

The role of investment for poverty alleviation in Yogyakarta: Evidence from logit regression

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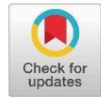
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1 The role of investment for poverty alleviation in Yogyakarta: Evidence from logit regression

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Abstract: This article discusses the Solow-Romet theory of economic growth, aiming to explain the relationship between household poverty in the Province of Daerah Istimewa Yogyakarta (DIY) through investments in education, quality of life improvement, and health. The study examines various influence variables, including Non-Formal Education (XNF), Educational Scholarships (XBS), Protein Consumption (PK), Disease Prevention Costs (XL), Calorie Consumption (IK), Health Insurance Variables (XAS), and Food Security (XT) in assessing the poverty status of households in the Special Region of Yogyakarta in 2021. The estimation model employs a logit mode approach, using data from Susenas (National Socioeconomic) for the Special Province of Yogyakarta, with a sample size of 4044 households. The findings of this study indicate that investments in non-formal education, school fees, and educational scholarships do not significantly affect family poverty status. However, increased investment in quality of life (such as calorie consumption) and health (including disease prevention and health insurance spending) will affect the poverty status of households in the Special Province of Yogyakarta in 2021.

Keywords: Poverty Line; Health Investment; Quality of Life Improvement Investment; Educational Investment

JEL Classification: I32; H70; H75



Introduction

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Poverty can be reduced by improving the quality of human resources (Meilinda & Kurniawan, 2024). Investments in education and health can improve the quality of human resources by increasing people's productivity to obtain higher incomes, and ultimately, increasing incomes will reduce the number of low-income families. Research Atalay (2015) found that investment in human resources is related to improving the productivity and quality of labor for people with low incomes. Increasing non-formal education for people with low incomes will have an impact on increasing skills and sensitivity to external economic change, such as inflation and recession (Kefela, 2007). One way to improve the quality of human resources for low-income families is to invest in cheap education and health for low-income people. Research findings on the impact of education on poverty Grimm (2007) find that investment has a direct effect on education and income, and is influenced by choice of work and household composition. Investments in education can help break the cycle of poverty by equipping low-income families with the skills and knowledge needed

to earn high wages. Education is a multidimensional process, on the one hand, encouraging economic growth and, on the other hand, reducing poverty by increasing productivity (Breton & Breton, 2021). Education promotes economic growth by improving the quality of the workforce, improving health facilities, reducing poverty, and increasing technological development (Mudombi et al., 2016; Suripto et al., 2020). Knowledge accumulation can occur through investment in formal and non-formal education. With the increase in opportunities to get cheap education, there will be an increase in the accumulation of knowledge in society at large. Increasing the accumulation of knowledge will have an impact on the discovery of new ideas to increase labor productivity. The increase in the quality of the workforce through the implementation of new ideas has influenced poverty alleviation. Poor people with good formal and non-formal skills will quickly adjust to changes in external economic shocks (Gounder & Xing, 2012).

The cause of poor households is an interesting topic of research study to study. According to Aggarwal (2007) and (Cremin & Nakabugo (2012) states globalization has resulted in the industrialization of the manufacturing industry, shifting to service industries that lead to capital-intensive technology, reducing workers with low human resources to be replaced by workers with high human resources, resulting in an increase in unemployment. Cazzavillan et al (2013) and Čiutienė & Railaitė (2015) sees that the main factor causing poverty is the decline in the human resources of poor households.

The Human Development Index (IPM) is an index that measures the success rate of human resource development in a region based on three dimensions: health, education, and income. Countries with high HDI scores tend to have low poverty rates this is because the three dimensions that makeup HDI are related to poverty. Regions with a high level of health, a healthy population, and not susceptible to disease will impact reducing poverty (Kefela, 2007; Suripto & Subayil, 2020).

