

The Effect of Government Capital Expenditure, Dependency Ratio, and the Number of Poor Population on the Human Development Index in North Sumatra Province, 2000–2024

Rohani Sijabat

Faculty of Economics and Business, Universitas HKBP Nommensen Medan

rohani.sijabat@student.uhn.ac.id

Elvis F. Purba

Faculty of Economics and Business, Universitas HKBP Nommensen Medan

Martin Luter Purba

Faculty of Economics and Business, Universitas HKBP Nommensen Medan

Abstract

This study analyzes the effect of government capital expenditure, the dependency ratio, and the number of poor population on the Human Development Index (HDI) in North Sumatra Province over the period 2000–2024. The HDI is used as an indicator of the population's quality of life, covering the dimensions of health, education, and a decent standard of living. Using a quantitative approach, the study relies on secondary time-series data published by the Central Bureau of Statistics (Badan Pusat Statistik, BPS) of North Sumatra Province and applies multiple linear regression to examine the relationship between the independent variables and HDI. The results show that government capital expenditure has a positive but not statistically significant effect on HDI, while the dependency ratio and the number of poor population each have a negative and statistically significant effect. Jointly, the three variables explain approximately 83.3% of the variation in HDI ($R^2 = 0.8328$) and are together statistically significant ($F = 28.228$; $p < 0.01$). These findings indicate that a high dependency burden and a high incidence of poverty are the main obstacles to human development in North Sumatra, whereas the effectiveness of capital spending — not merely its magnitude — determines its contribution to human development outcomes. The study recommends integrated policy measures that improve the targeting of capital expenditure, reduce the dependency burden through productive employment and skills development, and accelerate poverty reduction, in order to promote sustainable human development in North Sumatra Province.

Keywords: *Human Development Index; Government Capital Expenditure; Dependency Ratio; Number of Poor Population; Multiple Linear Regression; North Sumatra*

1. Introduction

Development is central to a nation's progress, understood as a continuous process of positive transformation that is prioritized according to society's most pressing needs. The Human Development Index (HDI) reflects the level of development achievement across several fundamental dimensions of quality of life and serves as an instrument for classifying a country as developing or developed, as well as for evaluating how economic policy affects people's welfare (Badan Pusat Statistik, 2020). Since 2010, the HDI methodology introduced by UNDP has combined life expectancy, expected years of schooling, mean years of schooling, and gross national income per capita, reflecting the view that development

success cannot be measured by economic growth alone and must instead capture the quality of human resources (Fridarahma, 2015).

Todaro and Smith (2006), as cited in Rossianna (2021), argue that successful development is determined by the fulfilment of several fundamental aspects — sufficiency, self-esteem, and freedom — which constitute the basic goals of every society. In this view, human development is the primary yardstick of a nation's progress, rather than Gross Domestic Product alone. At the regional level, government capital expenditure is one of the principal instruments through which local governments pursue this goal: it represents an investment in durable public assets — schools, roads, and health facilities — whose benefits are felt over the long term (Halim, 2002, as cited in Setiawan & Budiana, 2015). In North Sumatra Province, the success of development is reflected not only in aggregate economic growth but also in the availability of such public facilities for the population.

Beyond capital spending, the population's age structure also shapes development outcomes. The dependency ratio — the proportion of the non-productive-age population (under 15 and 65 years or older) relative to the productive-age population (15–64 years) — determines how heavy a burden the productive-age population must bear. A higher dependency ratio implies a greater burden on the productive population and can therefore constrain HDI achievement (Kuncoro, 2010, as cited in Rossianna, 2021). Likewise, poverty, being multidimensional in nature, restricts people's access to education, health services, and other basic needs, and is consistently identified in the literature as a constraint on human development (Purba, 2015).

Between 2000 and 2024, North Sumatra's HDI rose from 61.77 to 75.76, moving the province from the “medium” to the “high” HDI category. Over the same period, government capital expenditure fluctuated considerably — rising from around IDR 1.07 trillion in 2000 to a peak of IDR 9.79 trillion in 2016, before falling back to the range of IDR 1.1–2.0 trillion after the 2017 change in regional budget classification. The dependency ratio declined from 63.0% in 2000 to below 49% in recent years, while the number of poor population fell from a peak of about 1.98 million people in 2006 to approximately 1.11 million in 2024, despite intermittent increases in certain years. Although the general trend in HDI is positive, its trajectory does not always move in tandem with capital expenditure, the dependency ratio, or the poverty rate, which continue to fluctuate. This inconsistency raises questions about the actual strength and direction of the relationship between these variables and motivates a more rigorous empirical investigation.

