REMITTANCES AND HEALTHCARE UTILIZATION: EVIDENCE FROM ETHNIC MINORITY ELDERS IN RURAL VIETNAM

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Abstract

This study examines the impact of remittances on healthcare utilization among ethnic minority elders in rural Vietnam. Using data from the Vietnam Household Living Standards Survey (VHLSS) in the period of 2022–2024, the paper applies propensity score matching (PSM) to address selection bias in remittance receipt. Healthcare utilization is measured by the probability of healthcare facility visits and total household healthcare expenditure. The results show that remittances significantly increase both outcomes. Specifically, remittance-receiving households are 7–11 percentage points more likely to use healthcare services and spend 8–24 percent more on healthcare than non-recipient households, depending on the matching method. These findings are robust across alternative matching techniques. The results suggest that remittances help relax liquidity constraints and reduce financial barriers to healthcare access for ethnic minority elders. The study highlights the complementary role of remittances in improving health equity and supporting elderly care in disadvantaged rural and mountainous regions of Vietnam.

Keywords: *Remittances; healthcare utilization; ethnic minorities; elderly; rural Vietnam.*

KIỀU HỐI VÀ SỬ DỤNG DỊCH VỤ CHĂM SÓC SỨC KHỎE: BẰNG CHỨNG TỪ NGƯỜI CAO TUỔI DÂN TỘC THIỂU SỐ TẠI VÙNG NÔNG THÔN VIỆT NAM

Tóm tắt

Nghiên cứu này xem xét tác động của kiều hối đến việc sử dụng dịch vụ chăm sóc sức khỏe của người cao tuổi dân tộc thiểu số ở vùng nông thôn Việt Nam. Sử dụng dữ liệu từ Khảo sát Mức sống Hộ gia đình Việt Nam (VHLSS) giai đoạn 2022–2024, bài báo áp dụng phương pháp ghép điểm xu hướng (PSM) để giải quyết sai lệch chọn lọc trong việc nhận kiều hối. Việc sử dụng dịch vụ chăm sóc sức khỏe được đo bằng xác suất đến các cơ sở y tế và tổng chi tiêu cho chăm sóc sức khỏe của hộ gia đình. Kết quả cho thấy kiều hối làm tăng đáng kể cả hai kết quả này. Cụ thể, các hộ gia đình nhận kiều hối có khả năng sử dụng dịch vụ chăm sóc sức khỏe cao hơn từ 7–11 điểm phần trăm và chi tiêu nhiều hơn từ 8–24% cho chăm sóc sức khỏe so với các hộ gia đình không nhận kiều hối, tùy thuộc vào phương pháp ghép cặp. Những phát hiện này vẫn nhất quán trên các kỹ thuật ghép cặp khác nhau. Kết quả cho thấy kiều hối giúp giảm bớt các hạn chế về thanh khoản và giảm bớt các rào cản tài chính trong việc tiếp cận chăm sóc sức khỏe cho người cao tuổi dân tộc thiểu số. Nghiên cứu nhấn mạnh vai trò bổ sung của kiều hối trong việc cải thiện công bằng y tế và hỗ trợ chăm sóc người cao tuổi ở các vùng nông thôn và miền núi khó khăn của Việt Nam.

Từ khoá: *Kiều hối; sử dụng dịch vụ chăm sóc sức khỏe; dân tộc thiểu số; người cao tuổi; nông thôn Việt Nam.*

1. Introduction

Population aging has emerged as a major socio-economic challenge in Vietnam over the past two decades. The pace of aging has been particularly rapid in rural areas, where economic opportunities remain limited and public service provision is uneven. As the population ages, the demand for healthcare services increases substantially, placing growing pressure on households and on the health and social protection systems. These challenges are especially pronounced for elders living in disadvantaged rural and mountainous regions.

Among the elderly population, ethnic minority elders represent one of the most vulnerable groups. Compared to the Kinh majority, ethnic minority older adults tend to have lower educational attainment, lower income levels, and poorer access to healthcare infrastructure. Moreover, many reside in remote areas where healthcare facilities are scarce, transportation costs are high, and information barriers persist. These structural disadvantages translate into lower levels of healthcare utilization and poorer health outcomes, despite Vietnam's substantial progress in expanding health insurance coverage (Baulch et al., 2012; Nguyen, 2025; World Bank, 2019).

In this context, remittances have become an increasingly important source of household income in rural Vietnam. Large-scale labor migration—both internal and international—has generated significant monetary transfers from migrant family members to those left behind. Previous studies have shown that remittances play a crucial role in smoothing household consumption, reducing poverty, and mitigating income shocks (Dey & Basak, 2024; Nguyen, 2008; Nguyen & Mont, 2012; Ojeyinka & Ibukun, 2024). For elderly household members, remittances may function as an informal social protection mechanism, particularly in

areas where formal pension systems and elderly care services remain limited.

From an economic perspective, remittances can affect healthcare utilization through several channels. First, remittances relax liquidity constraints, enabling households to afford healthcare expenses that might otherwise be postponed or forgone. Second, additional income from remittances may shift household expenditure priorities toward health investment, especially for older members whose healthcare needs are greater. Third, remittances from migrant children may strengthen intergenerational support and increase awareness of health risks, thereby encouraging timely use of healthcare services (Ali et al., 2024, Adams & Cuecuecha, 2013; Amuedo-Dorantes & Pozo, 2011; Kapri & Jha, 2020).

