

# Assessment of Basic Social Services Coverage on Life Quality for Ethnic Minorities in Vietnam

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This research uses the weighting method to build a composite index of life quality and an impact assessment model to explain the relationship between basic social services coverage and life quality for ethnic minorities in Vietnam. The study uses secondary data collected through Vietnam Household Living Standards Surveys (VHLSS), the survey on the socio-economic situation of 53 ethnic minorities in 2015 and provincial GDP per capita data conducted by the General Statistics Office of Vietnam (GSO). The results show that the life quality of ethnic minorities is relatively low compared to the majority and quite different among localities. The results also reveal that basic social services coverage, especially in terms of health and education, plays an important role in improving the life quality of ethnic minorities. In addition, improving the quality of infrastructure, especially transport and communication infrastructure, is important to increase accessibility to basic social services for ethnic minorities.

**Keywords:** *Ethnic minorities, Basic social services, Life quality, Vietnam.*

**JEL code:** C43, C51, H40, J15, J17

## Introduction

There are 53 ethnic groups in Vietnam, with a population of 14.7 million people, accounting for 14.7% of the national population. Among those, six ethnic groups with populations of over one million people include Tay, Thai, Muong, Mong, Khmer, Nung (the Tay are the most populous with 1.85 million). There are eleven ethnic groups with a population of less than 5000 people, of which O Du has the lowest population (428 people) (Central Population and Housing Census Steering Committee, 2019). The majority of ethnic minorities reside in the midlands and mountains, with low socio-economic starting points, underdeveloped



infrastructure, and having many of the poorest households in the country. Although the government has issued and implemented many programs and projects to ensure access to basic education for children and ethnic minorities, the proportion of illiterate adults remains high and the school enrolment rate at the right age for children is lower than the national average (Do, et al., 2020). The percentage of women visiting health facilities for antenatal care is low in some ethnic minorities, leading to high infant mortality rates. There are still 15.6% of ethnic minority households who are living in simple and non-solid houses. More than 50% of households of Kho Mu, Chut, La Ha, La Chi, Lao, Pu Peo, Bru Van Kieu, Ha Nhi, Lo Lo, Khang and Xinh Mun consume unhygienic water and 17% of ethnic minority households have hygienic toilets. Access to computers and the Internet is very limited for ethnic minorities. Less than 1% of households in the ethnic groups of Si La, Chut, La Hu, and Xinh Mun have computers (Phung, Nguyen, Nguyen, Nguyen & Ta, 2016). Low coverage of basic social services leads to the low life quality of ethnic minorities.

In order to provide an overall picture of the life quality of ethnic minorities and assess the impact of social service coverage on the life quality, the article uses weighting methods in the construction of life quality indicators, as well as quantitative analysis to assess the influence. The data used for analysis is accurate and objective since it is synthesised from Vietnam Household Living Standards Surveys (VHLSS), the survey on the socio-economic situation of 53 ethnic minorities in 2015 and provincial GDP per capita data conducted by the General Statistics Office (GSO).

## Literature Review

The basic social services introduced by UNDP, UNESCO, UNFPA, UNICEF and WHO at the time of the World Summit on Social Development in Copenhagen in May 1995 "are service activities that provide for those who meet the minimum needs of life" (DAC/UNICEF, 2006). The 20/20 Initiative defines basic social services as comprising basic education, primary health care, and family planning services, low-cost water and sanitation, and nutrition programs (UNDP, 2001). Mehrotra, Vandemoortele and Delamonica (2000), confirm that basic social services help people to achieve sustainable development. Components of basic social services such as healthcare, basic education, clean water and adequate housing help people work towards a better life and leave poverty. McGuire (2005), points that providing social services to the poor includes fulfilling the needs of the poor for basic education, health, nutrition, and other basic social needs.