The existing literature on this topic remains fragmented: most studies examine government spending, demographic structure, or poverty in isolation rather than jointly, and empirical evidence specific to North Sumatra Province covering the full 2000–2024 period is still limited. This study addresses that gap by jointly analyzing the effect of government capital expenditure, the dependency ratio, and the number of poor population on HDI in North Sumatra Province. Specifically, the study aims to: (1) examine the effect of government capital expenditure on HDI; (2) examine the effect of the dependency ratio on HDI; and (3) examine the effect of the number of poor population on HDI in North Sumatra Province during 2000–2024.

2. Literature Review

2.1 The Human Development Index

The concept of human development was introduced by UNDP in 1990 as a process of expanding people's choices, placing individuals at the center of development rather than treating them merely as instruments of production (UNDP, 1995, as cited in Rossianna, 2021). Since 2010, HDI has been constructed from three dimensions — a long and healthy life (life expectancy), knowledge (expected and mean years of schooling), and a decent standard of living (gross national income per capita) — each of which is normalized before being combined using a geometric mean (BPS, 2015, as cited in Fridarahma, 2015). Based on its value, HDI is conventionally classified as low (< 60), medium (60–70), high (70–80), or very high (> 80).

2.2 Government Capital Expenditure

Government expenditure is a component of aggregate demand in the national income identity $Y = C + I + G + (X - M)$, where G represents government spending. Capital expenditure specifically refers to spending directed at building infrastructure to meet public needs; because it produces long-lived physical assets that increase a region's net worth, it is often labelled "development expenditure" (Mirza, 2012). Its distinguishing characteristics are that it is tangible, increases regional assets, provides benefits beyond one accounting period, and is relatively large in value (Ibnu, 2021).

2.3 Dependency Ratio

The dependency ratio measures the number of non-productive-age residents (below 15 and 65 years and above) relative to the productive-age population (15–64 years), and is computed as $RK = [P(0-14) + P(65+)] / P(15-64) \times 100$. It serves both as a demographic indicator, showing the burden borne by the productive-age population, and as a broader indicator of a country's stage of development (Purba, 2015).

2.4 Poverty

Poverty is multidimensional, encompassing limited asset ownership, weak social and political organization, and restricted access to knowledge, financial resources, and information (Sitio, 2019). Population growth theory in the Malthusian tradition suggests that when population grows faster than the availability of resources, and productivity in the production sector remains low, poverty becomes difficult to avoid; conventionally, poverty is distinguished into absolute, relative, and structural poverty (Purba, 2015).

2.5 Relationships Between the Research Variables

Government Capital Expenditure and HDI

Capital expenditure is closely linked to improvements in infrastructure, education, and health services — the very components that constitute HDI. Greater investment in development projects can expand employment opportunities and raise household income, which in turn lowers the dependency burden and supports higher HDI (Aulia, 2020; Komariah, Yogiantoro & Hukom, 2019).

Dependency Ratio and HDI

A higher dependency ratio implies a heavier burden on the productive-age population, diverting resources toward consumption rather than investment in human capital, and is therefore expected to reduce HDI. Regions with a lower dependency ratio — that is, those benefiting from a demographic dividend — tend to record higher HDI because more resources can be channeled into education, health and productive investment (Setiawan & Budiana, 2015).

Number of Poor Population and HDI

New growth theory emphasizes the government's role in building human capital through education and research to raise productivity; conversely, a large poor population reflects low productivity and restricted access to education and health services, both of which constrain HDI (Sitio, 2019). Empirically, a larger poor population is consistently associated with lower HDI (Indiati, Wijaya & Putra, 2021; Girindraningrum, 2024).

2.6 Prior Research

Table 1 summarizes several prior studies that examine similar variables in different regions and periods, which inform the hypotheses developed in this study.

Table 1. Summary of Prior Research

Author (Year)	Focus / Method	Key Findings
Rossianna (2021)	Government expenditure, dependency ratio and poverty on HDI in the Special Region of	Education expenditure had a positive and significant effect on HDI; health expenditure had a negative and significant effect; the dependency ratio and poverty each had a negative and significant effect on HDI.

