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The Effect of Life Expectancy, Average Years of Schooling, and Total Labor Force on Gross Regional Domestic Product of Yogyakarta Special Region (2017-2023)

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ABSTRACT
This study aims to analyze the impact of life expectancy, average years of schooling, and labour force on the Gross Regional Domestic Product (GRDP). This research utilizes secondary data, including GRDP at constant prices, Life Expectancy (LE), Average Years of Schooling (AYS), and Labor Force in the Regencies/Cities of the Special Region of Yogyakarta from 2017 to 2023, as published on the bps.go.id website. The study employs a sample of five regencies/cities from 2017–2023. The analysis method used in this research is panel data regression analysis, conducted using Stata 17 software. The findings indicate that life expectancy, average years of schooling, and the labor force positively and significantly influence the Gross Regional Domestic Product (GRDP) in the Regencies/Cities of the Special Region of Yogyakarta from 2017 to 2023.

Keywords: *Life Expectancy, Average Years of Schooling, Labor Force, Gross Regional Domestic Product, Panel Data Regression*

INTRODUCTION

One standard measure used to assess regional economic performance is Gross Regional Domestic Product (GRDP). GRDP is the sum of added value generated by all business units in a region or the total value of final goods and services produced by all regional economic units (Romhadhoni *et al.*, 2018). In addition to measuring economic activity, GRDP is the basis for developing policies to encourage the growth of potential sectors, reduce regional disparities, and increase employment. By understanding the various factors that influence GRDP, governments and policymakers can develop more effective and sustainable development strategies.

The GRDP level of a region is caused by factors such as human resources, natural resources, and development policies (Khairunnida & Utomo, 2024). Education and health levels are very important factors in determining the quality of human resources (Simbolon *et al*., 2024). Life expectancy reflects the quality of public health, which can impact labour productivity. Individuals with good health conditions tend to have higher productivity levels to contribute more to regional GRDP. Meanwhile, the average number of years of schooling indicates the level of education that improves the quality of human resources. The longer a person is educated, the greater their chances of acquiring better skills and knowledge, which in turn will increase the efficiency and competitiveness of labour in the labour market. Meanwhile, the size of the labour force determines the production capacity of a region, although the quality of

labour must also be considered (Akasumbawa *et al*., 2021). The more labour available, the greater the production capacity of a region.

Table 1
PDRB Provinsi se-Pulau Jawa Tahun 2017 - 2023 (dalam miliar rupiah) Atas Dasar Harga Konstan Tahun 2010

YEAR	BANTEN	DKI	WEST JAVA	CENTRAL JAVA	DIY	EAST JAVA
2017	410,137	1,635,359	1,343,662	893,750	92,300	1,482,300
2018	433,783	1,735,208	1,419,624	941,091	98,024	1,563,442
2019	456,620	1,836,241	1,490,960	991,517	104,485	1,649,896
2020	441,149	1,792,291	1,453,381	965,227	101,699	1,611,393
2021	460,953	1,856,001	1,507,746	997,321	107,373	1,668,754
2022	484,129	1,953,489	1,589,985	1,050,278	112,901	1,757,875
2023	507,426	2,050,473	1,669,421	1,102,474	118,626	1,844,809

Source: (Badan Pusat Statistik, 2025)

The Special Region of Yogyakarta (DIY) recorded the lowest GRDP value from year to year, one of which was Rp118,626 billion in 2023. Although nominally in the lowest position, DIY shows the highest cumulative increase in GRDP value among all provinces in Java, which is 28.53% from 2017 to 2023. This figure is higher than the cumulative increase in GRDP value of other provinces, such as East Java (24.46%), West Java (24.24%), DKI Jakarta (25.38%), Banten (23.73%), and Central Java (23.35%). This fact shows that DIY GRDP has experienced significant development. This is undoubtedly due to the condition of the factors that influence economic activity in the region.

