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Education and its effect on monetary poverty of households in Peru

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Introduction: The objective of this research was to determine the effect of education on poverty in Peruvian households, in the period 2022.

Methods: For which the quantitative approach was considered, of a non-experimental research type, with a descriptive correlational design, considering the information collected in the National Household Survey (ENAHO); the logit-binomial logistic regression model was used to measure the effect of the variables expenditure on education, monthly economic income, years of schooling, the mother tongue of the head of the household, age of the head of the household, marital status of the head of the household, gender of the head of the household, and area of residence, on the probability of being poor, according to the poverty line established by the INEI.

Results and discussion: According to the results obtained, expenditure on education, monthly economic income, years of schooling, and area of residence explain the probability of being poor in a negative way, while the mother tongue of the head of the household, the age of the head of the household, the marital status of the head of the household, and the gender of the head of the household explain the probability of being poor in a positive way. Therefore, it was determined that there is a significant effect of education on whether households in Peru are considered poor or not.

KEYWORDS

education, poverty, education level, head of household, economic income

1 Introduction

Poverty is a social phenomenon that is present in all societies, whether to a greater or lesser degree, which is why it is the object of study in order to take measures to confront it and minimize its negative impact on the economy. Currently, poverty is not defined exactly and there are different points of view; however, most of the conceptualization of this term coincides with that situation in which people do not have sufficient means to satisfy their basic needs, depending on the social group and specific moment in which they are found. Within these needs, we find food, education, health, housing, and clothing, among others (Aguado et al., 2007; Capurro et al., 2020; Carrasco and Castillo Araujo, 2021; Cepal, 2020; Cuenca-López and Torres, 2020; Dammert and García, 2011; Kasri, 2017; Quispe-Mamani et al., 2022b; Schreiner, 2012; Sobrino, 2015; Wiesenfeld and Sánchez, 2012).

Peru is one of the countries in the region that has gone through one of the most rapid changes at the family structure level. Currently, one in four children in Peru lives with a single parent; according to INEI data, the highest percentage of these families is made up of the mother and her children, placing these structures in a clear situation of vulnerability; and with

a high possibility of exceeding the poverty line due, mainly, to the lower probability of completing higher education and reduced job opportunities, with an average of 3.7 members per household. The current level of poverty is still a worrying indicator and an unfortunate sign of the enormous social inequality that exists, and despite having had a significant decrease compared to the 1990s, where poverty plagued almost half of the population; it is clear that it is still an urgency and priority at the level of public policy (Herrera, 2002; Inei and Banco Mundial, 2000; Instituto Nacional de Estadística e Informática, 2021; Instituto Nacional de Estadística e Informática, 2022a; Sánchez, 2015).

Monetary poverty reached 30.1% of the total Peruvian population in 2020, representing an increase of 9.9 percentage points compared to the previous year. However, this increase is justified due to the global health crisis due to coronavirus that emerged in March 2020, the government had to declare a State of National Emergency and establish restrictive measures to prevent the spread of COVID-19 (Aparicio et al., 2011; Herrera, 2002; INEI, 2021; Sánchez, 2015).

On the other hand, it is important to know what the government spends on; investment in the education sector plays a fundamental role and contributes to economic growth in the long term. Education has a positive effect on the labor productivity of worker and reduces production losses, and this translates into higher income and a reduction in the level of poverty; as the more years of schooling received, the better the economic income of household. Peru's public spending on the education sector was 4.2% of PIB in 2020, a figure that is relatively low compared to international standards. Our country is one of those with the lowest spending on education in proportion to the GDP of Latin American countries, in the last two decades. Therefore, the government must address the inefficiencies of each sector to achieve greater development and, therefore, a reduction in the level of poverty (Aramburú and Rodríguez, 2011; Bazán, 2022; Calatayud, 2020; Cornejo, 2020; Huerta and Milla, 2020; Orco, 2009; Paulini, 2003; Ponce, 2016; Quispe-Mamani et al., 2022a; Quispe-Mamani et al., 2022b; Urbina and Quispe, 2016).

Just as you mentioned by Briceño (2013), investing in education produces an improvement in wellbeing due to the extension of growth possibilities. In the same way, Carrasco and Castillo Araujo (2021) proposed the theory of human capital, a postulate that emphasizes that investing in education offers, in monetary terms, the possibility of higher income for families. Kamichi (2022), ensures that investment in human capital is a main objective of the government of any country if economic growth and social wellbeing are to be achieved; that is, it depends on the level of education and preparation of the people, achieving better development.