A growing international literature documents a positive relationship between remittances and healthcare utilization. Evidence from Nepal indicates that remittance-receiving households spend more on healthcare and are more likely to seek medical treatment (Thapa & Acharya, 2017). Similar findings have been reported in studies from Morocco, Malawi, and Cambodia, where remittances improve access to healthcare services for vulnerable groups, including children and older adults (Chauvet et al., 2013; Elbadawi & Rocha, 1992; Nanziri et al., 2025; Tong, 2015). However, the magnitude and direction of these effects vary across institutional and socio-economic contexts, suggesting that remittances do not automatically translate into better health outcomes.

However, the positive income effect of remittances does not automatically translate into improved elderly care. An emerging concern in migration and aging research is the so-called "care drain" effect, whereby labor migration—while generating financial transfers—reduces the availability of direct, day-to-day caregiving for older household members left behind. For ethnic minority elders living in remote rural areas, the physical absence of adult children may limit assistance in navigating healthcare systems, arranging transportation to medical facilities, and ensuring timely treatment, potentially offsetting part of the financial benefits provided by remittances.

In Vietnam, existing empirical research has largely focused on the effects of remittances on poverty reduction, income inequality, education, and household welfare. Relatively little attention has been paid to healthcare utilization, and even fewer studies have examined the elderly population. Moreover, evidence on ethnic minority elders is particularly scarce, despite their heightened vulnerability. An additional methodological challenge in this literature is the non-random

nature of remittance receipt, which may lead to selection bias if not properly addressed.

This study aims to fill these gaps by examining the impact of remittances on healthcare utilization among ethnic minority elders in rural Vietnam. Using data from the Vietnam Household Living Standards Survey (VHLSS) 2022–2024, the study employs propensity score matching (PSM) to control for observable differences between remittance-receiving and non-receiving households and to estimate the causal effects of remittances (Dey & Basak, 2024; Zennati, 2025). Healthcare utilization is measured by the probability of healthcare facility visits and total household healthcare expenditure, capturing both access to and intensity of healthcare use.

By focusing on ethnic minority elders, this paper contributes new evidence to the literature on remittances and health in developing countries. The findings provide insights into how informal financial transfers can complement formal health and social protection systems, particularly in disadvantaged rural and mountainous regions. From a policy perspective, the results highlight the importance of considering remittances when designing strategies to improve healthcare access and promote health equity among older populations in Vietnam.

2. Literature review

The relationship between migration, remittances, and household welfare has been widely examined in the development economics literature, particularly in contexts where formal social protection systems remain limited. Remittances are commonly conceptualized as a form of non-labor income that helps households smooth consumption, manage risks, and cope with economic shocks arising from income volatility, health expenses, and demographic changes. In many developing countries, remittances have therefore emerged as an important informal mechanism of social protection, especially for rural and vulnerable populations (Niimi et al., 2009; Nguyen, 2022).

Empirical evidence consistently shows that remittance receipt is not a random process but is closely associated with migration characteristics, household demographics, and regional disparities. Using data on internal migrants in Vietnam, Niimi et al. (2009) demonstrate that remittance behavior reflects both migrants' earning capacity and household needs at origin. This non-random selection into remittance receipt has important implications for empirical analysis, as households receiving remittances often differ systematically from non-recipient households. Similar concerns are raised in studies examining emigration and remittance management in Vietnam, which emphasize the

need to account for selection effects when assessing the welfare impacts of remittances (Nguyen, 2022).

Beyond their determinants, remittances have been shown to exert significant effects on household welfare outcomes, including poverty reduction and consumption smoothing. Evidence from rural India and Malawi suggests that remittance-receiving households experience lower poverty levels and improved welfare relative to non-recipient households, particularly in regions characterized by limited economic opportunities (Dey, 2014; Kangmennaang et al., 2017). These findings are reinforced by micro-level evidence from Vietnam, which shows that remittances influence household behavior across multiple dimensions, including consumption patterns, labor allocation, and investment decisions (Bui et al., 2015). Together, this body of work highlights the broader welfare-enhancing role of remittances in migrant-sending economies.

Closely related to remittances, the literature on cash transfer programs provides important insights into how income transfers affect household behavior. Evidence suggests that income support does not necessarily discourage labor supply and may instead operate through mechanisms such as income stabilization and improved allocation of household resources (Nguyen & Tarp, 2023). In the context of aging populations, cash transfer programs targeting poor and vulnerable older adults in Vietnam have been shown to improve economic security and living standards, underscoring the importance of income transfers for households facing declining labor income and rising health needs (Giang & Hoang, 2013). These findings provide a useful benchmark for understanding remittances as an informal counterpart to formal cash transfer programs.

A growing strand of the literature focuses explicitly on the link between remittances and health-related outcomes. From a theoretical perspective, remittances are expected to relax liquidity constraints and reduce financial barriers to healthcare access, particularly in settings where healthcare expenditure relies heavily on out-of-pocket payments. Empirical evidence from Nepal supports this mechanism, showing that remittances increase both healthcare utilization and household healthcare expenditures and interact positively with national health policies (Chezum et al., 2018; Kapri & Jha, 2020). Similar patterns are observed in Pakistan, where remittance-receiving households allocate significantly more resources to healthcare than non-recipient households (Khan et al., 2021).

Evidence from Africa and North Africa further corroborates the positive association between remittances and

health-related investments. In Morocco, matching-based estimates indicate that remittances raise household expenditures on both education and healthcare, particularly among poorer households (Kawkaba et al., 2025). In Malawi, migration and remittances are found to improve overall household welfare, including dimensions related to health, although the magnitude of these effects varies across regions and household characteristics (Kangmennaang et al., 2017). These cross-country findings highlight both the potential of remittances to enhance health investments and the importance of contextual factors in shaping their impacts.