Author (Year)	Focus / Method	Key Findings
	Yogyakarta, 2012–2019; multiple linear regression, secondary data.	
Nugraeni & Aji (2021)	Poverty, economic growth and dependency ratio on HDI in East Java, 2014–2019; panel data regression.	Poverty had a negative effect on HDI, while economic growth showed a positive relationship with HDI.
Mirza (2012)	Poverty, economic growth and capital expenditure on HDI in Central Java, 2006–2009; multiple linear regression.	Poverty had a negative and significant effect on HDI, while economic growth and capital expenditure each had a positive and significant effect on HDI.
Umiyati, Amril & Zulfanetti (2013)	Capital expenditure, economic growth and number of poor population on HDI across districts/cities in Jambi Province, 2009–2013; panel data.	Capital expenditure had a positive and significant effect on HDI; economic growth was not significant; the number of poor population had a negative and significant effect on HDI.
Komariah, Yogiartoro & Hukom (2019)	Capital expenditure and economic growth on HDI in Kotawaringin Timur Regency, 2009–2017; multiple linear regression.	Capital expenditure had no significant effect on HDI, whereas economic growth had a positive and significant effect on HDI.

Source: compiled by the authors from the cited studies.

2.7 Conceptual Framework

Building on the theoretical review and prior findings above, this study proposes that government capital expenditure (X_1), the dependency ratio (X_2), and the number of poor population (X_3) jointly and individually influence the Human Development Index (Y) in North Sumatra Province. Capital expenditure is hypothesized to relate positively to HDI, while the dependency ratio and the number of poor population are hypothesized to relate negatively to HDI.

2.8 Hypotheses

Based on the conceptual framework, the following hypotheses are proposed:

H1: Government capital expenditure has a positive effect on the Human Development Index in North Sumatra Province, 2000–2024.

H2: The dependency ratio has a negative and significant effect on the Human Development Index in North Sumatra Province, 2000–2024.

H3: The number of poor population has a negative and significant effect on the Human Development Index in North Sumatra Province, 2000–2024.

3. Research Methods

3.1 Scope, Data, and Sources

This study focuses on North Sumatra Province and covers the period 2000–2024. It uses secondary annual time-series data published by the Central Bureau of Statistics (BPS) of North Sumatra Province, comprising government capital expenditure, the dependency ratio, the number of poor population, and the Human Development Index. Because HDI has been calculated using two different methodologies

(the pre-2010 and post-2010 UNDP methods), HDI values for 2000–2011 were converted to the new-method basis to ensure comparability across the full study period.

3.2 Data Analysis Method

The relationship between the independent variables and HDI is estimated using multiple linear regression, following the equation:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \varepsilon_i$$

where Y is the Human Development Index; X_1 is government capital expenditure (billion IDR); X_2 is the dependency ratio (%); X_3 is the number of poor population (thousand people); β_0 is the constant; β_1 – β_3 are the regression coefficients; and ε is the error term. Estimation was carried out in EViews 12.

3.3 Classical Assumption Tests

Prior to interpreting the regression results, the model was checked against the classical assumptions required for Ordinary Least Squares to yield the Best Linear Unbiased Estimator (BLUE). Normality of the residuals was tested using the Jarque-Bera test, where a probability value greater than 0.05 indicates normally distributed residuals. Multicollinearity was assessed using the Variance Inflation Factor (VIF), with a value below 10 indicating the absence of problematic multicollinearity among the independent variables. Autocorrelation was tested using the Durbin-Watson (DW) statistic, where the model is considered free of autocorrelation if $dU < DW < (4 - dU)$.

3.4 Goodness of Fit, F-test, and t-test

The coefficient of determination (R^2) was used to assess how much of the variation in HDI is explained jointly by the independent variables. The F-test was used to determine whether the independent variables jointly and significantly affect HDI, while the t-test was used to determine the significance of each independent variable's effect individually, at a significance level of $\alpha = 0.05$.

3.5 Operational Definition of Variables

Government Capital Expenditure (X_1) is the realization of regional government spending directed at acquiring fixed assets with a useful life beyond one year, measured in billion IDR.

Dependency Ratio (X_2) is the ratio of the non-productive-age population (below 15 and 65 years or above) to the productive-age population (15–64 years), expressed as a percentage.

Number of Poor Population (X_3) is the number of residents classified as poor by BPS based on the provincial poverty line, measured in thousand people.

Human Development Index (Y) is the composite index of life expectancy, education, and standard-of-living dimensions, as published by BPS.