In this sense, according to the various definitions and points of analysis about poverty, the different alternatives that could be applied to reduce it are also explained, such as creating jobs; improving the infrastructure of health, education, and basic services; increasing the income of people and others. In the case of education, it is not clearly defined which educational variables have the best impact on reducing monetary poverty or which is the main determinant (Abrar Ul Haq et al., 2018; Acosta, 2020; Agidew et al., 2018; Barba, 2009; Booysen et al., 2008; Bornacelly, 2013; De Janvry and Sadoulet, 2000; Kasri, 2017; Lewin et al., 2006; Özpinar and Akdede, 2022; Tacuba, 2016).

Hence, the questions that arise in this research are as follows: What is the effect of education on poverty in households in Peru, 2022? Furthermore, the objective of this research is to determine the effect of education on poverty in households in Peru, in the period 2022.

Therefore, as education is essential to escape poverty, it is expected to have an inverse influence on poverty; since the more years of schooling received, the proportional decrease in poverty should be. Additionally, it is expected that spending on education, monthly income, and the area of residence will have a negative influence on poverty; while the mother tongue of the head of the household, the age of the head of the household, the marital status of the head of the household, and the gender of the head of the household will have a negative influence on poverty.

2 Literature review

2.1 Poverty

The term poverty is complex, as it refers to living a tolerable life that involves aspects such as having a long and healthy life, a good education, good medical care, as well as having political freedom, respect for human rights, personal security, access to productive and well-paid work, and participation in community life. However, given the fact that some variables that constitute the quality of life of people cannot be counted (such as free association, freedom of expression, among others), the study of poverty has been restricted to quantifiable and material aspects related to the standard of living (Bazán, 2022; De Janvry and Sadoulet, 2000).

Poverty measurements based exclusively on monetary income provide an incomplete assessment of the standard of living. Identifying people in poverty solely based on their current income is an approach focused on the household's consumption capacity within the market, but it does not directly reflect their access to public goods. In the case of multidimensional poverty in Peru, various microeconomic factors, such as access to education, health services, and basic infrastructure, are key determinants. However, many of these services are private or require additional payments, meaning they cannot be obtained solely with available income. This weakens the relationship between income and well-being, as poverty is not only dependent on monetary resources but also on access to essential services that influence quality of life (Larrañaga, 2007).

According to the monetary approach, members of a family whose *per capita* spending is not sufficient to acquire a basic basket of food and non-food items such as education, housing, health, among others, are considered poor (INEI, 2020).

2.2 Human capital theory

According to Rojas and de Aguirre (2023), by introducing the concept of human capital, he proposes an alternative to the Malthusian assumption of neoclassical growth theory. In his model, human capital is an important source of economic development that depends on advances in technological and scientific knowledge. A key assumption of this model is that the rate of return on investments in human capital rises rather than falls as human capital increases. Man is creative, and therefore, education today implies more production for the future; for this reason, resources are not necessarily fixed and can increase as the population grows.

2.3 Human capital, education, and poverty

According to Pizarro et al. (2011), considering the current concept of human capital as the main source of wealth for a country, investment in education is one of the most appropriate strategies to achieve economic growth and poverty reduction, having a positive impact on people's income and other social and economic aspects that generate wellbeing.

2.4 Relationship between poverty, inequality, and education

Many authors claim that education has a considerable influence on economic growth as demonstrated by empirical evidence. As stated by Patrinos (2016), education is a valuable tool to combat poverty and inequality, and it also has a positive effect on economic growth. In addition, by increasing the level of education, the level of income would increase, and there would be a tendency for poverty to decrease. Improving education and eradicating poverty are two complementary objectives as improvements in education have an impact on the economic growth of country, which will result in an improvement in the quality of education and a decrease in the poverty rate.

There are many ways to establish and quantify the relationships that exist between these variables. For example, based on the profile of the poor population, analyzing the correlation that exists between the levels of education attained by the head of the household and the family's socioeconomic situation; or what percentage of the first decile of the population completed primary education vs. the percentage recorded in the tenth decile; or finding the probability of being poor if one completes higher education or what percentage of the variance (inequality) of income is explained by education (Arsani et al., 2020; Martin et al., 2013; Mihai et al., 2015).

2.5 Poverty line

According to the INEI, the poverty line is the monetary equivalent of the cost of a basic food and non-food consumption basket, which for the year 2022 amounts to 415 soles per month per inhabitant, the person whose monthly expenditure is less than 415 soles is considered poor. Similarly, the extreme poverty line considers the population whose expenditure per inhabitant does not cover the cost of the basic food consumption basket, which for the year 2022 is estimated at 226 soles per month per person; people whose monthly expenditure is less than 226 soles are considered extremely poor (Instituto Nacional de Estadística e Informática, 2022b).