Investing in education is a powerful tool for reducing poverty. The education gained will enhance the skills and knowledge of individuals that can be useful for participating in the labor market and increasing their income. Regions with high levels of education tend to have a workforce with higher wage earnings and lower poverty rates (Ducanes & Tan, 2014; Machira et al., 2023). Investment spending on education will prevent households from becoming poor. A high HDI indicates that the region has improved the three main dimensions of human development (health, education, and income). An increase in three dimensions (health, education, and income) means that an area can increase the welfare of its citizens, reduce inequality, encourage economic growth, and release its citizens from poverty. DIY Province has a high HDI level, but the poverty rate is also high. This phenomenon is interesting to study; why is a high HDI level not followed by a reduction in the poverty rate? Why are good quality human resources not followed by a low poverty rate? The good quality of human resources in DIY Province is not followed by high productivity and is not in line with increased income.

Poverty in the long term can be reduced by addressing the underlying problems that cause poverty, such as poor health services, lack of quality education, and low-income levels. Provincial poverty rate data on the island of Java in 2021 are as follows:

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Table 1 Poverty Rate and Human Development Index (IPM) Province in Java Island

No	Province	Poverty Rate	HD
1	DI. Yogyakarta	12.80	80.22
2	Jawa Tengah	11.79	72.16
3	Jawa Timur	11.40	72.14
4	Jawa Barat	8.40	72.45
5	Banten	6.66	72.72
6	Dki Jakarta	4.72	81.11

Source: Statistics Indonesia 2021

Low human resources affect low productivity levels, which will result in low individual income, and ultimately, individuals can enter the poor category. Individual productivity is influenced by the level of education, knowledge, skills, and level of health (Afzalur Rahim & Minors, 2003). The higher a person's education, the better his skills, the higher his income, and the less chance of becoming poor.

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Poverty as a condition in which a person or family cannot meet the minimum basic needs for a decent life (BPS - Statistics Indonesia, 2008). BPS uses the expenditure approach to measure poverty by comparing per capita family expenditure with the poverty threshold value (poverty line). Based on this definition, BPS uses the Poverty Line or Minimum Living Needs (KMHM) concept to determine the poverty threshold value. The concept of the Poverty Line includes basic needs such as food, clothing, housing, and education. BPS categorizes a person or family as poor if their expenses are below the poverty line set in that area.

Investment and poverty are analyzed by combining the Solow-Romer economic growth model. The Solow-Romer model is an economic model used to analyze the relationship between economic growth, technological progress, and investment (Zhang, 2020; Zhao, 2019). The Solow-Romer growth model views capital accumulation and investment in education as important factors that contribute to knowledge stock and economic growth. The stock of knowledge is the new ideas from a workforce that uses knowledge to increase productivity. New ideas are known as technology. The Solow-Romer growth model suggests that technological progress and innovation are the main drivers of economic growth, and investment in education plays an important role in facilitating this progress. Investment in education leads to individuals gaining a greater amount of knowledge, which can then enhance the expertise and skills required to invent and develop new technologies. Therefore, it can further contribute to economic growth (Chu, 2018; Moore & Donaldson, 2016).

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Calorie consumption is related to nutrition. People who live in poverty tend to have limited access to nutritious and sufficient food. Hence, their calorie consumption is often less than the body's needs to carry out daily activities. Generally, a person's daily calorie needs range from 2,000 to 2,500 calories (Hardinsyah et al., 2012; Ramachandran, 2007). However, people living in poverty often experience food shortages and are unable to meet their daily calorie needs. As a result, people experiencing poverty will tend to experience nutritional problems, lack vitamins and minerals, and be susceptible to various diseases. The relationship between caloric consumption and poverty is very close because

sufficient caloric intake is essential for maintaining health, providing energy for physical activity, and supporting increased income. There is a very strong relationship between the improvement of education facilities and health facilities and increasing per capita income in Yogyakarta Province (Susanto, 2021). Improvement of education and health facilities through government investment directly impacts productivity, further increasing income. Individuals who experience obstacles in accessing sufficient calories can cause their health to deteriorate and cause low productivity (Suripto et al., 2020). Investing in nutritious, calorie-dense foods can be an effective strategy for reducing poverty and improving individual health. Policies that guarantee access to staple food, such as the Raskin program, can help increase access to adequate food and free individuals from poverty. Access to food and nutrition will improve labor quality and productivity (Ramachandran, 2007; Suripto & Istanti, 2021; Varadharajan et al., 2013).