4. Result and Discussion

4.1 Descriptive Overview

During 2000–2024, North Sumatra's HDI rose steadily overall, from 61.77 in 2000 to 75.76 in 2024, moving the province from the “medium” into the “high” human development category, notwithstanding a temporary dip around 2012 that coincided with a change in the regional budget classification system. Government capital expenditure grew from about IDR 1.07 trillion in 2000 to a peak of IDR 9.79 trillion in 2016 before contracting sharply after 2017 following a reclassification of regional expenditure items, and has since fluctuated between roughly IDR 1.1 and 2.0 trillion. The dependency ratio declined from a high of 63.0% in 2000 to below 49% by 2024, reflecting a more favorable population age structure, although it fluctuated within that broader downward trend. The number of poor population, after peaking at approximately 1.98 million people in 2006, fell to approximately 1.11 million by 2024, indicating overall progress in poverty reduction despite occasional year-to-year increases.

Taken together, these trends suggest a complex relationship among the variables: rising HDI has generally coincided with higher capital expenditure and a falling dependency ratio, but has not always mirrored short-term fluctuations in capital spending, indicating that the effectiveness — not merely the level — of public spending, together with demographic and poverty conditions, jointly shapes human

development outcomes. This descriptive pattern motivates the multiple regression analysis presented below.

4.2 Multiple Linear Regression Results

The regression model was estimated using 25 annual observations (2000–2024). The estimated equation is:

$$Y = 92.130 + 0.0000827 X_1 - 0.218590 X_2 - 0.007841 X_3$$

Table 2. Multiple Linear Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.	VIF
Constant (C)	92.13041	2.819216	32.67945	0.0000	–
Government Capital Expenditure (X_1)	0.0000827	0.0000858	0.964311	0.3484	1.027
Dependency Ratio (X_2)	-0.218590	0.050272	-4.348133	0.0004	1.093
Number of Poor Population (X_3)	-0.007841	0.001252	-6.261748	0.0000	1.119

Source: EViews 12 output, processed by the authors.

Table 3. Model Diagnostics

R-squared	0.832817	F-statistic	28.22837
Adjusted R-squared	0.803314	Prob(F-statistic)	0.000001
Durbin-Watson stat.	1.837202	Jarque-Bera (normality)	0.705697

Source: EViews 12 output, processed by the authors.

The positive constant of 92.130 indicates the predicted HDI value when government capital expenditure, the dependency ratio, and the number of poor population are all held at zero. The coefficient on capital expenditure (0.0000827) indicates that, holding other variables constant, a one-billion-rupiah increase in capital spending is associated with a 0.0000827-point increase in HDI, though the effect is not statistically significant ($p = 0.3484$). The coefficient on the dependency ratio (-0.218590 , $p = 0.0004$) indicates that a one-percentage-point increase in the dependency ratio is associated with a 0.219-point decrease in HDI, holding other variables constant. The coefficient on the number of poor population (-0.007841 , $p < 0.0001$) indicates that an increase of one thousand poor people is associated with a 0.0078-point decrease in HDI, holding other variables constant.

4.3 Classical Assumption Test Results

The Jarque-Bera normality test yields a statistic of 0.7057, well above the 0.05 significance threshold, indicating that the regression residuals are normally distributed. The VIF values for X_1 , X_2 and X_3 (1.027, 1.093 and 1.119 respectively) are all far below the conventional threshold of 10, indicating that multicollinearity among the independent variables is not a concern. The Durbin-Watson statistic of 1.837 falls between the critical values $dU = 1.7666$ and $(4 - dU) = 2.2334$, indicating that the model is free of autocorrelation. Overall, the model satisfies the classical assumptions required for reliable OLS inference.

4.4 Goodness of Fit, F-test, and t-test

The model's R^2 of 0.8328 (Adjusted $R^2 = 0.8033$) indicates that government capital expenditure, the dependency ratio, and the number of poor population jointly explain approximately 83.3% of the variation in HDI in North Sumatra Province, with the remaining variation attributable to factors outside the model. The F-statistic of 28.228 (Prob = 0.000001 < 0.05) indicates that the three independent variables jointly have a statistically significant effect on HDI. At the individual level, the t-test results ($\alpha = 0.05$, t-table = 2.060) show that capital expenditure is not statistically significant ($t = 0.964 < 2.060$),

while the dependency ratio ($t = -4.348$) and the number of poor population ($t = -6.262$) are each statistically significant, consistent with the regression coefficients reported in Table 2.