2.6 Education and the probability of being poor

The robust way of quantifying the relative importance of education and other variables in determining a person's final poverty situation requires the econometric estimation of a probability model. If a regression is estimated where, for example, the explanatory variables are the levels of education, sex, and age, and the explained variable is a dichotomous variable that reflects the fact of being poor (the variable takes the value 1) or not (takes the value 0), considering a certain functional form; what will be obtained is precisely the probability of being poor. Furthermore, if the explained variable (P, the probability of being poor) is partially derived with respect to one of the explanatory variables (e.g., years of education), the impact of one more year of education on the future probability of being poor is obtained (Awan et al., 2011; Hofmarcher, 2021; Tilak, 2002).

3 Materials and methods

3.1 Research approach, type, and design

This study adopts a quantitative, non-experimental approach with a descriptive and correlational design, aimed at verifying the established hypothesis and objectives. Its purpose is to analyze the effect of education on poverty in Peruvian households during the year 2022 (Hernández et al., 2010).

3.2 Population and sample

The population under study is made up of the total number of inhabitants of Peru in the year 2022, which amounts to 32,625,948 inhabitants, according to the INEI (2021). The sample consists of a total of 25,051 household heads, who were selected based on the criteria of the National Institute of Statistics and Informatics (INEI) in the 2022 National Household Survey.

3.3 Variable identification

The present study examines variables such as the condition of monetary poverty (expressed in two categories), the years of study of the head of the household, the age (expressed in years), the gender (expressed in two categories), the level of education (expressed in several categories), the language spoken (expressed in various categories) and educational expenditure (expressed in soles) (Table 1) (Juárez et al., 2002; Solano and Álvarez, 2005).

3.4 Model approach

To determine and measure which educational variables influence the reduction of monetary poverty in Peruvian households, the binary response model was considered: logit; this is because poverty is a qualitative variable, where its categorization was established in two groups, poor and non-poor. In this way, the econometric model proposed is as follows:

$$Prob\left(Monetary\ poverty\ in\ the\ household_i = 1\right) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 Education\ spending + \beta_2 Monthly\ economic\ income + \beta_3 Years\ of\ schooling + \beta_4 Mother\ tongue + \beta_5 Age + \beta_6 Civil\ status + \beta_7 Gender + \beta_8 Residence\ area + u_i)}}$$

The binary logistic regression model was considered because, as a data analysis technique, it uses mathematics to find the relationships between two data factors (education and poverty); therefore, it uses

TABLE 1 Operationalization of the research variable.

Variable type	Dimension	Variable name	Category	Information source
Dependent variable	Social	Monetary poverty in the household	1: Poor	National Household Survey (ENAHO), INEI-2022
			0: Not poor	
Independent variable	Economic	Education expenses	Soles	
	Economic	Monthly economic income	Soles	
	Social	Years of schooling	Years of education received	
	Social	Mother tongue of the head of the household	Castilian	
			Quechua	
			Aymara	
			Others	
	Social	Age of head of the household	Year old	
	Social	Marital status of the head of the household	1: Cohabitant	
			2: Married	
			3: Widower	
			4: Divorced	
			5: Separated	
			6: Single	
	Social	Gender of the head of the household	1: Male	
			0: Feminine	
	Social	Residence area	1: Rural area	
			0: Urban area	

TABLE 2 Joint description of the variables.

Variables	Mean	Standard deviation	Minimum value	Maximum value
Monetary poverty in the household	0.21	0.41	0.00	1.00
Education expenses	129.53	466.86	0.00	11,633.00
Monthly economic income	1064.77	1146.35	1.00	20,500.00
Years of schooling	11.51	3.95	0.00	18.00
Mother tongue of the head of the household	1.19	0.51	1.00	4.00
Age of head of the household	37.97	14.21	14.00	85.00
Marital status of the head of the household	3.54	2.17	1.00	6.00
Gender of the head of the household	0.59	0.49	0.00	1.00
Residence area	0.83	0.37	0.00	1.00

this relationship to predict the value of one of these factors based on the other; this prediction has a finite number of results, such as a yes or a no, and allows for a more practical analysis of the behavior of poverty based on education.