Beyond healthcare expenditure, several studies examine healthcare utilization directly, with a particular focus on left-behind populations. Evidence from Cambodia shows that remittances increase healthcare utilization among children left behind by migrant parents, suggesting that financial transfers can partially compensate for the absence of direct parental care (Treleaven, 2019). Extending this perspective to older populations, research from China indicates that rural-to-urban migration affects healthcare utilization among middle-aged and older adults, while remittances play a mitigating role by improving households' financial capacity to access healthcare services (Xu & Chen, 2025). These findings underscore the importance of intergenerational financial transfers in maintaining access to healthcare in the context of migration-induced family separation.

The literature also highlights the relevance of remittances for elderly welfare and intergenerational support. Using Vietnamese data, Nguyen et al. (2012) show that monetary transfers from children significantly influence the labor supply decisions of elderly parents, indicating that financial support can alter economic behavior in later life. This suggests that remittances may enable older adults to reduce labor participation and potentially reallocate time and resources toward health-related activities. Complementary evidence from studies on financial inclusion among migrant and refugee populations further suggests that remittances can enhance households' ability to manage financial risks, which may indirectly affect health-related decisions (Wellalage & Locke, 2020).

Methodologically, much of the literature employs quasi-experimental techniques to address the selection bias inherent in remittance receipt. Studies using propensity score matching and related methods demonstrate that controlling for observable differences between remittance-receiving and non-receiving households is essential for obtaining credible estimates of remittance impacts (Dey, 2014; Dey & Basak, 2024; Kawkaba et al., 2025). More advanced approaches, such as inverse probability of treatment weighting, further strengthen causal inference in non-experimental settings

(Wellalage & Locke, 2020). These methodological advances provide a solid foundation for analyzing the causal effects of remittances on healthcare outcomes.

The literature on remittances and healthcare utilization increasingly emphasizes that income effects operate within specific structural and socio-cultural contexts. For ethnic minority populations, healthcare access is shaped not only by financial constraints but also by persistent structural barriers, including geographic isolation, limited healthcare infrastructure, and language constraints that restrict effective communication with healthcare providers (World Bank, 2019; Nguyen, 2025). These barriers are particularly pronounced in rural and mountainous regions of Vietnam, where ethnic minority elders often face longer travel distances to medical facilities and lower levels of health literacy. Integrating these factors early in the literature highlights the importance of examining remittances in marginalized institutional and spatial settings rather than treating income effects in isolation (Baulch et al., 2012; Niimi et al., 2009). Despite the substantial body of evidence, important gaps remain. While existing studies document positive effects of remittances on healthcare expenditure and utilization in countries such as Nepal, Pakistan, China, and Cambodia, empirical evidence for Vietnam remains limited, particularly with respect to healthcare utilization rather than expenditure. Moreover, the literature has paid little attention to ethnic minority elders, who face compounded disadvantages related to income, geography, and access to healthcare services. Addressing these gaps is essential for understanding the role of remittances as a complementary mechanism to formal healthcare and social protection systems in an aging and ethnically diverse society.

3. Data and Methodology

3.1. Data

This study uses data from the Vietnam Household Living Standards Survey (VHLSS) for the period 2022–2024, conducted by the General Statistics Office of Vietnam (GSO) with technical support from the World Bank. The VHLSS provides nationally representative micro-level information on household socio-economic conditions, including demographics, income, employment, and healthcare utilization, which allows for an in-depth examination of the relationship between remittances and healthcare outcomes.

The empirical analysis focuses on rural households with elderly members. Healthcare utilization is captured using two outcome variables reported in Table 1. The first is a binary indicator measuring whether at least one household member visited a healthcare facility during the reference period. This variable reflects the household's access to and use of formal healthcare services. The second outcome variable is the logarithm of total household healthcare expenditure, measured in thousand Vietnamese dong, which captures the intensity of healthcare use and allows for a more flexible functional form in the estimations.

Remittance receipt is the main explanatory variable and is defined as a binary indicator equal to one if the household received cash transfers from migrant members, and zero otherwise. As shown in the descriptive statistics, households receiving remittances differ systematically from non-recipient households in terms of healthcare utilization, demographic composition, and socio-economic characteristics, highlighting the potential for selection bias if these differences are not properly addressed.

The set of covariates included in the analysis reflects key household-head and household characteristics that may jointly influence remittance receipt and healthcare utilization. Characteristics of the household head include age, gender, marital status, years of schooling completed, and formal employment status. Ethnicity is captured through an indicator for Kinh households, with ethnic minority households forming the reference group, allowing the analysis to explicitly account for ethnic differences in socio-economic conditions and healthcare access.

Household-level characteristics include household size, the number of children under 15 years old, the number of elderly members aged 60 and above, and the logarithm of total household income. These variables capture demographic structure and economic capacity, both of which are closely related to healthcare demand and the ability to finance health-related expenditures. Regional dummy variables for the Red River Delta, the Midlands and Northern Mountainous Areas, the Northern and Coastal Central Region, the Central Highlands, and the Southeastern Area are included to control for geographic heterogeneity in healthcare infrastructure and economic development. In addition, a year dummy for 2024 is used to capture temporal differences between survey waves.

The final analytical sample consists of households with complete information on healthcare utilization, remittance receipt, and all covariates listed in Table 1. Sampling weights provided by the GSO and the World Bank are applied in all estimations to account for the complex survey design and to ensure that the results are representative at the national and regional levels.