In Vietnam, the phrase "basic social services" was first mentioned in the Vietnam National Action Program for Children 2001-2010 (Prime Minister, 2001a). Shortly thereafter, in the overall objective of the National Target Program on poverty reduction and employment in 2001-2005, the goal of supporting the poor, poor households and poor communes to access

social services has also been established (Prime Minister, 2001b). From here, the public policies issued by the State often set the goal of ensuring access to basic social services. At the same time, the components of basic social services in Vietnam have been agreed with the promulgation of multidimensional poverty lines, including education, health care, housing, clean water and sanitation, and information (Prime Minister, 2015).

Fulfilling basic social services empowers the poor to escape poverty. It helps the poor to be more fruitful and gives them new opportunities to make the essential income to escape poverty and live a full life (McGuire, 2005). Investing in human capital by providing basic social services is the key to poverty reduction (Morrisson, 2002). Developing countries have increased efforts to improve the accessibility of basic social services and to make them more inclusive. However, outcomes have been mixed: while some have been successful, others, the poor still lack adequate access to basic social services (Zhuang, 2011). Ballard (1979), argued that cultural and social considerations need to be taken into account, and especially to meet ethnic diversity when providing basic social services to ethnic minorities.

Tran and Nguyen (2016), identify that welfare accessibility in terms of housing, health care services, employment services, and public services is a condition for having a better life for minorities in the urban areas of Vietnam. De Jongh, Mncayi and Mdluli (2019), show that access to clear water and sanitation contribute to the quality of life for many, besides other factors, such as diversification, energy utilisation, employment and productivity, which make them vital drivers for the region's prosperity. Malley and Fernández (2010), listed two groups of criteria to evaluate the quality of basic social service delivery: (i) the quality of service care and (ii) the quality of life. In this study, the quality of social services is examined through the impact on the life quality, and demonstrates the relationship between coverage of basic social service quality and life quality.

Felce and Perry (1995), mentioned three perspectives on life quality: (i) the life quality conditions; (ii) satisfaction with life; (iii) a combination of living conditions and life satisfaction. However, Cummins (1992), defined life quality as a combination of living conditions and life satisfaction but emphasised the need to consider personal values, aspirations and individual desires. This view has many advantages over the three perspectives previously mentioned. Scutella, Wilkins and Horn (2009), stated that life quality is assessed based on three criteria groups: (i) health and happiness, (ii) living environment and (iii) crime. On the economic front, many scholars argue that the life quality of the people depends on their spending on health and the possession of assets for daily living. Gao, Zhai and Garfinkel (2010), address spending needs according to different levels of households. Generally, the types of expenditure that ensure the life quality of the people include the following: (i) food expenditure to ensure daily rations for family members and (ii) paying outside food for the purpose of improving living conditions, protecting the health of family

members, maintaining relationships with the neighbours, and the communities in which they live, hence creating development opportunities for oneself and one's children through advanced knowledge training. On the basis of a combination of criteria for measuring life quality, Dasguta and Weale (1992), Scutella, et al. (2009), Gao, et al. (2010) and using the results of the survey on household living standards of Vietnam over the years, Mai, Do and Nguyen (2012), determined the life quality of households based on ownership of assets for daily activities, as follows: the current status of home conditions, the number of televisions, phones, refrigerators, air conditioners, washing machines, to name just a few.

The life quality, set in a shift of the perception of public management, is closely connected with the social services provided (Abbate, Giambalvo & Milito, 2001). More specifically, Møller and Schlemmer (1983), suggest that there is a connection between basic needs (nutrition, health, housing, clean water, transportation and education) and life quality. Ensuring basic needs is the foundation to ensuring life quality. Through the assessment of Thailand's Socio-Economic Development Plan 1987-1991, Meesapya (1994), pointed out the positive impact of ensuring the basic needs of the Thai Government's people on life quality. However, this will also depend on people's ability to absorb and ensure their own needs. On the contrary, if the basic needs are not met, the life quality will also decrease (Brinkerhoff & Frideres, 1997). From a government perspective, McGregor, Camfield and Woodcock (2009), assert that through empirical data on life quality, policymakers can identify the needs of people to ensure, from there, the promulgation of appropriate policies that could contribute to the development of society.