4 Results

4.1 Descriptive analysis of the explanatory variables

When managing the existing information in the National Household Survey, for the 2022 period, from the database with updated INEI methodology; the results were obtained by variables shown in Table 2, where the total number of respondents amounts to 25,051 people; the age range of the heads of household is between 14 and 85 years, with an average age of 38 years, who have an average of 12 years of study; the average monthly economic income received by them amounts to 1064.77 soles per month and the average expenses on education amount to 129.53 soles per month (Table 2).

Specifically, monetary poverty in the household is considerable, given that of the total number of respondents, 78.54% are part of the non-poor group and 21.46% are part of the situation of being poor. In the case of education expenses, on average, households incur expenses of an average of 129.53 soles per month, in some cases not allocating any amount to the education of household members, which shows a situation of lack; Regarding the monthly economic income, on average it amounts to 1064.77 soles, with a deviation of 1146.35, evidencing

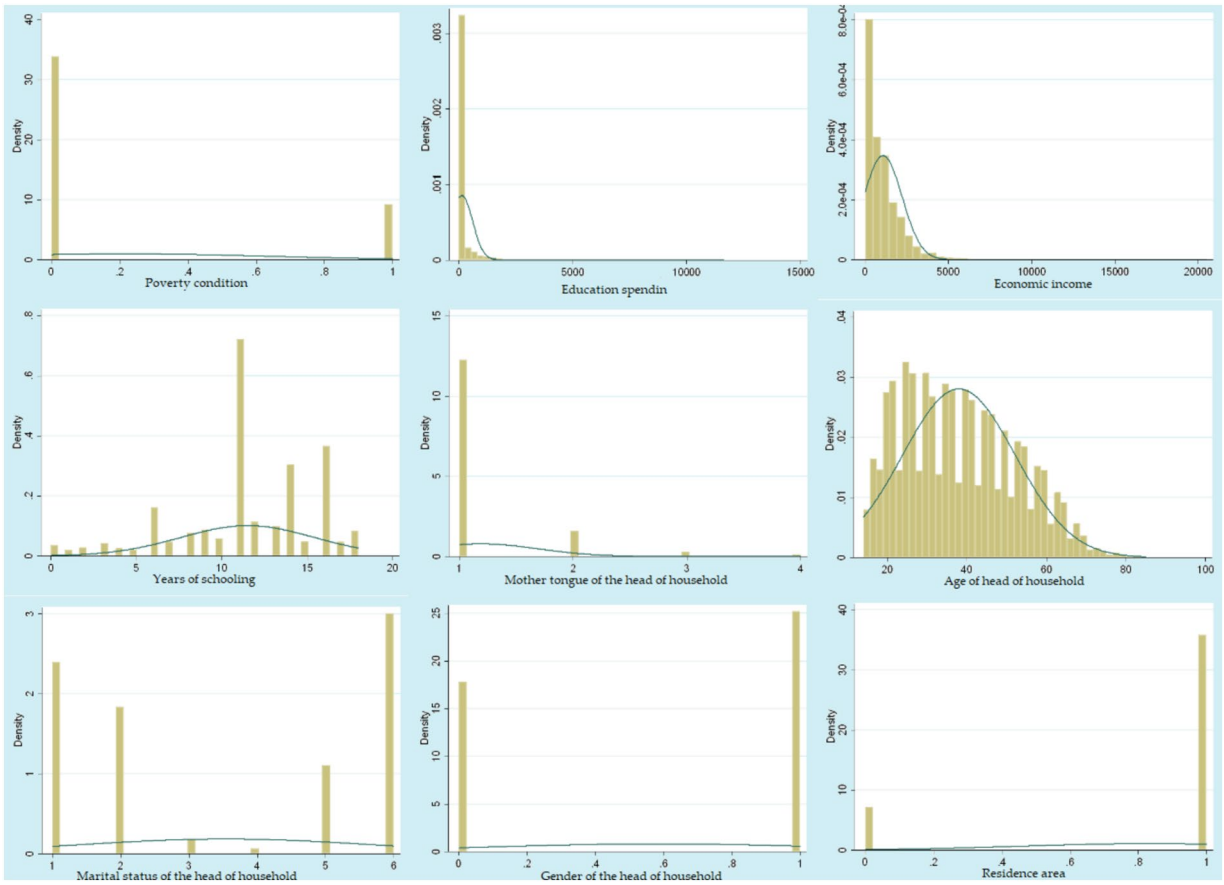

FIGURE 1
Behavior of education and its effect on monetary poverty.

a bias between households with low economic resources and those with high economic income (Figure 1).