Protein is essential in supporting body growth and development, maintaining healthy body tissues, and supporting the immune system (Carbone & Pasiakos, 2019). Limited access to protein consumption can lead to poor health and decreased productivity. Protein consumption investment can be important in reducing poverty and improving individual health (Ballantyne et al., 2011; Nagari & Nindya, 2017).

Health insurance provides individuals with access to health services, including prevention, diagnosis, and treatment of diseases. Low-income people will face challenges in accessing health insurance due to limited financial resources. Healthcare costs can significantly burden impoverished individuals (Peterson et al., 2018; Uyar, 2021). Without health insurance, individuals living in poverty face high costs of accessing health services, and health care, ultimately causing a significant drop in income into the category of poor. Investment in health insurance can effectively reduce poverty and improve health outcomes for individuals and communities (Sudha, 2006; Suripto et al., 2020). Investing in health insurance can help overcome barriers to accessing health services, reduce healthcare costs, and promote economic development by increasing labor productivity.

The accumulation of educational capital refers to investments in education and training that can increase human capital and increase productivity and potential for higher earnings. The relationship between the accumulation of educational capital and poverty is very significant because individuals who live in poverty often do not have access to quality education and training, which can perpetuate the cycle of poverty (Kuwahara, 2013). Investing in educational capital can be a powerful tool for reducing poverty. The importance of education investment in supporting economic growth is caused by increased productivity (Anwar, 2020). Education and training can increase an individual's skills and knowledge, make them more competitive in the job market, and lead to higher-paying job opportunities (McGuirk et al., 2015). This can help individuals and families escape poverty and achieve greater economic stability. However, the accumulation of educational capital is often associated with significant costs, including tuition fees, educational materials, and other costs. These costs can be prohibitive for impoverished individuals and families, limiting their access to educational and training opportunities. Government spending on improving education and health will directly impact increasing welfare (Wiksadana & Sihalo, 2021), and increasing welfare is driven by worker

productivity. Policies and programs that promote access to quality education and training can be effective strategies for reducing poverty.

Knowledge accumulation and poverty have a very complex and varied relationship. Poverty can be **413** obstacle to the accumulation of knowledge because individuals who live in poverty do not have access to quality education and learning opportunities. Consequently, a limited knowledge base leads to a reduced generation of new ideas for the production process. This can result in limited knowledge and skills, resulting in a perpetual cycle of poverty. The accumulation of knowledge can affect work productivity, income, health, and greater social and political engagement, which ultimately helps break the cycle of poverty (Kuwahara, 2013). Policies and programs promoting access to quality education, training, and skills can effectively reduce poverty.

Research Method

The Solow-Roman **5** economic growth model was chosen as the theoretical basis for explaining the high poverty rate in the Province of the Special Region of Yogyakarta but a good HDI. The Solow-Romer economic growth model explains how an economy can grow over time through capital accumulation and technological advances. This model was developed by economists Robert Solow and Paul Romer in the 1980s. The Solow-Romer model assumes that the economy consists of three factors of production: capital, labor, and technology. The Solow-Romer model formulates that economic growth can be explained by capital accumulation and technological progress. The model shows that the main drivers of economic growth are an investment in physical capital (such as machines and infrastructure), human capital (such as education and skills), and innovation that leads to technological advances. Technology is formed through knowledge and innovation by creating new ideas to drive economic growth **52**. The Solow-Romer model explains how the level of technological progress is combined with the accumulation of physical capital and the increase in human capital (Breton, 2015; Sumer, 2012; Zhao, 2019). The merging of the two models is done by modifying the production function of the Solow model to incorporate accumulated knowledge and accumulated new ideas into the Romer model. The production function of the Solow-Romer model with investment in education and investment in health is written as follows:

$$Y_t = f(K, HE, LA) \dots\dots\dots (1)$$

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The Y notation represents output, K is physical capital, HE is education or human capital investment, A is knowledge or technology stock, and L is labor. In the Solow-Romer production function, education or human capital is a factor that influences output, as are physical capital and labor. By combining physical capital accumulation and knowledge accumulation, this model can consider the contribution of tangible and intangible inputs to economic growth (Corrado et al., 2009). In addition, the endogenous nature of capital accumulation and production allows the model to account for the dynamic nature of technological progress and knowledge accumulation over time.