Table 1: Descriptive statistics

	Treatment group		Control group		.Diff
	Mean	SD	Mean	SD	(t-statistic)
Health care utilization outcomes					
Probability that at least one member of the household had a healthcare facility visit	0.489	0.499	0.504	0.500	0.119***
Logarithm of total household health expenditure (in 1,000 VND)	7.805	1.223	8.023	1.164	0.321***
Independent variable					
Head of Household characteristics					
Age	54.031	13.651	53.827	13.918	4.598***
Male (yes=1, no=0)	0.754	0.430	0.635	0.481	-0.037***
Kinh people (Kinh=1, otherwise=0)	0.815	0.387	0.945	0.227	0.127***
Current married (yes = 1, no = 0)	0.779	0.414	0.752	0.431	-0.027**
Years of schooling completed (grade level)	7.720	3.240	9.219	3.129	0.351***
Formal employment (yes = 1, no = 0)	0.342	0.474	0.608	0.488	0.054**
Household characteristics					
Household size (number of people)	3.618	1.689	3.543	1.613	-0.227***
Number of children under 15 years old	0.931	1.070	0.813	0.952	0.032
Number of elders above 60 years old	0.607	0.822	0.619	0.808	0.254***
Log of household income (1,000 VND)	11.750	0.822	12.169	.766	0.012
Red River Delta (yes=1, no=0)	0.236	0.425	0.238	0.426	0.171***
Midlands and Northern Mountainous Areas (yes=1, no=0)	0.196	0.397	0.120	0.325	-0.048***
Northern and Coastal Central Region (yes=1, no=0)	0.225	0.417	0.226	0.418	0.025**
Central Highlands (yes=1, no=0)	0.074	0.262	0.061	0.240	0.009
Southeastern Area (yes=1, no=0)	0.066	0.249	0.201	0.401	-0.028***
Year=2024 (yes=1, no=0)	0.492	0.499	0.502	0.500	0.018
Observations	**10,389**		**5,407**		**12,676**

*Source: VHLSS 2022-2024; Note: Diff is t statistics; * significant at 0.1 level; ** significant at 0.05 level; *** significant at 0.01 level; Standard deviation is in parentheses.*

3.2. Methodology
Empirical Strategy

Estimating the impact of remittances on healthcare utilization using observational data poses important empirical challenges due to selection bias. Households that receive remittances may differ systematically from those that do not in ways that also affect healthcare utilization, such as income levels, demographic composition, migration networks, and regional characteristics. Ignoring these differences may lead to biased estimates of the remittance effect.

To address this issue, the study employs a propensity score matching (PSM) approach (Dey & Basak, 2024; Kawkaba et al., 2025). The propensity score is defined as the probability that a household receives remittances conditional on a set of observed characteristics. In the first step, a probit model is estimated in which remittance receipt is regressed on household-head characteristics, household demographic composition, income, ethnicity, regional indicators, and the year dummy. These covariates are selected based on theoretical considerations and prior empirical evidence, as they are expected to influence remittance receipt while being plausibly exogenous to healthcare utilization outcomes.

Based on the estimated propensity scores, remittance-receiving households are matched with non-receiving households that have similar propensity scores. This matching procedure aims to balance the distribution of observable characteristics between the treated and control groups, thereby approximating the conditions of a randomized experiment. To assess the robustness of the results, multiple matching algorithms are applied, including k-nearest neighbors matching, radius matching, kernel matching, and local linear regression matching.

The impact of remittances on healthcare utilization is quantified using the Average Treatment Effect on the Treated (ATT), which measures the average difference in healthcare outcomes between remittance-receiving households and their matched counterparts. The analysis considers both the probability of healthcare facility visits and the logarithm of total household healthcare expenditure as outcome variables, capturing access to healthcare services and the intensity of healthcare use.

Identification Assumptions and Estimation

The validity of the PSM approach relies on two key assumptions. The first is the conditional independence assumption, which requires that, conditional on observed

covariates, remittance receipt is independent of potential healthcare outcomes. While this assumption cannot be tested directly, the rich set of household and household-head characteristics included in the model helps mitigate concerns about omitted variable bias. The second assumption is the common support condition, which requires sufficient overlap in the distribution of propensity scores between remittance-receiving and non-receiving households. Observations outside the region of common support are excluded from the analysis.

The quality of the matching procedure is assessed through balancing tests that compare covariate distributions between treated and control groups before and after matching. Indicators such as standardized mean differences, pseudo R-squared values, and likelihood ratio tests are used to evaluate whether matching substantially reduces observable differences between the two groups. The results indicate that the matching procedure achieves satisfactory balance across covariates.

Standard errors for the ATT estimates are computed using bootstrapping techniques to account for the additional uncertainty introduced by the matching process. All estimations incorporate sampling weights to reflect the complex survey design of the VHLSS.

3.3. Estimation Strategy

The objective of this study is to estimate the causal impact of remittances on healthcare utilization using observational household survey data. Let D_i denotes a binary treatment indicator, where $D_i=1$ if household iii receives remittances and $D_i=0$ otherwise. Let Y_i denotes the observed healthcare outcome of interest, which includes (i) the probability that at least one household member visited a healthcare facility and (ii) the logarithm of total household healthcare expenditure.

Treatment and Potential Outcomes Framework

Following the potential outcomes framework, each household iii has two potential outcomes:

$Y_i(1)$ and $Y_i(0)$

where $Y_i(1)$ represents the healthcare outcome if the household receives remittances and $Y_i(0) Y\_i(0) Y_i(0)$ represents the outcome if it does not. The observed outcome can be written as:

$Y_i=D_iY_i(1)+(1-D_i)Y_i(0)$

The parameter of interest is the Average Treatment Effect on the Treated (ATT), defined as:

$ATT=E[Y_i(1)-Y_i(0)|D_i=1]$

Since $Y_i(0)$ is not observed for treated households, estimating the ATT requires constructing a valid counterfactual for treated households in the absence of remittances.