The behavior of the years of schooling is quite particular, but on average, the years of schooling received by the heads of the household amounts to 12 years; that is, they have an average level of incomplete secondary education. Furthermore, the maximum period of schooling was only received by 3.53% of household heads with 18 years of schooling, 30% of respondents received only years of schooling, and 145% did not receive any years of schooling (Table 3).

Additionally, in the case of the origin of the mother tongue of the head of the household; 85.64% indicated that they have Spanish as their mother tongue, 11.22% indicated that they have the Quechua language as their mother tongue, 2.11% indicated that they have Aymara as their mother tongue, and 1.03% indicated that they have other languages as their mother tongue. In the case of age, on average, the heads of household are 38 years old, where the lowest age is 14 years and the oldest head of the household is 85 years old. Regarding marital status; 27.88% are cohabiting, 21.38% are married, only 2.14% are widowed, 0.78% are divorced, 12.86% are separated, and 34.95% are single. This is reflected in the gender of the head of the household, where 58.59% of the heads of the household are men and only 41.41% are women. Furthermore, of the group studied, 83.35% have the urban area as their residence area and 16.65% have the rural area as their residence (Figure 1).

4.2 Analysis of the relationship of the variables with monetary poverty in the household

When analyzing the relationship of the explanatory variables with monetary poverty in household, the Pearson *P* coefficient was used; from which, it can be considered that expenditure on education, monthly economic income, years of schooling, age of the head of the household, and area of residence have a low and significant negative correlation with monetary poverty at household; on the contrary, the mother tongue of the head of the household, marital status of the head of the household and gender of the head of the household have a low and significant positive correlation with monetary poverty at household (Table 4).

As determining the explanation of the correlation of the variables with monetary poverty in the household is complex, the coefficient of determination (R2) was considered. Therefore, educational expenditure in the household share up to 0.14%; monthly economic income and monetary poverty in the household share up to 2.01% of the variance; years of schooling and monetary poverty in the household share up to 3.61% of the variance; the mother tongue of the head of the household and monetary poverty in the household share up to 2.35% of the variance; the age of the head of the household and monetary poverty in the household share up to 0.003% of the variance, the

marital status of the head of the household; and monetary poverty in the household share up to 1.11% of the variance, the gender of the head of the household; and monetary poverty at household share up to 0.23% of the variance and area of residence and monetary poverty at household share up to 6.40% of the variance (Table 4).

4.3 Econometric model estimation analysis

Analyzing the hypothesis proposed, that the educational variables that help reduce the level of monetary poverty in households in Peru are education expenses, monthly economic income, years of schooling, mother tongue of the head of the household, age of the head of the household, marital status of the head of the household, gender of the head of the household, and area of residence, given that they have a significant effect in determining the level of monetary poverty in the household.

TABLE 3 Behavior of the years of schooling.

Years of schooling	Frequency	Percentage
0	364	1.45%
1	198	0.79%
2	292	1.17%
3	438	1.75%
4	270	1.08%
5	224	0.89%
6	1,689	6.74%
7	489	1.95%
8	816	3.26%
9	910	3.63%
10	609	2.43%
11	7,573	30.23%
12	1,199	4.79%
13	1,056	4.22%
14	3,189	12.73%
15	508	2.03%
16	3,842	15.34%
17	501	2.00%
18	884	3.53%
Total	25,051	100.00%

The binomial logit econometric model was applied, where the dependent variable is monetary poverty in the household (1 = poor and 0 = not poor), and the independent variables are education expenses, monthly economic income, years of schooling, the mother tongue of the head of the household, the age of the head of the household, the marital status of the head of the household, the gender of the head of the household, and the area of residence; a logistic cumulative distribution function is assumed because this distribution allowed us to obtain a model with better goodness of fit.

The regression results are shown in Table 5, where the pseudo-R squared value is 0.1010, indicating that the independent variables explain 10.10% of monetary poverty in households in Peru. Additionally, the chi-square p-value is less than 0.01, which, with a 99% confidence level, suggests that the independent variables have a highly significant effect on monetary poverty in Peruvian households.

When performing the individual analysis of the variables of the results in Table 5, it follows that all the coefficients of each of the explanatory variables are individually significant at the 5% level, given that the absolute value of the *Z*-statistic of the variables is greater than 2. The analysis of each of the exogenous variables shows as follows:

The coefficient of the variable expenditure on education of the head of the household takes the value of −0.0001, which is significant at 5% and negative; therefore, an increase in the education expenses of the head of the household causes a reduction in the probability of being poor.

The coefficient of the variable monthly economic income of the head of the household takes the value of −0.0002, which is significant at 1% and negative; therefore, an increase in the monthly economic income of the head of the household causes a reduction in the probability of being poor.