The capital stock equation of the Solow-Romer model with the production of new ideas can be written as $\Delta A = \overline{HE}AL$. Additional stocks of knowledge are obtained from additional investment in education and knowledge possessed by research workers who produce additional ideas or new ideas using their stock of ideas.

Romer's growth model assumes that the accumulation of knowledge is endogenous, meaning that it is generated in the economy through investment in research and research (Hendricks, 2002; Zhao, 2019). The workforce consists of workers who produce output (LY) and workers who produce ideas $\overline{EL}$ where $LA = \overline{EL}$ (the workforce produces new ideas) and $LY = (1 - \overline{EL})\overline{L}$ (the workforce produces output). The value $\overline{EL}$ is the constant value of the population that produces research, while $(1 - \overline{EL})$ is part of the population that produces output. If the production of knowledge is constant and proportional to the growth of research staff (LA) then $\Delta A = A_0(1 - \overline{EL})$ is the growth of knowledge accumulation. The level of technological progress is endogenous and depends on the level of knowledge in the economy (Arbex & Perobelli, 2010). The rate of change at the level of technology (dA/dt) is assumed to be directly proportional to the level of knowledge (A). Output growth consists of knowledge growth, contribution from research capital growth, and research workforce growth:

$$gY = g\overline{HE}\overline{EL} + \alpha gK + \beta gLAY \dots\dots\dots (2)$$

Output growth is $gY = \frac{\Delta Y_{t+1}}{Y_t} = y^*$, and capital growth is $gK = \frac{\Delta K}{K} = \overline{Z}\frac{Y}{K} = \overline{Z}yk - \overline{d}$. The solution to the Solow-Romer equation by entering the capital-output ratio becomes:

$$y_t^* = \frac{Y^*}{L} = \left(\frac{\overline{Z}}{gY^* + \overline{HE}\overline{EL}}\right)^{\alpha} A^{*\beta} (1 - \overline{EL}) \dots\dots\dots (3)$$

The growth of per capita output will depend on the size of the stock of knowledge through education $\left(\frac{\overline{Z}}{gY^* + \overline{HE}\overline{EL}}\right)$, the amount of income used to increase knowledge $A^{*\beta}$, and the size of the workforce using the stock of knowledge to produce output $(1 - \overline{EL})$.

The effect of using H (human capital) is denoted by $\left(\frac{\overline{Z}}{gY^* + \overline{HE}\overline{EL}}\right)$ the effect of using the ability of the workforce because the knowledge it has $A^{*\beta} (1 - \overline{EL})$ is a contribution to Romer's productivity theory and is endogenous. The household income level is affected by the additional family income received due to additional human capital (contributed by Solow's growth theory) and by improving the quality of the workforce in the form of stocks of knowledge and experience (contributed by Romer's growth theory).

This study uses a household analysis unit in the Province of D.I. Yogyakarta (DIY). The reasons for choosing this location are: First, the poverty rate in D.I. Yogyakarta is the highest on the island of Java and even ranks 11th nationally. Second, other development indicators show very good rankings, such as the HDI, Happiness Index, and even the Indonesian Democracy Index, which always occupies the top three positions (Central Statistics Agency (BPS) of Yogyakarta, 2023; Herlina et al., 2021). How to get out of poverty

amid improving economic and human development indicators is an interesting topic to study. The model used is the logit regression model. The logit model is as follows:

$$Ly_i = \ln\left(\frac{p_i}{1-p_i}\right) = \beta_0 + \beta_1 XNF_i + \beta_2 XSP_i + \beta_3 XBS_i + \beta_4 IK_i + \beta_5 PK_i + \beta_6 XL_i + \beta_7 XAS_i + \beta_8 XT_i + e_i.$$

17 Ly_i is the probability that a household is in the poor category, with a dummy variable, with a value of 1 for poor category households and a value of 0 for households with no category poor. Households in the poor category are determined by the absolute poverty category of the BPS version, where a household is said to be poor if the family income earned is below the poverty line in the DIY Province in 2021. The DIY Province poverty line in 2021 is IDR 496,904 per capita per month. Independent variables consist of:

$\frac{\bar{Z}}{gY^* + helL}$ = Invest in improving human capital through family education

4 XNF : The cost of non-formal education is proxied by the course fees incurred by households per capita per month in rupiah units.