Propensity Score Estimation

To address selection bias arising from non-random remittance receipt, the study employs propensity score matching (PSM). The propensity score is defined as the conditional probability of receiving remittances given a vector of observed covariates X_i: $p(X_i)=Pr(D_i=1|X_i)$

The propensity scores are estimated using a probit model: $Pr(D_i=1|X_i)=\Phi(X_i'\beta)$

where $\Phi(X_i'\beta)$ denotes the cumulative distribution function of the standard normal distribution and β is a vector of parameters to be estimated.

The covariate vector X_i includes household-head characteristics (age, gender, marital status, years of schooling, formal employment), household characteristics (household size, number of children under 15, number of elderly members aged 60 and above, and logarithm of household income), ethnicity, regional indicators, and a year dummy. These covariates are selected based on their relevance for both remittance receipt and healthcare utilization.

Identification Assumptions

The PSM approach relies on two key identification assumptions. The first is the Conditional Independence Assumption (CIA):

$(Y_i(1),Y_i(0))\perp D_i|X_i$

which states that, conditional on observed covariates, remittance receipt is independent of potential healthcare outcomes.

The second is the Common Support Assumption, which requires sufficient overlap in the distribution of propensity scores between treated and control households: $0<p(X_i)<1$

Observations outside the region of common support are excluded from the analysis to ensure comparability between groups.

Matching Algorithms and ATT Estimation

Based on the estimated propensity scores, remittance-receiving households are matched with non-receiving households using several matching algorithms. For a generic matching estimator, the ATT can be expressed as:

$ATT=\frac{1}{N_T}\sum(Y_i-\sum w_{ij}Y_j)$

where T denotes the set of treated households, CCC denotes the set of matched control households, N_T is the number of treated observations, and w_{ij} are weights that depend on the chosen matching algorithm.

Specifically:

k-nearest neighbors matching assigns equal weights to the kkk control observations with propensity scores closest to that of the treated household.

Radius matching matches treated households with all control households whose propensity scores lie within a predefined caliper.

Kernel matching uses weighted averages of all control households, with weights inversely related to the distance between propensity scores.

Local linear regression matching estimates counterfactual outcomes using local linear regressions around each treated observation.

Using multiple matching algorithms allows robustness checks of the estimated treatment effects.

Balancing Tests and Inference

After matching, the quality of the matching procedure is assessed by comparing the distribution of covariates between treated and control groups before and after matching. Balance is evaluated using standardized mean differences, pseudo-R^2 statistics from the propensity score model, and likelihood ratio tests. Successful matching is indicated by substantial reductions in standardized bias and low post-matching pseudo-R^2 values.

Standard errors for the ATT estimates are computed using bootstrapping methods to account for the additional sampling variability introduced by the matching process. All estimations incorporate sampling weights to reflect the complex survey design of the VHLSS.

Interpretation of Estimated Effects

Under the maintained assumptions, the estimated ATT captures the average causal effect of remittances on healthcare utilization among households that receive remittances. For the binary healthcare visit outcome, the ATT is interpreted as the change in the probability of healthcare utilization attributable to remittance receipt. For healthcare expenditure, the ATT represents the percentage change in total household healthcare spending associated with remittances.

4. Results

Table 3 presents the marginal effects from the probit model estimating the probability that a household receives remittances. The results indicate that remittance receipt is systematically related to household demographic characteristics, economic conditions, ethnicity, and regional location, confirming that remittances are not randomly distributed across households. This finding is consistent with the migration and remittance literature, which emphasizes the importance of household structure and migration networks in shaping remittance behavior (Niimi et al., 2009; Nguyen, 2022).

Household-head characteristics are significant predictors of remittance receipt. Older household heads are more likely to receive remittances, reflecting the role of intergenerational transfers from migrant children to elderly parents, as documented in previous studies on elderly support in Vietnam (Nguyen et al., 2012). Male-headed households are less likely to receive remittances, while households headed by married individuals exhibit a higher probability of receiving transfers, suggesting that remittances may respond to household care responsibilities. Ethnicity plays a particularly important role. Households belonging to the Kinh majority are significantly more likely to receive remittances than ethnic minority households, highlighting persistent disparities in migration opportunities and access to remittance-sending networks. This result aligns with earlier evidence on ethnic differences in migration and remittance flows in Vietnam (Niimi et al., 2009).

Household composition is also closely related to remittance receipt. Larger households are less likely to receive remittances, whereas households with more children under 15 and more elderly members aged 60 and above have a significantly higher probability of receiving transfers. These patterns suggest that remittances respond to household dependency burdens and care needs. Higher household income is positively associated with remittance receipt, indicating that remittances are not exclusively targeted at the poorest households but may also reflect migrants' earning capacity and existing household resources.

Table 3: The impact on the probability of having cash transfer

	dy/dx	Std. err.	P>|z|
Age	0.0019***	0.0007	0.008
Male	-0.0419**	0.0156	0.007
Kinh people	0.1739***	0.0242	0.000
Current married	0.0728***	0.0232	0.002
Years of schooling completed (grade level)	-0.0033	0.0021	0.126
Formal employment	0.0014	0.0143	0.922

	dy/dx	Std. err.	P>|z|
Household size (number of people)	-0.0300***	0.0067	0.000
Number of children under 15 years old	0.0586***	0.0087	0.000
Number of elders above 60 years old	0.0731***	0.0124	0.000
Log of household income (1,000 VND)	0.0385***	0.0118	0.001
Red River Delta	0.1838***	0.0116	0.000
Midlands and Northern Mountainous Areas	0.1321***	00130	0.000
Northern and Coastal Central Region	0.0860***	0.0136	0.000
Central Highlands	0.1306***	0.0132	0.000
Southeastern Area	0.0160	0.0198	0.417
Year=2024	-0.0008	0.0115	0.939
Observations	**12,676**		
LR chi2(16)	408.49		
Prob > chi2	0.0000		
Pseudo R2	0.0934		

*Note: Coefficients have been transformed to marginal effects. * p<0.10, ** p<0.05, *** p<0.01.*

Source: Authors' calculations using VHLSS 2022-2024.