Similarly, the coefficient of the variable years of schooling of the head of the household takes the value of −0.0544, which is highly significant at 1% and negative; therefore, an increase in the years of schooling of the head of the household causes a reduction in the probability of being poor.

TABLE 4 Correlation coefficient and determination of variables.

Relationship of variables	Monetary poverty in the household	Determination coefficient R2
Monetary poverty in the household	1.0000	100.00%
Education expenses	−0.0369	0.14%
Monthly economic income	−0.1419	2.01%
Years of schooling	−0.1899	3.61%
Mother tongue of the head of the household	0.1534	2.35%
Age of the head of the household	−0.0051	0.003%
Marital status of the head of the household	0.1055	1.11%
Gender of the head of the household	0.0476	0.23%
Residence area	−0.2529	6.40%

They are significant at a 95% confidence level.

TABLE 5 Approach to the regression of the efficient econometric model.

Variables	Coefficient	Standard error	Valor Z	$p > z$	95% confidence interval	
Education expenses	−0.0001	0.0000	−2.26	0.0240	−0.0002	0.0000
Monthly economic income	−0.0002	0.0000	−8.61	0.0000	−0.0002	−0.0002
Years of schooling	−0.0544	0.0050	−10.86	0.0000	−0.0643	−0.0446
Mother tongue of the head of the household	0.4657	0.0290	16.05	0.0000	0.4088	0.5225
Age of the head of the household	0.0140	0.0013	10.74	0.0000	0.0115	0.0166
Marital status of the head of the household	0.1924	0.0087	22.01	0.0000	0.1753	0.2095
Gender of the head of the household	0.2300	0.0339	6.78	0.0000	0.1636	0.2965
Residence area	−1.1042	0.0401	−27.56	0.0000	−1.1827	−1.0256
Constant	−1.5924	0.1006	−15.83	0.0000	−1.7896	−1.3953
Log likelihood = −11709.41		Prob > chi2 = 0.0000				
Number of obs = 25,051		Pseudo R2 = 0.1010				
LR chi2 (8) = 2631.16		Correctly classified = 79.54%				

The coefficient of the variable mother tongue of the head of the household (age) takes the value of 0.4657, which is highly significant at 1% and positive; that is, as the head of the household has Quechua or Aymara as his mother tongue, then the probability of being poor increases.

The coefficient of the variable age of the head of the household takes the value of 0.0140, which is highly significant at 1% and positive; that is, as the age of the head of the household increases, the probability of being poor increases.

The coefficient of the marital status variable of the head of the household takes the value of 0.1924, which is highly significant at 1% and positive; which means that if the head of the household has a partner, the probability of being poor increases.

The coefficient of the variable gender of the head of the household takes the value of 0.2300, which is highly significant at 1% and positive; this indicates that a household where the head is a woman then increases the probability of being poor.

The coefficient of the variable area of residence of the head of the household takes the value of −1.1042, which is highly significant at 1% and negative; it is understood that if the head of the household lives in an urban area, the probability of being poor is reduced.

After the regression analysis of the Logit-Binomial model, the calculations of the marginal effects of the educational variables were made, the results of which are seen in Table 6.

The results allow us to deduce that educational expenses, monthly economic income, years of schooling, and area of residence negatively influence the probability of monetary poverty in the household; on the contrary, the variables mother tongue of the head of the household, age of the head of the household, marital status of the head of the household and gender of the head of the household have a positive relationship with the probability that there is monetary poverty in the household.

In this sense, if there is an increase of one sol in education expenses and monthly economic income, then the probability of having monetary poverty in the household decreases by 0.002 and 0.003 percentage units, respectively. If the years of schooling increase by 1 year, then the probability of having monetary poverty in the household decreases by 0.833 percentage units. If the area of residence is the urban area, then the probability of having monetary poverty in the household decreases by 20.63 percentage units.

On the contrary, if the mother tongue of the head of the household is Quechua or Aymara; if the age of the head of the household increases by 1 year; if the marital status of the head of the household is married; or if the gender of the head of the household is female; then the probability of having monetary poverty in the household increases by 7.121, 0.215, 2.942, and 3.475 percentage units, respectively.

Additionally, checking whether the model helps us estimate correctly, we tested the prediction capacity of the model with the Stat class command in the Stata-16 program, it was found that the model has a 79.54% correct prediction capacity; therefore, for every 100 heads of the household, the model correctly estimates 80 of them (Table 7).