4.5 Discussion

The Effect of Government Capital Expenditure on HDI

Government capital expenditure is found to have a positive but statistically insignificant effect on HDI in North Sumatra Province, a result that departs from theoretical expectations and is best explained by the considerable year-to-year fluctuation in capital spending over the study period, particularly the sharp contraction after the 2017 reclassification of regional budgets. This finding echoes Komariah, Yogiantoro and Hukom (2019), who likewise found that capital expenditure had no significant effect on HDI in Kotawaringin Timur Regency (2009–2017), attributing this to a declining trend in capital spending even as HDI continued to rise — suggesting that the availability of capital expenditure alone does not guarantee improvements in public services such as education, health, and the economy. In contrast, Mirza (2012) found capital expenditure to have a positive and significant effect on HDI in Central Java, attributing the difference to budget allocations that were more consistently targeted at education, health, and economic activity. Together, these findings suggest that the effectiveness and targeting of capital spending — not merely its magnitude — determine its contribution to human development, consistent with Aulia (2020), who found that government spending on education meaningfully raised HDI in Indonesia through improvements in human resource quality.

The Effect of Dependency Ratio on HDI

The dependency ratio is found to have a negative and statistically significant effect on HDI, consistent with the study's hypothesis. This result aligns with Hidayat and Woyanti (2021), who similarly found a negative and significant relationship between the dependency ratio and HDI in Indonesia. As the dependency ratio rises, the burden borne by the productive-age population in supporting the non-productive-age population increases, which constrains the resources available for improving welfare (Bhakti, Sari & Pratama, 2012). Conversely, a lower dependency ratio — reflecting a more favorable demographic structure — eases this burden and creates room for higher welfare. Setiawan and Budiana (2015) similarly found that regions with a high dependency ratio tend to record lower HDI than regions benefiting from a demographic dividend, owing to the greater economic burden imposed by a large non-productive-age population.

The Effect of Number of Poor Population on HDI

The number of poor population is found to have a negative and statistically significant effect on HDI, indicating that an increase in the poor population tends to be followed by a decline in HDI. This result confirms that poverty is a key constraint on improving quality of life, particularly with respect to education, health, and standard of living, and is consistent with Saputro (2022), who found that the poverty rate had a negative and significant effect on HDI in East Java Province. Limited economic capacity restricts households' access to adequate education and health services, which in turn depresses HDI (Indiati, Wijaya & Putra, 2021). A large poor population reduces people's opportunities to obtain higher education, adequate health care, and a decent standard of living, thereby systematically lowering HDI (Girindraningrum, 2024).

5. Conclusion

This study analyzed the effect of government capital expenditure, the dependency ratio, and the number of poor population on the Human Development Index in North Sumatra Province during 2000–2024 using multiple linear regression. Four main conclusions can be drawn. First, government capital expenditure has a positive but not yet statistically significant effect on HDI in North Sumatra Province, indicating that increases in capital spending have not consistently translated into measurable improvements in human development, most likely owing to fluctuations in the volume and targeting of that spending. Second, the dependency ratio has a negative and significant effect on HDI: a higher dependency burden on the productive-age population constrains welfare improvement and, in turn,

depresses human development outcomes. Third, the number of poor population has a negative and significant effect on HDI, as a high incidence of poverty restricts access to education, health services, and other basic needs, thereby lowering HDI directly. Fourth, jointly, all three variables significantly affect HDI ($R^2 = 0.833$), confirming that human development in North Sumatra Province is shaped not only by government spending policy but also by the social and demographic conditions of the population.

Based on these findings, four policy implications are proposed. First, local government should improve the targeting and effectiveness of capital expenditure, prioritizing allocations toward sectors with a direct bearing on human development — education, health, and basic infrastructure — rather than focusing on the magnitude of spending alone. Second, the government should manage the population's age structure by expanding productive employment, skills training, and educational quality for the working-age population, so as to reduce the dependency burden over time. Third, poverty-reduction efforts should be accelerated through more targeted economic empowerment, wider access to education, and improved health services, implemented as part of a sustained, long-term strategy. Fourth, regional spending policy, poverty-alleviation programs, and employment policy should be integrated and mutually reinforcing, so that each policy instrument contributes coherently to raising the Human Development Index in North Sumatra Province.

