (dummy variables)				
Root MSE	0.277171	R-squared	0.994254	
Mean dependent var	70.99675	Adjusted R-squared	0.992841	
S.D. dependent var	3.680352	S.E. of regression	0.311407	
Akaike info criterion	0.687218	Sum squared resid	5.915415	
Schwarz criterion	1.174242	Log likelihood	-10.45788	
Hannan-Quinn criter.	0.882023	F-statistic	703.6275	
Durbin-Watson stat	1.755056	Prob(F-statistic)	0.000000	

Source: Processed Data, 2026

By using the FEM model, the estimation results are obtained according to Table 1, which shows the panel data regression results with the following equation:

$$\text{HDI} = 13,83752 + 0,822061 \text{ EI} + 0,001088 \text{ PD} - 0,336243 \text{ PR} + 0,074676 \text{ UER} - 0,0000127 \text{ INV}$$

Based on the fixed effects model estimation results, when variations occur among the variables expenditure index, population density, poverty rate, unemployment rate, and investment across regencies/cities and over the period 2018–2024, the constant term is 13.83752. This indicates that if all independent variables (expenditure index, population density, poverty, unemployment, and investment) are held at zero, the Human Development Index (HDI) is expected to be 13.83752. Below is the interpretation of the regression coefficients:

The coefficient for the expenditure index is 0.822061, meaning that a one percent increase in the expenditure index is associated with a 0.822061 percent increase in the HDI, *ceteris paribus*. The coefficient for population density is 0.001088, indicating that a one percent increase in population density is associated with a 0.001088 percent increase in the HDI, *ceteris paribus*. The coefficient for the poverty rate is –0.336243, implying that a one percent increase in the poverty rate is associated with a 0.336243 percent decrease in the HDI, *ceteris paribus*. The coefficient for the unemployment rate is 0.074676, suggesting that a one percent increase in the unemployment rate is associated with a 0.074676 percent increase in the HDI, *ceteris paribus*. The coefficient for investment is –0.0000127, indicating that a one percent increase in investment is associated with a 0.0000127 percent decrease in the HDI, *ceteris paribus*.

F-statistic Test

The test of the simultaneous influence of independent variables on the dependent variable is carried out using the F-Statistic Test. If the Prob (F-statistic) value is smaller than $\alpha = 0.05$ with a 95 percent significance level. According to the FEM output results shown in Table 1, all independent variables, namely expenditure index, population density, poverty, unemployment, and investment, simultaneously affect the human development index significantly, because the significance value is $0.000000 < 0.05$, which means H_0 is rejected and H_1 is accepted.

t-statistic Test

The t-test is used to examine the individual influence of independent variables on the dependent variable. The t-statistic

test is conducted by comparing the probability value (Prob.) of the t-statistic with $\alpha = 0.05$ at a 95 percent confidence level. Based on the Fixed Effects Model (FEM) output presented in Table 1, the probability values for the expenditure index variable is 0.0000, for population density is 0.0036, and for the poverty rate is 0.0035. Since each of these probability values is smaller than $\alpha = 0.05$, the expenditure index, population density, and poverty rate variables have a statistically significant effect on the Human Development Index (HDI) across regencies and cities in Jambi Province during the 2018–2024 period. In contrast, the unemployment rate variable has a probability value of 0.1311, and the investment variable has a probability value of 0.9247. As these values exceed $\alpha = 0.05$, both the unemployment rate and investment variables do not have a statistically significant effect on the Human Development Index in regencies and cities of Jambi Province for the 2018–2024 period.

Coefficient of Determination (R^2)

From the results of testing the FEM output in Table 1, a coefficient of determination (R^2) value of 0.994254 was obtained, meaning that 99.42 percent of the human development index in Regencies and Cities in Jambi Province for the period 2018–2024 is explained by the variables of expenditure index, population density, poverty, unemployment, and investment, while the remaining 0.58 percent is explained by other variables not included in this study.

Fixed Effect Model Intercept

Based on Table 1, the intercept values derived from the Fixed Effects Model (FEM) estimation indicate region-specific deviations in the Human Development Index (HDI) for each regency and city in Jambi Province over the 2018–2024 period, after controlling for the variables expenditure index, population density, poverty rate, unemployment rate, and investment. These fixed effect coefficients represent the time-invariant, entity-specific differences relative to the overall model intercept. The estimated fixed effects for each region are as follows: Batang Hari Regency: HDI is 1.331098 percentage points higher than the baseline. Bungo Regency: HDI is 3.793416 percentage points lower than the baseline. Merangin Regency: HDI is 0.384283 percentage points lower than the baseline. Muaro Jambi Regency: HDI is 2.090192 percentage points higher than the baseline. Sarolangun Regency: HDI is 3.003971 percentage points lower than the baseline. West Tanjung Jabung Regency: HDI is 0.573617 percentage points higher than the baseline. East Tanjung Jabung Regency: HDI is 1.071129 percentage points lower than the baseline. Tebo Regency: HDI is 1.362113 percentage points lower than the baseline. Jambi City: HDI is 0.849406 percentage points higher than the baseline. Sungai Penuh City: HDI is 3.387302 percentage points higher than the baseline. Kerinci Regency: HDI is 1.383296 percentage points higher than the baseline.

These fixed effect values reflect each region's inherent, time-constant characteristics that influence HDI beyond the observed variables such as geographic conditions, historical development paths, institutional quality, or unobserved socio-cultural factors. They do not represent year-to-year changes but rather baseline differences across regions within the panel data framework.

5. CONCLUSION

The results of the panel data regression show that the simultaneous test indicates that the variables of expenditure index, population density, poverty rate, unemployment rate, and investment collectively influence the human development index in the Regencies and Cities in Jambi Province during 2018-2024. Meanwhile, in the partial test, the variables of expenditure index, population density, and poverty rate affect the human development index in the Regencies and Cities in Jambi Province during 2018-2024, whereas the unemployment rate and investment do not affect the human development index in the Regencies and Cities in Jambi Province during 2018-2024.

The suggestion in the study is that the government should strive for equitable development between regions in Jambi Province by making it a priority in sustainable development through strategic steps that can be strengthened, such as investment incentives, job training, and improving access to basic services such as education and health. It is expected that the government can implement relevant development policies and strategies to improve the Human Development Index in the Regencies and Cities of Jambi Province by increasing the community's purchasing power through targeted social protection programs, improving the efficiency of public services such as transportation, education, and health so

that population growth does not reduce the quality of services, and expanding multidimensional poverty alleviation programs, which not only focus on income but also access to education, health, and sanitation.

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7. CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in the paper.

8. AUTHOR CONTRIBUTION STATEMENT

*Author's Lesly Ghina Devina*¹- contributed to the conceptualization, research design, and writing of the original draft.

*Author's Syamsurijal Tan*²- was responsible for data collection, analysis, and validation of the results.

*Author's Etik Umiyati*³- provided supervision, critical review, and editing of the final manuscript.

All authors have read and approved the final version of the manuscript.

9. ETHICS STATEMENT

This research was conducted in accordance with the ethical standards of **Jambi University** and adhered to the principles outlined in the Declaration of Helsinki. All participants were informed about the purpose of the study and provided written informed consent prior to participation. Participants' privacy and confidentiality were strictly maintained, and data collected were used solely for academic purposes.

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