Table 2
Life Expectancy in Districts/Municipalities of Yogyakarta Special Region Year 2017-2023 (in years))

District/City	Year						
	2017	2018	2019	2020	2021	2022	2023
Kulonprogo	75,10	75,16	75,22	75,27	75,29	75,30	75,39
Bantul	73,51	73,61	73,72	73,82	73,84	73,86	74,02
Gunungkidul	74,64	74,70	74,77	74,81	74,91	74,94	75,17
Sleman	73,77	73,87	73,98	74,07	74,14	74,19	74,34
Kota Yogyakarta	74,35	74,45	74,51	74,58	74,66	74,69	75,01

Source: (Badan Pusat Statistik, 2025a)

The Life Expectancy Rate (AHH) in the regencies/cities of Yogyakarta Special Region (DIY) continues to increase during 2017-2023, reflecting improvements in the quality of health and welfare of the community. Kulonprogo Regency recorded the highest AHH, from 75.10 years (2017) to 75.39 years

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(2023), followed by Yogyakarta City and Sleman. Meanwhile, Gunungkidul and Bantul districts have a lower AHH, although they continue to increase. This positive trend shows progress in health services and social conditions in DIY.

Table 3
Average Years of Schooling in Districts/Cities Special Region of Yogyakarta 2017-2023 (in years)

District/City	Year						
	2017	2018	2019	2020	2021	2022	2023
Kulonprogo	8,64	8,65	8,66	8,86	9,02	9,17	9,18
Bantul	9,2	9,35	9,54	9,55	9,57	9,59	9,79
Gunungkidul	6,99	7	7,13	7,21	7,3	7,31	7,32
Sleman	10,65	10,66	10,67	10,91	10,92	10,94	11,01
Kota Yogyakarta	11,43	11,44	11,45	11,46	11,72	11,89	12,11

Source: (Badan Pusat Statistik, 2025d)

The average years of schooling (RLS) in the Special Region of Yogyakarta (DIY) show an increasing trend during 2017-2023. Yogyakarta City has the highest RLS, rising from 11.43 years (2017) to 12.11 years (2023), followed by Sleman and Bantul. Meanwhile, Gunungkidul has the lowest RLS, although it still increased from 6.99 years to 7.32 years in the same period. Compared to the national RLS, which stood at 8.10 years in 2017 and increased to 8.69 years in 2023, DIY has a higher rate, reflecting better access to education in the region.

Table 4
Total Labor Force in Yogyakarta Special Region Year 2017-2023

District/City	Year						
	2017	2018	2019	2020	2021	2022	2023
Kulonprogo	244.415	252.966	256.632	269.426	268.964	279.905	269.268
Bantul	558.978	577.461	579.229	609.943	595.343	626.283	602.581
Gunungkidul	659.305	675.286	676.334	703.666	739.322	698.907	657.041
Sleman	429.476	446.487	448.155	398.035	469.201	463.269	468.976
Kota Yogyakarta	225.013	239.542	243.570	247.092	262.125	267.712	223.828

Source: (Badan Pusat Statistik, 2025c)

The size of the labour force in the Special Region of Yogyakarta (DIY) fluctuated during 2017-2023. Gunungkidul recorded the highest number of the labour force, reaching 739,322 people in 2021, although it decreased to 657,041 people in 2023. Bantul and Sleman districts also show an increasing trend until 2022 before experiencing a slight decline in 2023. Meanwhile, Yogyakarta City has the lowest labour force, with the highest figure in 2022 (267,712 people) before declining to 223,828 people in 2023.

Compared to the national labour force, which continues to increase from around 131 million people in 2017 to 143 million people in 2023, the trend in DIY

tends to be more variable. Economic factors, labour migration, and the pandemic's impact on the region's employment sector can influence this fluctuation. Based on this background, this study examines the effect of life expectancy, average years of schooling, and total labour force on the Gross Regional Domestic Product (GRDP) in the Regency / City of Yogyakarta Special Region in 2017-2023. This research is conducted to see whether these factors positively affect the Gross Regional Domestic Product (GRDP) in the Regency / City of Yogyakarta Special Region.

LITERATURE REVIEW

Gross Regional Domestic Product (GRDP)

According to the Central Bureau of Statistics (BPS), Gross Regional Domestic Product (GRDP) is the sum of gross value added generated by all business units or the total value of final goods and services produced by all regional economic activities. GRDP is the leading indicator used to measure the economic health of a region. Positive GRDP growth reflects healthy economic development, while a decline in GRDP may indicate problems that must be addressed immediately.