XSP: School fees, school construction donations (entry fee for school fees (SPP/UKT) and school committee fees, other school fees (skills, tutoring, textbook tests, photocopies of study materials), writing materials (pens, pencils, erasers, rulers, calculator term) in rupiah units

17 XBS: Educational scholarships are a dummy variable with a value of 1 for households with educational scholarships and 0 if households do not have educational scholarships.

$A^{\beta}(1 - \bar{\epsilon})$ = Investment to increase productivity with additional quality of life improvement through additional knowledge and health

IK: Calorie Consumption is measured by per capita calories per day (Kcal)

PK: Protein consumption is measured by grams of household protein consumption per capita per day.

XL: Countermeasure costs are determined by the costs incurred to protect oneself from diseases, such as the cost of sports, cost of vitamins and medicines, and **19** bs Per capita per month in Rupiah

25 XAS: Health insurance is measured by a dummy variable, with a value of 1 if the household has health insurance, and a value of 0 if the household does not have health insurance.

XT: Food security is measured by monthly per capita Raskin rice receipts in kilograms.

26 The logit regression model is used to analyze poverty in the DIY Province. The logit model is a type of regression model used in statistics to analyze the relationship between a binary dependent variable and one or more independent variables. The logit model uses a logistic function that analyzes the linear combination of independent variables into probability values between 0 and 1 to explain the variation of the dependent variable (Baltagi, 2008; Gujarati & Porter, 2009; Liu, 2022). Estimation of the logit model will be tested individually (partially) with the Z test, tested as a whole (together) with the

statistical likelihood ratio (LR) test, and tested with the goodness of fit with McFadden R^2 (19) (McF). The regression coefficients need to be converted into odds ratios to interpret the effect of the independent variables on the dependent variable in the form of probabilities. The odds ratio is the ratio between the odds of the dependent variable when the independent variable increases by one unit compared to when the independent variable does not change. Interpretation of the logit model is differentiated based on the variable type, namely categorical variables and numerical variables, by looking at the odds ratios of the related variables. The data used in this study is secondary data, with the main data coming from the 2021 DIY Province Susenas with a sample of 4044 households in the DIY Province. Susenas data (National Socioeconomic Survey) is data generated from a survey conducted by the BPS-Statistics Indonesia to obtain information about the social and economic conditions of the Indonesian people.

Result and Discussion

23 The dependent variable in this study is the poor status of households in the Province of DIY. The independent variable Investment TO increase human capital through education is proxied by the Non-Formal Education Cost Variable (XNF), School Development Costs (entry fees, School Tuition Fees/UKT and Other Tuition Fees (skills, tutoring, textbook exams, photocopies of materials) lessons, tools writing (pen, pencil, eraser, ruler, calculator, terminal) and Education Scholarship (XBS) Independent variables Investment to improve household quality of life through knowledge and health is proxied by the variables Calorie Consumption (IK), Protein Consumption (PK), Cost Disease Prevention (XL), Health Insurance (XAS), and Food Insurance (XT).

2 The individual logit model test was conducted by comparing the statistical Z value with the Z table with a significance level (α) of 0.05. Z table with $\alpha = 0.05$ of 1.65, this provides information that investment is to increase productivity by increasing the quality of life of workers $A^{\beta}(1 - \bar{p})$ proxied by the Variable Prevention Cost (XNF), Caloric Consumption (IK), Health Insurance (XAS), Food Insurance (XT) have a negative and significant effect on the poverty status of households in the DIY Province with $\alpha = 0.05$. Meanwhile, investment to increase productivity through investment in education $\frac{Z}{gV^* + he\bar{p}_L}$ is proxied from variables; Non-formal education costs (XNF), school fees (XSP), educational scholarships (XBS), and protein consumption (PK) have no significant effect on the poverty status of households in DIY Province in 2021.