Chappell (2007), shows the fact that there is a disjuncture among ethnic groups in terms of the objective and socio-psychological indicators of life quality. However, very little of the work on life quality has focused on ethnic minorities. Using multiple linear regression models, Thumboo, et al. (2003), conclude that ethnicity and socio-economic status are associated with clinically important differences in health-related life quality in a multi-ethnic, urban Asian population.

## **Life quality Index of Ethnic Minorities in Vietnam**

### ***Method of Calculating the Life Quality Index***

There is a variety of methods of calculating the life quality index built on a set of sub-indices. These methods can be divided into two main genres, including (i) building the composite index by getting the average of the sub-indicators; and (ii) applying weighting to sub-indicators when developing composite indexes. The first method has the advantage of being simple, but the significant drawback is that it does not take into account the importance of the sub-indicators. The second method has many ways for calculating weights, such as weights

assigned based on expert opinion, or weights calculated by analysing data by statistical methods.

This study uses the second method proposed by Nicoletti (2000), used by Greyling and Tregana (2016) and OECD (2008), in which the calculation of the weights of the sub-indicators is based on the results of statistical analysis. As such, to build an overall life quality index, the main steps after cleaning the data will include:

**Step 1:** Analyse the data into main components using factor analysis of mixed data (FAMD);

**Step 2:** Standardise load factors and calculate sub-indicators;

**Step 3:** Calculate weights ( $w_i$ ) for sub-indices;

**Step 4:** Calculate composite indexes based on sub-indices and corresponding weights.

The idea of Principal Component Analysis (PCA) is as follows: The main goal of the PCA method is to reduce data dimensions. From a dataset with quite a large number of variables, PCA helps to extract  $p$  main components ( $p < k$ ). These components are characterised by non-correlation and still retain most of the information from the entire data set. In the index development, these key components can be interpreted as sub-indicators, representing different aspects of the index. The non-correlation of the sub-components implies that these sub-indices help to measure different aspects, which do not contain each other's information about the general index.

### ***The Results of Calculating the Life Quality Index of Ethnic Minorities in Vietnam***

This research uses five groups of component indicators to calculate the life quality index of people, including (i) education; (ii) health; (iii) housing; (iv) income; and (v) sanitation (see Appendix 1). The data for calculating the life quality index of people collected through the Vietnam Household Living Standards Surveys (VHLSS) from 2006 to 2016, conducted by the General Statistics Office, included: the 13 variables contain information about different aspects of people's lives (see Appendix 1). Because these variables include both qualitative and quantitative variables, the FAMD method is used to calculate the main component. After calculation, we retain five main components, with individual values of approximately one or more, as shown in Table 1.

**Table 1:** Principal components and specific values

Principal components	Specific values	Explainable	Accumulated sum
1	4.01	26.71	26.71
2	1.70	11.37	38.08
3	1.34	8.91	46.99
4	1.24	8.25	55.23
5	0.99	6.63	61.86

As shown in Table 1, the first principal component can explain 26.71% of the change in the data set, and the same for other components. The aggregate of the five principal components could explain 61.86% of the data set.

The standardisation is performed so that the total contribution of each variable in each principal component is equal to 1; the results reported in Table 2 are as follows:

**Table 2:** Standardised coefficients and sub-indices

Variables	w1	w2	w3	w4	w5
<i>Household head's education level</i>	0.35	0	0	0	0
<i>Average income per capita</i>	0.00	0	0	0.35	0
<i>Primary school</i>	0.28	0	0	0	0
<i>Secondary school</i>	0.37	0	0	0	0
<i>High school</i>	0	0	0	0	0
<i>Housing</i>	0	0	0	0.65	0
<i>Health examination expenses</i>	0	0.28	0	0	0
<i>Inpatient expenses</i>	0	0.37	0	0	0
<i>Severe illness</i>	0	0.34	0	0	0
<i>Clean water</i>	0	0	0	0	1
<i>Television</i>	0	0	0.44	0	0
<i>Telephone</i>	0	0	0.24	0	0
<i>Kitchen</i>	0	0	0.33	0	0

Thus, we can see that the data is aggregated into five sub-indices, showing different aspects of life quality, respectively: (i) education (household head's education level, primary school, secondary school, high school); (ii) health care (examination, inpatient, severe illness); (iii) facilities (television, telephone, kitchen); (iv) economy (average income, housing); and (v) sanitation (clean water).