Life Expectancy Rate

Life expectancy (AHH) is the age a person may achieve by being born in a particular year (Sulistyorini, 2007). Ideally, life expectancy is calculated based on the age-specific death rate (ASDR), whose data is obtained from years of death registration records, so it is possible to create a death table. However, because registration records are unavailable, the AHH is calculated indirectly with the Micro Computer Program for Demographic Analysis (MCPDA) program package or Mortpack (Badan Pusat Statistik Grobokan, 2023).

Average Years of Schooling

Average Years of Schooling is the average number of years spent by the population aged 15 years and over to pursue all types of education. The average years of schooling (RLS) is a number that describes the length (years) of schooling experienced by the population aged 25 years and over. RLS can be used to determine the level and quality of community education in a region. The dropout rate influences the average length of schooling (RLS) due to the inability to pay tuition fees. In addition, there are still several factors that cause children to drop out of school, such as environmental factors, understanding of the importance of education, culture, availability of educational facilities/infrastructure and others (Badan Pusat Statistik Kabupaten Karanganyar, 2024).

Total Labor Force (AK)

The population is categorized into working-age population and nonworking-age population. The working-age population is divided into two groups, namely the Labor Force and the Non-Labor Force. The Labor Force consists of working-age people who are employed (to earn income/profit) and unemployed (Badan Pusat Statistik Kabupaten Brebes, 2023).

RESEARCH METHODS

Research Approach and Data Source

This study uses a quantitative approach with the panel data regression method to analyze the effect of life expectancy, average years of schooling, and total labour force on Gross Regional Domestic Product (GRDP) in the Regency / City of Yogyakarta Special Region in 2017-2023. The data used is secondary

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data obtained from the official publication of the Central Statistics Agency (BPS). The combination of time series and cross-sectional data allows for a more comprehensive analysis of the factors that influence GRDP in the region.

In this study, the panel data regression model used is the random effect model. The regression model is written as follows:

$$\ln (PDRB_{it}) = \beta o + \beta 1 \ln(AHH_{it}) + \beta 2 \ln(RLS_{it}) + \beta 3 \ln(AK_{it}) + e_{it} \ldots\ldots\ldots\ldots\ldots (1)$$

Description:
Y: Gross Regional Domestic Product (GRDP) at Constant Prices (Billion Rupiah)
β : Coefficient
LnAHH : Average Years of Schooling (Years)
LnRLS : Life Expectancy (Years)
LnAK : Labor Force (Person)
i : Number of Observations (5 districts/cities)
t : Number of years (2017-2023)
e: *Error term*
Ln: Natural logarithm

RESULTS AND DISCUSSION

Model Estimation

A series of specification tests were conducted to determine the most suitable regression model, namely the Chow Test, Hausman Test, and Lagrange Multiplier Test. The Chow Test results are as follows:

Table 5
Chow Test

Effect Test	Statistik	Probability
Cross-section F	345.14	0.0000*

*Statistically significant at the 5% level

Based on the results of the Chow test, it is known that the cross-section F value is 346.14 with a probability value of 0.0000 < α = 0.05, which means accepting Ha or rejecting H0 so that these results indicate that the best model that can be used to test the hypothesis is the Fixed effect model and then will proceed to the next stage, namely the Hausman test to test the Fixed Effect model and Random Effect model.

From the regression results conducted to compare the best model Fixed effect model with the Random Effect model, the Hausman Test estimation results are obtained as follows:

Table 6
Hausman Test

Test Summary	Chi-Sq. Statistic	Prob.
Cross-section random	0.97	0.8078

*Statistically significant at the 5% level

Based on the results of the Hausman test, it is known that the random cross-section value is 0.97 and the random cross-section probability value is 0.8078>α =0.05, thus making the best model decision used is the Random Effect model.

The Lagrange Multiplier Test results are shown in the following table.

Table 7
Lagrange Multiplier TEst

Test Summary	Chi-Sq. Statistic	Prob.
Cross-section random	87.73	0.0000

*Statistically significant at the 5% level

Based on the Lagrange Multiplier test results, it is known that the chibar2 value is 87.70 with a probability value of 0.0000 <α = 0.05, which means accepting H a so that these results indicate that the best model that can be used to test the hypothesis is the Random effect model.

Classical Assumption Testing

In addition to model selection, this study also conducted a series of classical assumption tests to ensure that the regression used produced unbiased estimates. The normality test is applied to test whether the residuals in the model are normally distributed, which is usually done with the Jarque-Bera method.