Finally, analyzing the sensitivity and specificity of the model, it is evident that the optimal cutoff point between sensitivity and specificity is 22%. Regarding the ROC curve, the area under its curve is 0.7157, which shows that it is an acceptable model and that it discriminates correctly (Figure 2).

5 Discussion

According to the results found in this research, expenses on education, monthly economic income, years of schooling, and area of residence negatively explain the probability of having monetary poverty at household; while the mother tongue of the head of the household, the age of the head of the household, the marital status of the head of the household, the gender of the head of the household are positively related to the probability of having monetary poverty in the household.

The results shown in the previous point are corroborated by León (2019), since when investigating human capital and regional poverty in Peru, he was able to determine that, the greater the number of years of schooling achieved and for each additional year in life expectancy, then the percentage of the population in a situation of poverty decreases by 8.7 and 3.1 percentage points, respectively, which is

TABLE 6 Marginal effects of the econometric model.

Variables	dy/dx	Standard error	*z*	*p* > *z*	[95% C.I.]		*X*
Education expenses	−0.002	0.000	−2.26	0.024	0.0000	0.0000	129.53
Monthly economic income	−0.003	0.000	−8.7	0.000	−0.0001	0.0000	1064.77
Years of schooling	−0.833	0.001	10.87	0.000	−0.0167	−0.0068	11.51
Mother tongue of the head of the household	7.121	0.004	16.06	0.000	0.0625	0.0799	1.19
Age of the head of the household	0.215	0.000	10.78	0.000	0.0018	0.0025	37.97
Marital status of the head of the household	2.942	0.001	22.41	0.000	0.0269	0.0320	3.54
Gender of the head of the household	3.475	0.005	6.88	0.000	0.0249	0.0446	0.59
Residence area	−20.630	0.009	23.94	0.000	−0.4126	−0.1894	0.83

TABLE 7 Classification matrix of the proposed model.

Classified	True		Total
	D	~D	
	812	563	1,375
	4,563	19,113	23,676
Total	5,375	19,676	25,051
Classified + if predicted Pr(D) > = 0.5			
True D defined as CondP! = 0			
Sensitivity		Pr(+ D)	15.11%
Specificity		Pr(− ~ D)	97.14%
Positive predictive value		Pr(D +)	59.05%
Negative predictive value		Pr(~D -)	80.73%
False + rate for true ~D		Pr(+ ~ D)	2.86%
False - rate for true D		Pr(− D)	84.89%
False + rate for classified	+	Pr(~D +)	40.95%
False - rate for classified	−	Pr(D -)	19.27%
Correctly classified			79.54%

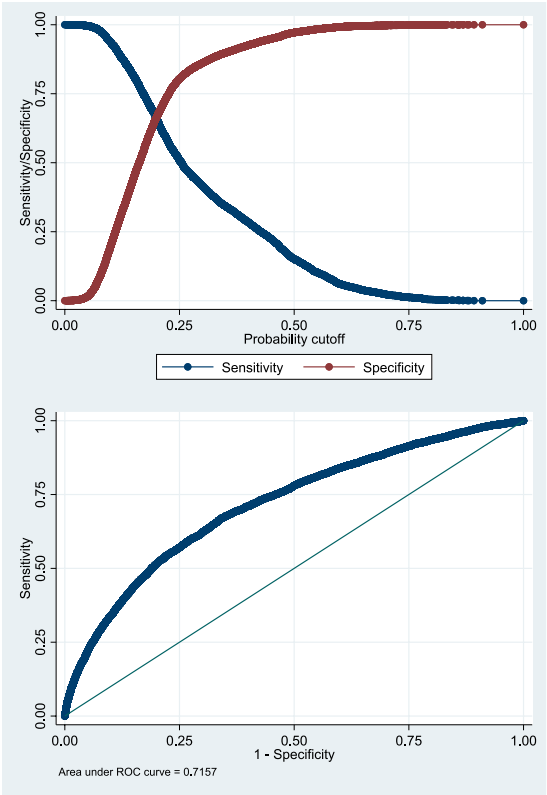

FIGURE 2
Analysis of specificity and sensitivity by cutoff points.

complemented by the investment expenditure by the State, the geographic location of the household, with market access conditions that contribute to it.

In contrast to the results obtained by Arias and Sucari (2019), who were able to determine that, starting with secondary education in Peru, monetary poverty can be reduced as an increase in the amount of educated population by educational levels would lead to a decrease in poverty by regions in a margin of 1.07, 1.68, and 0.83%. Furthermore, the relevant public policy is for the regions and the central government to close gaps in access to education, especially in secondary education and non-university education, which have a greater effect. However, this must be complemented with the generation of a more pertinent and favorable macroeconomic environment, where access to the labor market is guaranteed by people's education, thus increasing the flow of income; which is corroborated by Aguado et al. (2007).