**Figure 1.** Life quality of ethnic minorities

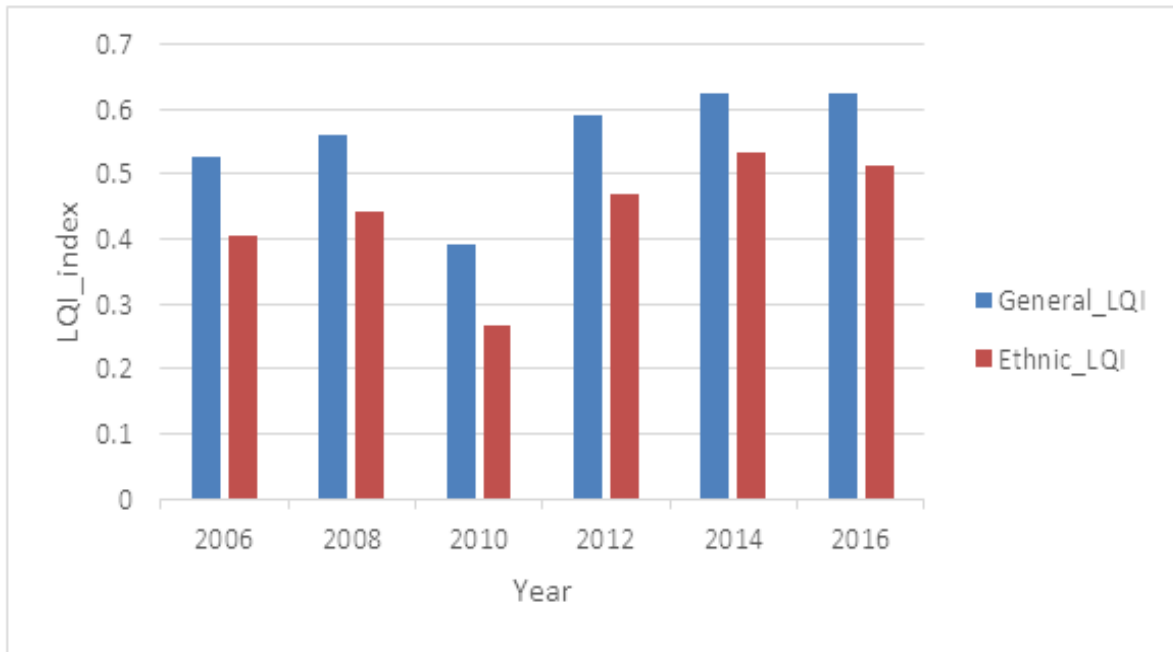


Figure 1 shows that the life quality of people in general and of ethnic minorities, in particular, has improved significantly over time, except for 2010. In general, there is a considerable difference between ethnic minorities and the general living standard, but this gap has gradually narrowed since 2014 compared to the previous periods.