Table 8
Normality Test

	Chi2	Prob>chi2
Jarque-Bera Normality test	3.74	0.1541

*Statistically significant at the 5% level

The results of the normality test with the Jarque-Bera test show a probability value of 0.1545, which is greater than level of significancy 0.05, so it can be concluded that the residuals in the regression model are normally distributed.

Multicollinearity is tested by looking at the Variance Inflation Factor (VIF), where a VIF value smaller than 10 indicates that there is no high correlation between independent variables.

Table 9
Multicolinierity Test

Mean VIF	1.24

The multicollinearity test using the Variance Inflation Factor (VIF) resulted in a value of 1.24, still below the threshold of 10, which indicates no multicollinearity problem between independent variables.

Heteroscedasticity is tested with the Breusch-Pagan method to ensure the residual variance remains constant.

Table 10
Heteroscedasticity Test

Chi2(1)	Prob. Chi2
1.18	0.2766

*Statistically significant at the 5% level

Furthermore, the heteroscedasticity test using the Breusch-Pagan test shows a probability of 0.2766, which is greater than 0.05, so there is no heteroscedasticity

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in the model.

Tabel 11
Autocorrelation test

F (1.14)	Prob > F
7.371	0.0533

*Statistically significant at the 5% level

Finally, testing for autocorrelation with the Wooldridge Test yields a probability value of 0.0533, which is greater than 0.05, indicating that there is no autocorrelation in the regression model used.

Regression Model Estimation Results
Based on the results of the regression analysis, the regression equation is obtained as follows:

$PDRB_{it} = -83.0981 + 19.83889AHH_{it} + 1.449816RLS_{it} + 0.320875AK_{it}$.....(2)

With the following estimation results:

Table 12
Hasil Estimasi Model Regresi Data Panel

	C	AHH(X1)	RLS(X2)	AK(X3)
Coefficient	-83.0981	19.83889	1.449816	0.320875
t-Statistic	-3.72	3.68	2.38	2.29
Probability	0.000	0.000	0.0017	0.022
R-Square: Within = 0.8426 Between = 0.4520 Overall = 0.4624		Keterangan: N = 35 A = 5% (0,05)		
Wald Chi2 = 153.48				
Pro. F-Statistic = 0.0000				

The constant value of -83.0981 indicates that if the variables of Life Expectancy (AHH), Average Years of Schooling (RLS), and Total Labor Force (AK) are zero, the Gross Regional Domestic Product (GRDP) is predicted to be 83.0981 billion rupiah. The AHH variable coefficient of 19.83889 indicates that every 1% increase in life expectancy, assuming other variables remain constant, will increase GRDP by 19.83889%. The coefficient of the RLS variable of 1.449816 indicates that every 1% increase in the average years of schooling, assuming other variables remain constant, will increase GRDP by 1.449816%. The coefficient of the AK variable of 0.320875 indicates that every 1% increase in the total labour force, assuming other variables remain constant, will increase GRDP by 0.320875%.

HYPOTHESIS TEST RESULTS

Based on the calculation results obtained df = (n-k), df = (35-4) = 31, where the t table value is 1.69552, then:

- The t-count value on the Average Years of Schooling (RLS) variable is 2.38 with α = 5% (0.05), meaning that the t-count value (2.38) > t table (1.69552). This value indicates that the Average Years of Schooling (RLS) has a significant positive effect on the GRDP of regencies and cities in the Special Region of Yogyakarta.
- The t-count value of the Life Expectancy Score (AHH) variable is 3.68 with α = 5% (0.05), meaning that the t-count value (3.68) > t table (1.69552). This value indicates that the Life Expectancy Rate (AHH) has a significant positive effect on the GRDP of regencies and cities in the Special Region of Yogyakarta.
- The t-count value on the Total Labor Force (AK) variable is 2.29 with α = 5% (0.05), meaning that the t-count value (2.29) > t table (1.69552). This value indicates that the Total Labor Force (AK) has a significant positive effect on the GRDP of regencies and cities in the Special Region of Yogyakarta.

From these results, it can be concluded that all independent variables (RLS, AHH, and AK) have a positive and significant influence on the GRDP of Regency/City in Yogyakarta Special Region at the 5% significance level.