In addition, the results evidenced in the present research are consistent with what was found by Calero and Faustino (2024); as the higher the educational level of the head of the household in the Huánuco Region of Peru, it contributes to a greater decrease in the probability of being poor, taking into account the monetary poverty line. It also highlights that primary and secondary level studies allow reducing the probability of being poor by 2.19 and 3.60 percentage points, which shows that people who have a primary and secondary education level have a moderate and low probability of being poor.

Additionally, the results obtained in this research are consistent with what was found by León (2003), given that educational variables have a significant impact on the measurement of poverty, which translates into a structural and constant problem; in addition, other non-educational variables also have an impact on poverty and complement its current problem, which exposes and puts at risk the sustainability

conditions of Peru toward its full development and economic growth for the coming years.

Furthermore, what was found is coincident with Castro et al. (2017), given that, for said authors, households whose composition of its members occurs in a scenario of free union or cohabitation but that have minor children, households with a greater number of members, and with poor quality of employment of the head of the household, contribute to increasing the probability of the household being poorer. On the contrary, having a greater number of income earners in the household, residing in an urban area, and having a higher level of education, among others, contribute to reducing the probability that the household is poor.

Just as was determined by Bazán (2022), poverty in Peru is a complex socioeconomic problem with multiple dimensions, it is difficult to manage and at the same time complicated to eradicate completely. Education is a key determinant as having a population with more years of education received would guarantee greater capabilities and skills, which would allow access to greater opportunities to access the competitive labor market, which is confirmed in the research of Vegas (2017), Bazdresch (2001), Wedgwood (2007), and Mihai et al. (2015).

At the international level, there is research along the same lines at present, such as Arsani et al. (2020) who demonstrated that, in Indonesia, education significantly explains the wealth status of households and health; as the higher the level of education, the greater the improvement in household wealth, which contributes to the reduction in poverty and highlights that tertiary education (higher education) has more effect than primary and secondary education levels.

Another case was found by Hofmarcher (2021) as he demonstrated that there are poverty reduction effects economically contributed by education, which indicates that an additional year of education allows for reducing the probability of being poor, which is complemented by explaining participation in the labor force and employment, mainly full time.

Finally, it is consistent with the findings by Awan et al. (2011), as the work experience of the head of the household, with educational attainment, had a significant relationship with the incidence of poverty between the periods 1998–1999 and 2001–2002 in Pakistan, which explains that the higher the educational level achieved, then the chances of the person not being poor increase; which is complemented by the advantage of being a man, which gives him a greater chance of overcoming the poverty level.

That is why, with the evidence found in this research, complemented by what was shown by the authors discussed, the current government of Peru must improve and intensify educational policies and programs, in order to generate more competitive human capital, in accordance with the demands of the modern labor market, providing capacities and developing skills that allow them to face the demanding labor market. In addition, the implementation of public policies at the regional level must be guaranteed, seeking to implement projects and programs that allow closing the gaps in access to education, mainly to secondary education and university and non-university education, as these have more effects on the reduction of poverty, just as recommended Quispe-Mamani et al. (2022a) and Quispe-Mamani et al. (2022c).

In order to consolidate the empirical evidence found in this scientific research, it is necessary to continue deepening research related to the line of research on education and poverty, but using data from more periods, at the regional level and using econometric tools that allow evidencing the differentiated reality of education with poverty.

6 Conclusion

The educational variables that significantly reduce the probability of being poor in Peruvian households are years of schooling, educational expenses, monthly economic income of the head of the household, and area of residence; these variables have an inverse relationship with the probability of being poor.

Furthermore, to the extent that the head of the household has one more year of education, the probability of being poor reduces by 0.833 percentage units. Each unit increase in educational expenses decreases the probability of being poor by 0.002 percentage units; that is, for every 100 soles of spending on education, the probability of being poor reduces by 0.002 percentage units.

Data availability statement

The data used in this research are found in modules 100, module 200, module 300 and module 500 of the 2022 National Household Survey, URL: https://proyectos.inei.gob.pe/microdatos/.

Author contributions

JQ: Data curation, Writing – original draft, Writing – review & editing. RC: Conceptualization, Methodology, Software, Writing – original draft. MG: Formal analysis, Investigation, Resources, Validation, Writing – original draft.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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