**Figure 2.** Sub-indices for ethnic minorities

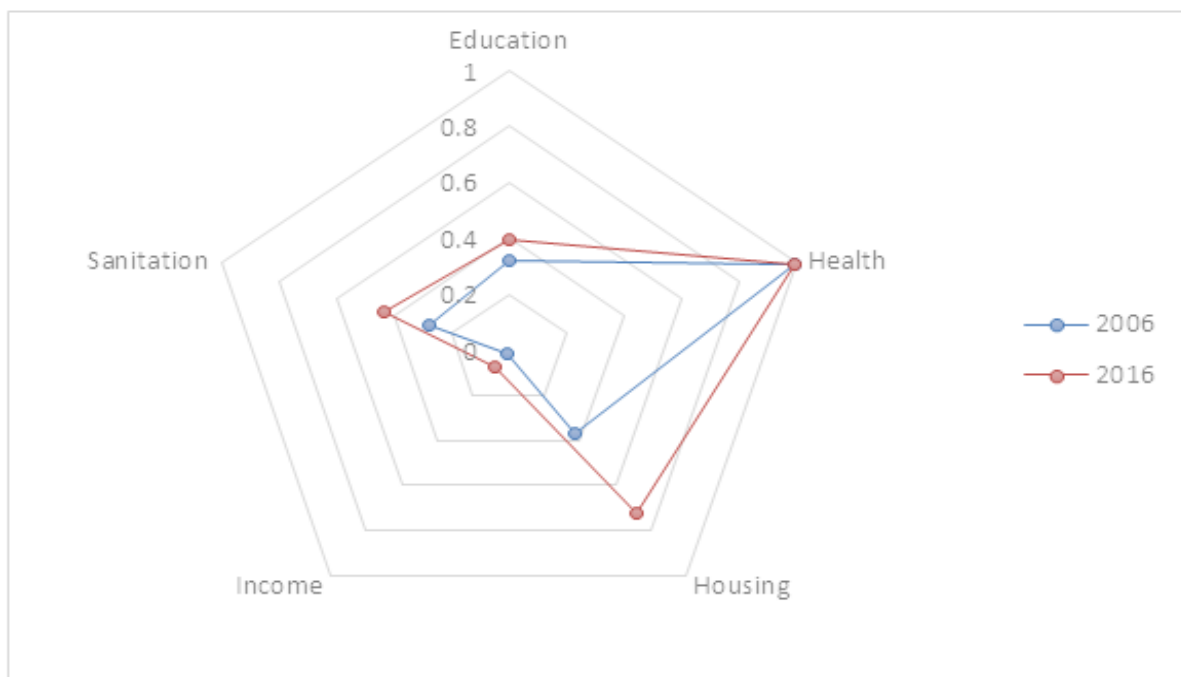


Figure 2 illustrates the changes for ethnic minorities in the sub-indices between 2006 and 2016. It can be seen that the improvement in the indicators of life quality is clearly reflected in factors such as housing and sanitation, and is recorded in some indicators such as education and income. Health factors did not differ much during this period and were among the highest of the five indicators that constitute life quality.

## **Model of Assessing the Impact of Basic Social Service Coverage on the Life Quality of Ethnic Minorities in Vietnam**

### ***Data Description***

The data set for the empirical analysis is aggregated by province from various sources, including the Vietnam Household Living Standards Survey (VHLSS) 2016; the survey on socio-economic situation of 53 ethnic minorities in 2015; provincial GDP per capita in 2000 provided by the General Statistics Office. In particular, the VHLSS data set is exploited to calculate the life quality index of ethnic minorities, the data set of 53 ethnic minorities is exploited to calculate variables representing social service coverage for people in general in provinces and cities across the country. The total data set used in the analysis has a total of 48 observations, including provinces and cities inhabited by ethnic minorities.

### ***Models and variables***

The model to assess the impact of basic social service coverage on the life quality of ethnic minorities in this study is as follows:

$$Ethnic\_LQI_i = \beta_0 + \beta_1 Std\_school_i + \beta_2 Clinic_i + \beta_3 Clinic * Inc\_diff + \beta_4 Infra_i + \beta_5 Infra\_sq_i + \beta_6 Credit_i + \beta_7 Gdp\_per00_i + u_i \quad (1)$$

In which,  $i$  is the provincial index,  $u_i$  is the random error. The variables in the specific model are as follows:

***Ethnic\_LQI***: The life quality index of ethnic minorities, the dependent variable in the regression model, is calculated by the method of Nicoletti et al. (2000), as mentioned in section 3.1, with indicators. The composition consists of five groups: (i) education; (ii) health; (iii) housing; (iv) income; and (v) hygiene. *Ethnic\_LQI* has values between 0 and 1.