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Table 2 Logit Model of Household Poverty in the Special Province of Yogyakarta in 2021 (sample of 4044 households)

Name Variable	Coefficient variable	Standard Error	z-Statistic	Prob.
C	-0.087314	0.173154	-0.504255	0.6141
XNF	-0.103091	0.141708	-0.727492	0.4669
XSP	0.092829	0.094070	0.986804	0.3237
XBS	-0.011461	0.026218	-0.437147	0.6620
IK*	-4.99E-06	2.33E-06	-2.138301	0.0325
PK	-8.79E-05	0.000108	-0.811866	0.4169
XL*	-0.007141	0.003535	-2.019985	0.0434
XAS*	-0.017051	0.003416	-4.991350	0.0000
XT*	-0.020862	0.007868	-2.651641	0.0080
McFadden R-squared	0.041283	LR statistic		131.698
SS dependent var	0.340988	Prob (LR statistic)		0.0000

*significant at the 5% significance level

Source: Susenas 2021 (processed)

10 The results of the logit model regression in Table 2 indicate that the LR statistical value is 131.69 with a probability value of less than 0.05. This means that the jointly selected independent variables influence the poverty status of households in the Special Province of Yogyakarta in 2021.

The model goodness-of-fit test is done by looking at the value of R^2 McF. The R^2 McF value is 0.0412; this means that the variation of the dependent variable (poverty status of households in the Special Province of Yogyakarta) can be explained by the independent variables (Variables of Non-Formal Education Costs (XNF), School Development Costs (entering SPP, SPP/UKT) Schools and Other Tuition Fees (skills, tutoring, textbook exams, photocopies of study materials, stationery (pens, pencils, erasers, rulers, calculators, terminals) and Educational Scholarships (XBS) Investments for the quality of life of households through good knowledge and health proxied by the variables Calorie Consumption (IK), Protein Consumption (PK), Disease Prevention Costs (XL), Health Insurance (XAS), and Food Security (XT) of 4.12 percent. Cross-sectional data tends to have high variability because it involves observations of various family entities that have high variability in responding to internal and external changes. This can make it difficult to explain variations in the dependent variable using the independent variables present in the (Gujarati & Porter, 2009; Seddighi, 2013). The R^2 McF value is relatively small because the dependent variable is categorical, and the data are sectional; however, this value is still good for sectional data (Akanbi & Du Toit, 2011).

The logit regression model for household poverty in DIY Province in 2021 in Table 2 shows that the cost of non-formal education as measured by course fees (XNF) has no significant effect on the poor status of households in DIY Province. This shows that investment in education through course fees has no impact on increasing labor productivity. The relationship between non-formal education costs incurred by households and poverty is very complex and varied, partly because the mission is a complex problem that cannot be solved only by non-formal education. Poverty is the result of various interrelated factors, such as limited economic opportunities, lack of access to basic services, and social

inequality. Another reason is that the cost of non-formal courses is not sufficient to allow one to gain access to the world of work. The findings Machira et al (2023) found that the effectiveness of education in increasing productivity in the long term requires government policies to maintain the quality of education and maintain the relationship of expertise with market needs.

10 The results of the logit model estimation in Table 2 show that the SPP/UKT education cost variable and household member school committee fees have no significant effect on household poverty in DIY Province in 2021. This means that formal education investments made by households in DIY Province are in the form of spending on school fees such as SPP/UKT, have no impact on improving the productivity of household members in the DIY Province, so education investment does not have an impact on alleviating poor households. This proves that investment in education to improve the quality of human resources does not affect changes in the quality of labor and labor productivity, which in turn will not affect poverty alleviation in DIY Province in 2021. In theory, education plays an important role in poverty alleviation. Investment in education can have an impact on poverty alleviation by expanding access to quality education, ensuring that the education provided is relevant to the needs of the world of work. Investment in education is not enough to tackle poverty when broader systemic problems exist, such as limited economic opportunities and lack of access to education services. The government needs to make effective education investments to support growth through a combination of productive routine expenditures in the health sector (Anwar, 2018). Increasing access to the world of work and individual skills will prevent individuals from earning low incomes and avoiding poverty (World Trade Organization, 2015). Babalola (2011) argue that education triggers economic growth through many factors, such as increasing employment, encouraging technological development, and becoming a source of innovation.