Regional effects are pronounced. Compared to the omitted region, households in the Red River Delta, the Midlands and Northern Mountainous Areas, the Northern and Coastal Central Region, and the Central Highlands are significantly more likely to receive remittances. These findings reflect spatial differences in migration patterns and access to labor markets. The year dummy for 2024 is not statistically significant, suggesting no major change in remittance receipt between survey waves.

The results indicate that Kinh households are significantly more likely to receive remittances than ethnic minority households, reflecting persistent disparities in migration opportunities and access to remittance-sending networks. However, this difference in receipt probability does not imply that remittances are less relevant for ethnic minority households. Given their structural disadvantages—such as geographic isolation, weaker healthcare infrastructure, and higher barriers to healthcare access—the marginal impact of remittances on healthcare utilization may be particularly meaningful for ethnic minority elders, even when remittance incidence is lower.

Overall, the probit results indicate strong selection into remittance receipt based on observable characteristics, underscoring the need for a matching-based approach to estimate the causal impact of remittances on healthcare utilization.

Matching Quality and Selection Bias Diagnostics

The quality of the propensity score matching procedure is evaluated using balancing tests and graphical diagnostics reported in Tables 4. Prior to matching, substantial differences exist between remittance-receiving and non-receiving households across most covariates, including age, education, ethnicity, household composition, income, and regional location. Many of these differences are statistically significant, indicating pronounced selection bias in the unmatched sample.

Table 4: *Balancing hypothesis test showing the variable characteristics before and after matching*

Variable	Unmatched	Mean		%bias	%reduct	t-test	
	Matched	Treated	Control		|bias|	t	p>|t|
Age	U	46.454	45.198	12.9	56.9	3.19	0.001
	M	46.097	46.639	-5.6		-2.14	0.052
Male (yes=1, no=0)	U	0.8120	0.8291	-4.5	-45.6	-1.12	0.262
	M	0.8149	0.8398	-6.5		-2.61	0.109
Kinh people (Kinh=1, otherwise=0)	U	0.8708	0.7650	27.7	82.5	7.61	0.000
	M	0.8688	0.8503	4.8		2.11	0.135
Current married (yes = 1, no = 0)	U	0.8627	0.8241	10.7	72.8	2.80	0.005
	M	0.8615	0.8720	-2.9		-1.23	0.220
Years of schooling completed (grade level)	U	8.5025	7.8731	19.9	95.2	5.16	0.000
	M	8.4847	8.515	-1.0		-0.38	0.700

| Variable | Unmatched | Mean | | %bias | %reduct | t-test | |
	Matched	Treated	Control		|bias|	t	p>|t|
Formal employment (yes = 1, no = 0)	U	0.3537	0.2939	12.8	82.9	3.21	0.001
	M	0.3516	0.3618	-2.2		-0.84	0.399
Household size (number of people)	U	3.7579	3.6005	10.9	63.5	2.79	0.005
	M	3.7396	3.7971	-4.0		-1.58	0.115
Number of children under 15 years old	U	1.0822	0.8743	20.4	81.7	5.07	0.000
	M	1.0574	1.0954	-3.7		-1.42	0.155
Number of elders above 60 years old	U	0.3064	0.1708	24.8	89.6	5.85	0.000
	M	0.2549	0.2689	-2.6		-0.98	0.329
Log of household income (1,000 VND)	U	11.991	11.846	23.0	92.4	5.86	0.000
	M	11.984	11.995	-1.8		-0.72	0.469
Red River Delta	U	0.2925	0.0967	51.0	87.6	11.59	0.000
	M	0.2597	0.2354	6.3		2.22	0.026
Midlands and Northern Mountainous Areas	U	0.1576	0.1570	0.2	-1132.6	0.05	0.964
	M	0.1633	0.1713	-2.2		-0.85	0.398
Northern and Coastal Central Region	U	0.2458	0.2525	-1.5	-107.2	-0.39	0.696
	M	0.2600	0.2737	-3.2		-1.23	0.220
Central Highlands	U	0.0478	0.0314	8.4	1.0	2.02	0.043
	M	0.0504	0.0666	-8.3		-2.74	0.016
Southeastern Area	U	0.0789	0.1294	-16.6	77.8	-4.53	0.000
	M	0.0816	0.0928	-3.7		-1.57	0.117
Year=2024 (yes=1, no=0)	U	0.5050	0.5113	-1.3	18.5	-0.32	0.750
	M	0.4987	0.4936	1.0		0.40	0.686

* if variance ratio outside [0.94; 1.07] for U and [0.93; 1.07] for M

Note: k-Nearest neighbors matching was used for the balancing test. "The performance of matching quality was relatively good among the samples. A statistically significant difference between unmatched (U) and matched (M) variables was indicated by an asterisk. * p<0.10, ** p<0.05, *** p<0.01.

After matching, covariate balance improves markedly. Table 4 shows that mean differences between treated and control groups are substantially reduced for all variables, and standardized percentage biases decline sharply. For the majority of covariates, post-matching differences are no longer statistically significant, suggesting that the matched control group provides a credible counterfactual for remittance-receiving households. The large reduction in standardized bias is consistent with best practices in the PSM literature (Caliendo & Kopeinig, 2008).