***Std\_School***: Percentage of primary schools in the area recognised to meet national standards, unit:%. This variable represents the quality of local education, in which localities with a higher percentage of school meeting standards are expected to have a higher quality of education, thus having a positive impact on life quality.



**Clinic:** The percentage of commune health clinics with doctors. This variable represents the role of ensuring the quality of grassroots health services, unit:%. In fact, in Vietnam, where the ethnic minorities are concentrated, the professional quality of the commune health care staff is quite low, so the presence of a team of doctors is an important factor to ensure the quality of medical examinations and treatment and affect the life quality.

The above variables represent different aspects to ensure the life quality of the general population in the area. In order to add the difference between ethnic minorities and Kinh people in the same locality in enjoying these common conditions, the model adds a difference in income between ethnic minorities and Kinh people. (*inc\_diff*), measured in quartiles of the difference in per capita income of Kinh and ethnic minorities in each province. In the model, *clinic\*inc\_diff* is an interaction variable between *clinic* and *inc\_diff*, showing the difference between ethnic minorities and the Kinh in the same area. The same environment, the greater the difference in income, represents the lower ability to "utilise" the environment, turning it into the life quality of ethnic minorities. The interaction variable between *clinic* và *inc\_diff* allows further consideration of the interaction between the health factor and the income difference factor. Due to the multicollinearity problem, we eliminate the interaction variable between *std\_school* and *inc\_diff*.

**Infras:** The rate of villages with hard roads, representing the quality of infrastructure of localities, units:%. In Vietnam today, transport infrastructure in remote areas, where many ethnic minorities are concentrated, is generally underdeveloped, so *infr* variables are expected to have a positive impact on quality variables, the lives of ethnic minorities. The *infr<sub>sq</sub>* variable is the square of the *infr* variable.

**Credit:** The proportion of ethnic minority households receiving concessional loans through local policy banks. For ethnic minority households, access to preferential credit sources from policy banks is important, because it increases access to basic social services, such as education and health, and increases capital to invest in production, thereby improving the life quality. Unit: %.

**Gdp\_per00:** GDP per capita of each province in 2000, unit: million VND. The variable *Gdp\_per00* is used in the model to control the effects from differences in local socio-economic characteristics to the standard of living of people in general and ethnic minorities in particular.

In terms of data sources, except for the *ethnic\_LQI* dependent variable, compiled from the 2016 Vietnam Household Living Standards Survey (VHLSS), the independent variables, including *std\_school*, *clinic*, *inc\_diff*, *infr*, and *credit* were extracted from the survey on the socio-economic situation of 53 ethnic minorities in 2015, provided by the General Statistics

Office. The independent variables in the model (1) are taken in the form of delay variables over time to control the spillover effects from the basic construction services to the life quality of ethnic minorities. Finally, the data set used in the analysis was aggregated at the provincial level, with 48 observations, including provinces and cities inhabited by ethnic minorities.

Regarding the estimation method, because the dependent variable receives the value in the range (0-1), the regression method with the fractional logistic regression method is selected and used in the analysis.

### Research Results

Table 3 represents the average value of *ethnic\_LQI* at 0.516 with the range of 0.296 to 0.735, indicating a difference in the life quality of ethnic minorities among localities, but the dispersion of the variable is not high. It is noteworthy that the distribution of the *std\_school*, *clinic*, *credit*, and *gdp\_per00* variables is quite large compared to the corresponding mean, suggesting that the factors of basic social service coverage are significantly different between localities.

**Table 3:** Basic statistics of the variables in the regression model

Variables	N	Mean	Std. Dev.	Min	Max
<i>Ethnic_LQI</i>	48	0.516	0.078	0.296	0.735
<i>Std_school</i>	48	40.783	19.413	12.4	93.443
<i>Clinic</i>	48	71.132	21.595	15.888	100
<i>Inc_diff</i>	48			1	4
<i>Infras</i>	48	98.600	1.730	92.573	100
<i>Credit</i>	48	30.977	12.251	1.400	65.396
<i>Gdp_per00</i>	48	3.311	4.950	1.018	35.015

After performing the necessary tests (Appendix 2), the model estimation results (1) by the regression method proportional to logistic distribution are reported in Table 4.