3 Investment through educational scholarships (XBS) has no significant effect on the poverty status of families in DIY Province in 2021. This means that household investment spending has no impact on improving labor productivity. Families that do not have educational scholarships are the same as those with educational scholarships and are categorized as poor households. Why do educational scholarships not affect poverty alleviation? Laksana et al (2022) found that a good learning orientation will determine the occurrence of individual innovation improvements, which ultimately affect company productivity. This means that the orientation for conducting education must be accompanied by the right orientation to increase productivity. Scholarships can be an effective means of increasing access to education and enhancing individual orientation to improve the quality of available resources, improve academic achievement, and provide financial support to individuals who do not have the funds to pursue higher education. Scholarships can help reduce financial barriers that can increase the motivation of individuals to access education, especially those from low-income backgrounds. Wafiq & Suryanto (2021) finds that economic growth without considering its environmental impact, including in the education sector, can lead to a sustained decline in environmental quality, consequently resulting in educational investments that neglect their environmental impact and contribute to an overall decline in environmental quality and welfare levels. The findings. Laajaj et al (2022) suggest that there is a need for the poor

population to understand educational scholarship recipients and increase educational motivation to work productively. Why are educational scholarships in DIY Province not related to poverty? Access to education is limited, and even if scholarships are available, other factors limit access to education, such as a lack of infrastructure, inadequate teaching resources, and a shortage of qualified teachers. Scholarships that are irrelevant to the local context or not aligned with the skills and knowledge needed to increase job skills do not significantly impact poverty reduction. Educational scholarships can reduce poverty depending on various factors, including access to education, relevance to local needs, employment opportunities, and support services. Without addressing these factors, educational scholarships are not effective in reducing poverty.

3
The results of the coefficient estimation of the protein consumption variable show that the protein consumption of household members has no significant effect on the risk of a household entering the poor category. Interpretation of the logit model provides evidence that protein consumption as an effort to improve the quality of human resources does not affect improving skills and work productivity. Protein consumption does not directly impact poverty alleviation in the Province of DIY. Adequate protein consumption is becoming increasingly difficult for poor households to access. Limited access to resources, such as fertile agricultural land, clean water, and adequate infrastructure, can make it difficult for poor households to produce or obtain protein-rich foods. As a result, insufficient protein consumption can lead to health problems, such as poor nutrition and a low immune system. Rumawas (2018) found that a person's performance can increase with education, work experience, and individual competition. While protein consumption does not have a direct impact on poverty alleviation, it is an important aspect of overall health and well-being. It can contribute to better physical and mental health outcomes, which in turn can have an impact on poverty reduction. Keller et al (2020) argue individuals who are more proactive with higher quality output can earn higher wages.

The calorie consumption variable negatively and significantly affects household poverty in the DIY Province. This investment expenditure has an impact on labor productivity. For every additional 1,000 kcal per capita per day, the probability that a household is included in the poor category decreases by 0.0049. The higher the calorie consumption of a household member, the less likely the household is included in the poor category. The results of this study indicate that the calorie consumption of household members affects the level of poverty reduction through increased productivity of family members. The research results Appleton (2003) found that guaranteed fulfillment of staple food consumption in Uganda was a driver of poverty alleviation. Investment in healthy food will reduce the probability of a household entering poor status (Zheng & Peng, 2021). Calorie consumption can have an impact on poverty alleviation in the Province of DIY because calorie consumption is an important aspect of ensuring adequate nutrition and can contribute to increasing one's stamina. The Ministry of Health of the Republic of Indonesia sets the standard calorie requirement per day as follows: Adult males with light to moderate activity need around 2200-2700 calories per day. Adult women with light to moderate activity need around 1800-2200 calories per day. Children and adolescents need more calories than adults, depending on age, sex, and level of physical activity. People who engage in high or heavy physical activity, such as athletes or physical workers,

need more calories than people who engage in light or moderate physical activity. According to data from the Indonesian Ministry of Health obtained from the 2018 Individual Food Consumption Survey (SKMI) results, the average per capita energy consumption in the DIY Province is 2,142 calories per day. This figure shows that energy consumption tends to be below the standard daily calorie requirement recommended by the Indonesian Ministry of Health.