6. References

- Aulia, M. (2020). Pengaruh pengeluaran pemerintah pada sektor pendidikan terhadap Human Development Index (HDI) di Indonesia.
- Badan Pusat Statistik Provinsi Sumatera Utara. (2016). Statistik keuangan pemerintah daerah Sumatera Utara 2014–2015. <https://sumut.bps.go.id>
- Bhakti, A., Sari, D. P., & Pratama, R. (2012). Pengaruh rasio ketergantungan terhadap kesejahteraan penduduk di Indonesia. *Jurnal Kependudukan Indonesia*, 7(1), 15–28.
- Fridarahma, C. G. (2015). Metode baru dalam perhitungan IPM [Web presentation]. SlideShare.
- Girindraningrum, R. A. A. T. P. I. F. (2024). Pengaruh indeks pembangunan manusia, tingkat partisipasi angkatan kerja perempuan, dan pekerja profesional perempuan terhadap jumlah penduduk miskin di 10 provinsi Indonesia tahun 2019–2024 [Undergraduate thesis, Universitas Muhammadiyah Surakarta]. <https://eprints.ums.ac.id/146039/>
- Hidayat, S., & Woyanti, N. (2021). Pengaruh PDRB per kapita, belanja daerah, rasio ketergantungan, kemiskinan, dan teknologi terhadap IPM di Indonesia. *Jurnal Ekonomi, Bisnis dan Akuntansi (JEBA)*, 23(4), 122–137.
- Ibnu. (2021). Belanja modal adalah: pengertian, jenis, dan cara menghitungnya. [Accurate.id](https://www.accurate.id).
- Indiati, S., Wijaya, R., & Putra, A. (2021). Pengaruh kemiskinan terhadap indeks pembangunan manusia di Indonesia. *Jurnal Ekonomi Pembangunan*, 22(2), 89–105.
- Komariah, D., Yogiantoro, M., & Hukom, A. (2019). Pengaruh belanja modal dan pertumbuhan ekonomi terhadap indeks pembangunan manusia. *Jurnal Riset Manajemen dan Bisnis (JRMB)*, 4(1), 523–532.
- Mirza, D. S. (2012). *Economics Development Analysis Journal*, 1(1).
- Nugraeni, A. R., & Aji, T. S. (2021). Pengaruh kemiskinan, pertumbuhan ekonomi, dan rasio ketergantungan terhadap indeks pembangunan manusia di Jawa Timur. *Independent: Journal of Economics*, 1(2), 1–15.
- Purba, E. F. (2015). *Ekonomi Indonesia*. Universitas HKBP Nommensen Medan.
- Rahadian, L. (2020). IPM Indonesia tumbuh tinggi namun belum merata. [Lokadata.id](https://www.lokadata.id).
- Rossianna, W. M. (2021). Analisis pengaruh belanja pemerintah, ratio ketergantungan dan kemiskinan terhadap indeks pembangunan manusia di Daerah Istimewa Yogyakarta [Undergraduate thesis, Universitas Pembangunan Nasional Veteran Yogyakarta].
- Saputro, A. (2022). Pengaruh tingkat kemiskinan terhadap indeks pembangunan manusia di Provinsi Jawa Timur tahun 2017–2021 [Undergraduate thesis, Universitas Airlangga].

- Setiawan, G., & Budiana, D. N. K. P. (2015). Pengaruh belanja modal terhadap indeks pembangunan manusia melalui pertumbuhan ekonomi sebagai variabel intervening Provinsi Bali. *E-Jurnal Ekonomi Pembangunan*.
- Sitio, F. S. (2019). Analisis pengaruh indeks pembangunan manusia, pengeluaran, inflasi, dan pertumbuhan ekonomi terhadap jumlah penduduk miskin di Indonesia [Undergraduate thesis, Universitas HKBP Nommensen Medan].
- Badan Pusat Statistik. (2020). Indeks Pembangunan Manusia 2019.
- Badan Pusat Statistik. (2020). Indikator kesejahteraan rakyat Provinsi Sumatera Utara.
- Todaro, M. P., & Smith, S. C. (2006). *Economic development* (9th ed.). Pearson Education.
- Umiyati, E., Amril, & Zulfanetti. (2013). Pengaruh belanja modal, pertumbuhan ekonomi dan jumlah penduduk miskin terhadap indeks pembangunan manusia di kabupaten/kota Provinsi Jambi. *Jurnal Sains Sosiohumaniora*, 29–37.