**Table 4:** Estimated Results

Independent Variables	Estimated coefficient	Independent Variables	Estimated coefficient
<i>Std_school</i>	0.0026** (0.001)	<i>Infras</i>	2.1956** (1.185)
<i>Clinic</i>	0.0081*** (0.001)	<i>Infras_sq</i>	-0.0115** (0.006)
<i>Clinic*inc_diff_2</i>	-0.0026** (0.001)	<i>Credit</i>	0.0070*** (0.003)
<i>Clinic*inc_diff_3</i>	-0.0051*** (0.001)	<i>Gdp_per00</i>	0.0080*** (0.003)
<i>Clinic*inc_diff_4</i>	-0.0098*** (0.002)	<i>_cons</i>	-105.348** (57.194)
<i>N</i>	48		

**Note:** Numbers in parentheses are standard errors; The symbols \*, \*\* and \*\*\* denote the significance levels at 10%, 5%, and 1%, respectively.

The estimated results in Table 4 show that the estimated coefficients are consistent with expectation and have statistical significance. The results show that covering general public service has a significant influence on the life quality of ethnic minorities in Vietnam in many respects. As follows:

The coefficient of *std\_school* variable is positive and statistically significant at 10% shows that, when the standard school rate increases by one percentage point, the life quality increases by 0.0026 units. This is in line with the expectation that the better the basic education is, the better the life quality of people becomes. Education is not only an important component of the life quality, but it also has a pervasive impact on other indicators, such as the higher the education level, the more people know how to improve their labour productivity and raise income.

The coefficient of the *clinic* variable positive to 1% significance level implies that if the locality has a better health service quality, the life quality of ethnic minorities is also higher. With the presence of doctors in community health clinics, it will be easier for people to access quality medical services without having to visit higher-level hospitals, thus increasing opportunities and the quality of medical examinations and treatment, contributing to improving the life quality of ethnic minorities.

The coefficient of the *clinic* variable is also significantly large (0.0081) compared to the coefficient of the *std\_school* variable (0.0026), and these numbers are statistically significant, indicating the increase in quality of health services, through the increase in the proportion of

clinics with doctors will play a significant role in improving the life quality of ethnic minorities in the current context.

The coefficients of the interaction variables between *clinic* and *inc\_diff* are negative, decreasing, and statistically significant. This is also in line with the expectation that the province which has a greater income gap between Kinh people and ethnic minorities, the ability to utilise health services to improve the life quality of ethnic minorities in that province will be lower. In particular, the coefficient of the *clinic\*inc\_diff\_4* variable is negative and has an absolute greater value than the coefficient of the *clinic* variable, which implies that if the income disparity between the two ethnic groups is too large, this will ensure that social services are not effective. It may even have negative impacts on the life quality of ethnic minorities if their ability to utilise the services is low and passive.

The coefficient of the *infrass* variable is positive and statistically significant, indicating that transport infrastructure has a positive impact on the life quality of ethnic minorities and this influence decreases gradually with scale. Accordingly, the localities with a higher rate of hardened roads are more convenient for people to access basic social services, and, at the same time, have more opportunities to increase economic activities and have a higher standard of living. In addition, the coefficient of the *infrass\_sq* variable is negative and statistically significant, showing the impact of this factor on the life quality of the people declining by scale.

The coefficient of the *credit* variable is positive and statistically significant, suggesting that credit support for ethnic minorities plays an important role in improving their life quality. As expected, with the preferential support, ethnic minorities will have the financial resources to invest in production, healthcare as well as investment in the education of children, so they can have a better life.