Table 5 further confirms the effectiveness of the matching procedure. Following matching, the pseudo R^2 from the propensity score model declines substantially, and the likelihood ratio test no longer rejects the joint insignificance of the covariates. In addition, the mean and median standardized biases fall well below commonly accepted thresholds, indicating that observable differences between treated and control households are largely eliminated.

Table 5: Test of selection bias after matching

Sample	Ps R2	LR chi2	p>chi2	Mean Bias	Med Bias	B	R	%Var
Unmatched	0.093	383.62	0.000	15.4	12.8	81.5*	1.51	67
Matched	0.005	42.82	0.000	3.7	3.4	16.5	0.92	83

* if B>25%, R outside [0.5; 2]

Graphical evidence reinforces these findings. Figure 1 illustrates a pronounced reduction in standardized percentage bias across covariates after matching, with post-matching biases clustered close to zero. Figure 2 shows substantial overlap in the distribution of propensity scores between treated and control groups within the region of common support, indicating that the common support assumption is satisfied. Together, these diagnostics suggest that the PSM procedure successfully addresses selection on observables and provides a solid basis for causal inference (Dey & Basak, 2024; Rosenbaum & Rubin, 2023).
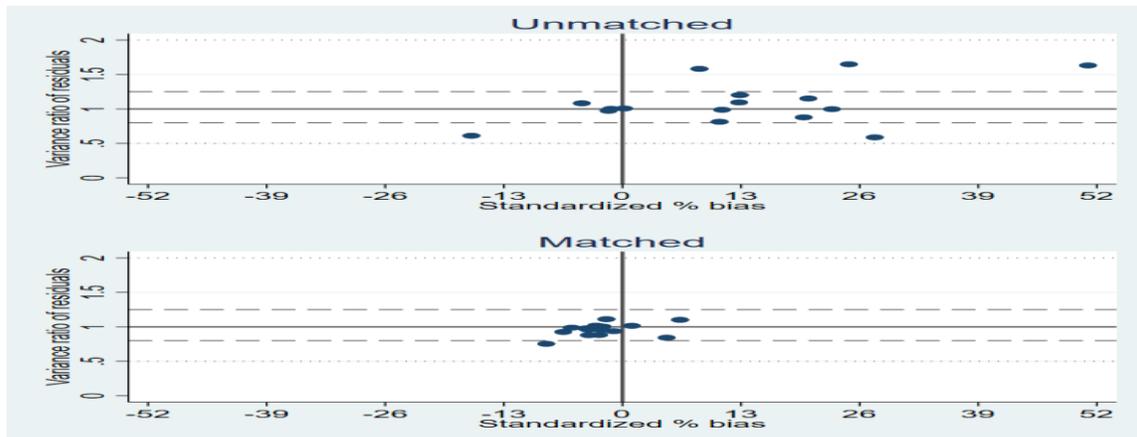
Figure 1. Test of the standardized % bias to determine the densities of pre- and post-matching p-scores.
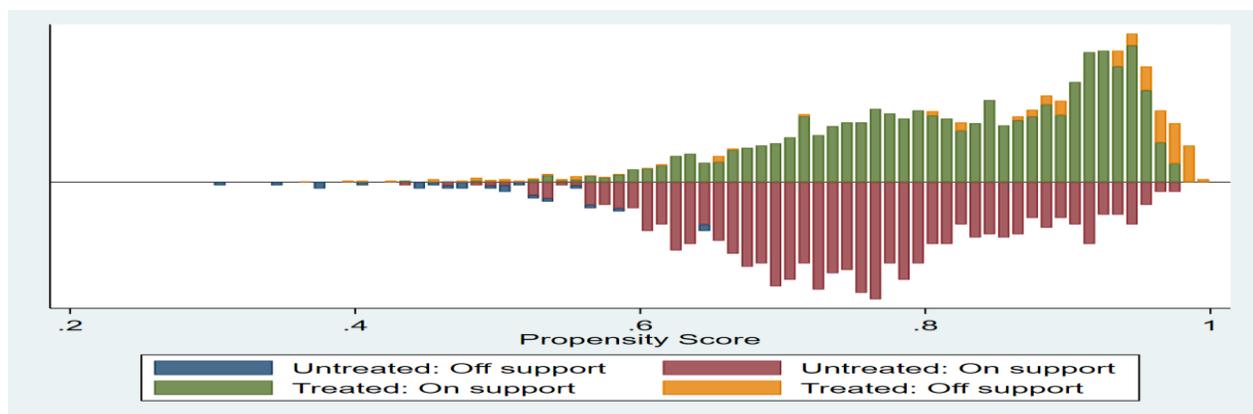

Figure 2. Test of the common support assumption to determine the densities of pre- and post-matching p-scores.

Impact of Remittances on Healthcare Utilization

The estimated impacts of remittances on healthcare utilization are reported in Table 6 using multiple matching algorithms. Across all specifications, remittances have a positive and statistically significant effect on both healthcare outcomes, indicating that remittance receipt improves access to and use of healthcare services among households with elderly members.

For healthcare facility visits, the Average Treatment Effect on the Treated (ATT) estimates indicate that remittance-receiving households are significantly more likely to have at least one member visit a healthcare facility compared to matched non-receiving households. Depending on the matching algorithm, remittances increase the probability of healthcare utilization by approximately 7 to 11 percentage points. The consistency of these estimates across k-nearest neighbors, radius, kernel, and local linear regression matching suggests that the results are robust to alternative matching specifications.