F-TEST RESULTS AND THE RESULTS OF THE COEFFICIENT OF DETERMINATION (R2)

The simultaneous test was conducted to test the effect of the independent variables on the dependent variable together. The regression results show that the Wald Chi-Square value is 153.48 with a p-value of 0.0000 (<0.05), so it can be concluded that the Average Years of Schooling (RLS), Life Expectancy Rate (AHH), and Total Labor Force (AK) simultaneously have a significant effect on GRDP in the Special Region of Yogyakarta in the 2017-2023 period.

The Coefficient of Determination (R^2) is used to measure how much variation in GRDP is explained by the independent variables:

- R^2 Within = 0.8431, meaning that 84.31% of the variation in GRDP within a district over time is explained by the model, while 15.69% is influenced by other factors.
- R^2 Between = 0.4520, indicating that 45.20% of the variation in GRDP between districts can be explained by the model, while 54.80% is influenced by other factors.
- R^2 Overall = 0.4624, indicating that the overall model is able to explain 46.24% of the variation in GRDP, while 53.76% is influenced by other variables not included in the model.
-

DISCUSSION

Effect of Life Expectancy on GRDP

Life expectancy in this study shows a positive and significant influence on GRDP with a coefficient of 19.83889. This result indicates that an increase in life expectancy reflects a better quality of health, which has an impact on increasing labour productivity.

This finding supports studies by Akasumbawa *et al.*, (2021), which found that life expectancy has a positive effect on GRDP in countries with large

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populations. In the context of the Special Region of Yogyakarta, improvements in the quality of health and medical services are likely to have increased the employability of the workforce and reduced the rate of absenteeism due to illness, which in turn increased economic productivity.

Effect of Average Years of Schooling on GRDP

The analysis shows that the average years of schooling positively and significantly influence GRDP with a coefficient of 1.449816. This means that % increase in average years of schooling by 1% will increase GRDP by 1.45%, assuming other variables remain constant (ceteris paribus). This result also supports research conducted by Anfasa (2021) and Auliana & Sa'roni (2023), which found that an increase in average years of schooling is positively related to regional GRDP. Higher education allows the workforce to adopt new technologies faster and increase productivity, which has a direct impact on increasing economic output.

Effect of Total Labor Force on GRDP

The total labour force was also found to have a positive and significant effect on GRDP with a coefficient of 0.320875. This indicates that the more labour available, the higher the GRDP. This result supports research (Maisaroh & Risyanto, 2018), which found that the labour force significantly influences GRDP in Banten Province. However, the lower coefficient value compared to other variables indicates that simply increasing the number of workers is not enough to boost GRDP significantly. The quality of labour and the level of education must also be improved to increase GRDP more effectively.

Implications of Findings and Research Novelty

The results of this study confirm the importance of improving the quality of human resources in driving regional GRDP. Investments in education and health are key in improving labour productivity, which in turn has a positive impact on the regional economy.

From a policy perspective, the results of this study can be used as a basis for designing regional development policies that are more oriented towards improving the quality of human resources. Local governments in the Special Region of Yogyakarta can prioritize investment in the education and health sectors as the primary strategy to achieve sustainable GRDP.

From an academic perspective, this study contributes to the development economics literature by confirming that education and health factors significantly increase GRDP. This study's novelty lies in using panel data regression with a random effect model that is more accurate in identifying the relationship between human capital factors and GRDP at the district/city level.

CONCLUSIONS

This study analyzes the influence of life expectancy, average years of schooling, and total labour force on Gross Regional Domestic Product (GRDP) in the Regency/City of Yogyakarta Special Region for 2017-2023. The results show that the three variables contribute positively and significantly to GRDP, where improvements in education and public health increase labour productivity. The size of the labour force also has a positive impact, although its effectiveness depends on the quality and efficiency of the workforce. Empirically, this study confirms that human capital is a significant factor in GRDP, which aligns with endogenous growth theory. From a policy perspective, investments in education and health, as well as improving labour skills, are strategic measures to support

inclusive and sustainable GRDP. As an academic contribution, this study applies panel data regression to comprehensively understand the relationship between human capital and the regional economy. For future research, other factors, such as infrastructure investment and fiscal policy, should be analyzed to provide greater insight into the factors that drive GRDP.

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