3 Expenditures for disease prevention per capita (XL) negatively affect the poverty status of households in the Province of DIY significantly. The Variable Cost of Disease Prevention per capita per month (XL) coefficient is 0.0071, which is negative. This means that households that spend additional investment for disease prevention costs of one hundred thousand rupiahs per month have a smaller chance of being included in the poor category by 0.0071 compared to families who do not invest in disease prevention. These results mean that the higher the spending on disease prevention costs, the lower the risk of a household entering the poor category. Investing in disease prevention can help people stay healthy and avoid high medical care costs, thereby reducing lost income due to illness. Suripto et al (2020) found that spending on disease prevention is associated with increased labor productivity.

It ultimately reduces the likelihood of poverty for families. Thus, healthier and fitter individuals are productive. **2** Research O'Donnell (2024) in low-income and upper-middle-income countries found that government spending on health insurance has long-term and multi-effect effects on increasing the income of low-income people. The increase in income occurs due to health insurance and a decrease in health costs that are sacrificed if there are family members who are sick.

The health insurance variable (XAS) has an estimated coefficient value of -0.017051 and is significant with a significance level of 5%. This means that households with the head of the family who has health insurance have the opportunity to fall into the poor category by 0.017051 times lower than households without health insurance. Families with health insurance can help household members access the health they need. Households living in poverty face medical expenses, which are a significant household financial burden. Health insurance can help reduce these costs, thereby helping household members stay healthy and avoid high medical expenses. Having health insurance can also have a positive impact on household income stability. Findings from Getahun et al (2023) on the effectiveness of household health insurance policies in Ethiopia in maintaining their health are influenced by the size of household members and the location of household residence. Households with less than 5 children have better health resilience than households with more than 5 children. Households in rural areas have better health resilience than those living in urban areas.

Food security is measured by rice receipts of the Raskin program (XT) per capita. Households with the head of household with Raskin food security have a 0.020862 times lower chance of being included in the poor category than households without Raskin food security. Food security for Raskin rice can be an important factor in poverty alleviation in the Province of DIY because people have physical, social, and economic access to

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sufficient, safe, and nutritious food to meet food needs for an active and healthy life. Poverty alleviation is closely related to food security and the fulfillment of nutritious food through government policy intervention through food assistance and food subsidies (Tsiboe et al., 2016, 2023). Food aid strategies in Ghana can keep poverty rates decreasing with increased incomes and lower health costs for people with low-incomes in Ghana. Raskin is a program that provides subsidized rice to low-income households in Indonesia, including the DIY Province, to help ensure access to affordable food. Providing subsidized rice through Raskin can help reduce poverty for low-income households. Raskin can help improve household health and welfare and reduce the burden of buying rice. Raskin can help households save money for food expenses, which can be used for other important expenditures such as housing, education, and health to prevent households from falling into the poor category. Aziz et al (2021) found that the importance of social assistance program assistance is strongly related to the level of welfare and ensures that the community can meet health needs and improve welfare.

Conclusion

Logit regression results for poor households in the Province of DIY found that investment expenditure for increasing knowledge (knowledge accumulation) through education was proxied by non-formal education costs, per capita course fees per month, school fees, school construction fees, and school committee fees, school fees others such as skills tutoring, tutoring, buying test books, photocopies of study materials, purchasing stationery (pens, pencils, erasers, rulers, calculators, compasses), educational scholarships, have no effect on the status of poor households in DIY Province in 2021. This means that family investment spending on education does not affect reducing the poverty rate in the Special Region of Yogyakarta.

Investments to increase productivity by improving quality of life through health are proxied by the variables: Caloric Consumption (IK), Disease Prevention Costs (XL), Health Insurance (XAS), and Food Security (XT) affect the poverty status of households in Provinces and Regions Special Region of Yogyakarta in 2021. This means that this increase in investment has led to a decrease in the poverty rate of households in the Province of the Special Region of Yogyakarta. Investments in improving the quality of life through protein consumption do not affect household poverty in the Special Region of Yogyakarta Province.

Author Contributions

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Conflicts of interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

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