Finally, the coefficient of the *gdp\_per00* variable is positive and statistically significant at 1%, implying that the unobserved peculiarities of the provinces also contribute significantly to the life quality of people, especially of ethnic minorities. These characteristics often reflect the advantages of socio-economic development brought about by geographical conditions or cultural and social practices.

## Conclusions and Recommendations

The paper provided an empirical study aimed at assessing the life quality and analysing the role of basic social service coverage in the life quality of ethnic minorities. The research results show that the life quality of ethnic minorities, in particular, has been improved over time. Factors such as sanitation, housing and education, in particular, have all improved

significantly. The study also reveals the critical roles of infrastructure and credit support in covering basic social services in general and especially in the fields of education, health. Those practical activities could help to improve the life quality of ethnic minorities in Vietnam today.

The findings of the study suggest some of the following policy recommendations as follows:

Firstly, the living standards of ethnic minorities are still significantly lower than those of the Kinh people and are quite different among localities. Therefore, improving the policies to improve the life quality of ethnic minorities is essential. More importantly, policies also need to take into account the peculiarities of peoples and localities right from the planning stage, as well as in organising the implementation. This helps to maximize the positive impact and minimise the negative impact of ensuring basic social services for the life quality of ethnic minorities.

Secondly, the results show that basic social services such as healthcare and education play an important role in improving the life quality of ethnic minorities. Therefore, increasing the proportion of clinics with doctors or improving teaching and learning conditions in schools should be considered as policies. According to the aggregated data, provinces with low life quality indexes like Khanh Hoa, Lai Chau, and Dien Bien also have the lowest level of the proportion of standard schools and clinics with doctors. Therefore, in order to improve the life quality of ethnic minorities, there should be active policies to improve health and education as well as the ability to utilise basic social services in these provinces.

Thirdly, the results demonstrate the critical role of infrastructure improvement, especially transportation infrastructure, in helping people to access basic social services more easily. Better infrastructure could also help to bring economic development opportunities for the localities. Therefore, it is necessary to continue investing in infrastructure development, especially transportation infrastructure in areas with ethnic minorities to contribute to improving the life quality of people.

Finally, the estimated results also illustrate that to utilise basic social services - such as healthcare and education - to improve life quality depends on the ability for the people to utilise these effectively. Therefore, in addition to improving those services in terms of quantity and quality, it is also very important to create mechanisms to encourage people to use such services. For example, there is a need for better information and communication systems to raise awareness about the role of education, preventive and curative care among ethnic minorities. It would be advisable to develop feasible credit policies to enable people to use these services as well.



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**Appendix 1:** Variables used in calculating life quality index

<b>Variables</b>	<b>Definition</b>
<i>Household head's education level</i>	Dummy variable with 4 categories: 1- high school; 2-from secondary school to high school; 3-from elementary to collegial-degree vocational training; 4-university and above
<i>Average income per capita</i>	Average income per capita (unit: VND thousand / month)
<i>Primary school</i>	Proportion of people aged 11 and older having a primary school diploma (unit: %)
<i>Secondary school</i>	Proportion of people aged 15 and older having a secondary school diploma (unit: %)
<i>High school</i>	Proportion of people aged 18 and older having a high school diploma (unit: %)
<i>Housing</i>	Housing conditions, dummy variables with 3 categories: 1-temporary housing; 2-semi-solid; 3-solidly)
<i>Health examination expenses</i>	Medical expenses (internal / outpatient) / total members
<i>Inpatient expenses</i>	Number of inpatient visits / total members
<i>Severe illness</i>	Households with severe illness people need to be taken care of
<i>Clean water</i>	Proportion of households using clean water for eating and drinking
<i>Television</i>	Households have televisions, dummy variables: 1-yes; 0-no
<i>Telephone</i>	Households using landline / mobile phones, dummy variables: 1-yes; 0-no
<i>Kitchen</i>	Households using gas, electric or magnetic cookers, dummy variables: 1-yes; 0-no

**Appendix 2:** Testing Heteroskedasticity

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of ethnic\_LQI

chi2(1) = 0.00

Prob > chi2 = 0.9553