Similar patterns are observed for healthcare expenditure. After matching, remittance receipt is associated with a statistically significant increase in the logarithm of total household healthcare expenditure. The estimated ATT implies that remittances raise healthcare spending by approximately 8 to 24 percent, depending on the matching method. These findings suggest that remittances not only increase the likelihood of seeking healthcare but also enhance the intensity of healthcare utilization, likely by relaxing liquidity constraints and reducing financial barriers to care. This result is consistent with evidence from Nepal, Pakistan, and Cambodia, which finds positive effects of remittances on healthcare expenditure and utilization (Chezum et al., 2018; Kapri & Jha, 2020; Khan et al., 2021; Treleaven, 2019).

4. Impact of cash transfer on health care utilization of the elders in rural Vietnam

This section examines the impact of cash transfers on healthcare utilization among elderly households in rural Vietnam using propensity score matching. The estimated effects are reported in Table 6, which presents the Average Treatment Effect on the Treated (ATT) obtained from four alternative matching methods: k-nearest neighbors matching,

radius matching, kernel matching, and local linear regression matching. Two outcome variables are considered consistently across all matching specifications: the probability that at least one household member visited a healthcare facility and the logarithm of total household healthcare expenditure.

Across all matching methods, cash transfers are found to have a positive effect on healthcare utilization outcomes. The results from k-nearest neighbors matching indicate that households receiving cash transfers are more likely to have at least one member visit a healthcare facility compared to matched non-recipient households. In addition, cash transfer receipt is associated with a statistically significant increase in the logarithm of total household healthcare expenditure. These findings suggest that cash transfers improve both access to healthcare services and the intensity of healthcare use.

Table 6: Estimated the impact of cash transfer on health care utilization

Variable	Sample	Treated group	Control group	Difference	T-stat
k-Nearest neighbors matching:					
Probability that at least one member of the household had a healthcare facility visit	Unmatched	0.4560	0.3668	0.0892	4.58
	ATT	0.4560	0.3499	0.1060	3.25
Logarithm of total household health expenditure (in 1,000 VND)	Unmatched	7.7982	7.4076	0.0438	8.90
	ATT	7.7982	7.5988	0.0786	2.54
Radius matching:					
Probability that at least one member of the household had a healthcare facility visit	Unmatched	0.4560	0.3668	0.0892	4.58
	ATT	0.4556	0.3817	0.0738	2.80
Logarithm of total household health expenditure (in 1,000 VND)	Unmatched	7.7982	7.4076	0.3906	8.90
	ATT	7.7979	7.5797	0.2181	3.44
Kernel matching:					
Probability that at least one member of the household had a healthcare facility visit	Unmatched	0.4560	0.3668	0.0892	4.58
	ATT	0.4560	0.3720	0.0840	3.37
Logarithm of total household health expenditure (in 1,000 VND)	Unmatched	7.7982	7.4076	0.3906	8.90
	ATT	7.7982	7.5618	0.2363	3.94
Local linear regression matching:					
Probability that at least one member of the household had a healthcare facility visit	Unmatched	0.4560	0.3668	0.0892	4.58
	ATT	0.4560	0.3701	0.0858	3.13
Logarithm of total household health expenditure (in 1,000 VND)	Unmatched	7.7982	7.4076	0.3906	8.90
	ATT	7.7982	7.5595	0.2387	3.61

*Notes: * Significant at 10%; ** significant at 5%; *** significant at 1%.*

Similar patterns are observed when radius matching is applied. The estimated ATT shows that cash transfer recipients exhibit a higher probability of healthcare facility visits relative to comparable non-recipient households. At the same time, healthcare expenditure is significantly higher among recipient households. The consistency of the estimated effects under radius matching suggests that the results are not driven by a small number of closely matched observations but hold when a broader set of comparable control households is considered.

The results obtained from kernel matching further reinforce these findings. Cash transfers are associated with a statistically significant increase in the likelihood of healthcare utilization, as measured by healthcare facility visits. Moreover, recipient households display higher healthcare expenditures than their matched counterparts. Because kernel matching uses weighted information from all control observations within the region of common support, these results indicate that the positive effects of cash transfers are robust across the full distribution of comparable households.

Consistent with the previous matching methods, the estimates from local linear regression matching show that cash transfers significantly increase both healthcare facility visits and household healthcare expenditure. This method, which adjusts for local differences in propensity scores, yields results that are qualitatively similar to those obtained from k-nearest neighbors, radius, and kernel matching, further strengthening confidence in the robustness of the estimated impacts.

Taken together, the evidence from all four matching methods suggests that cash transfers play a significant role in improving healthcare utilization among elderly households in rural Vietnam. The positive effects on both

the probability of healthcare facility visits and healthcare expenditure indicate that cash transfers help relax financial constraints faced by older households, enabling them to seek healthcare services more readily and to allocate more resources toward health-related needs.

The consistency of the estimated ATT across alternative matching techniques supports the credibility of the results under the maintained assumptions of the propensity score matching framework. Combined with the balancing tests and common support diagnostics reported earlier, these findings provide robust evidence that cash transfers contribute to improved healthcare utilization among elders in rural Vietnam.

5. Discussion

This study provides empirical evidence on the impact of cash transfers on healthcare utilization among elderly households in rural Vietnam using propensity score matching. The results indicate that cash transfers significantly increase both the probability of healthcare facility visits and household healthcare expenditure. These findings suggest that cash transfers help alleviate financial constraints faced by older households, thereby improving access to healthcare services and the intensity of healthcare use.

The results are consistent with previous evidence from other developing-country contexts, which shows that remittances and income transfers positively affect healthcare utilization and health-related spending (Chezum et al., 2018; Kapri & Jha, 2020; Khan et al., 2021; Treleaven, 2019). In line with the literature on intergenerational transfers, the findings also support the view that financial support from migrant family members plays an important role in sustaining elderly welfare, particularly in settings where formal social protection systems remain limited (Nguyen et al., 2012).

Importantly, the robustness of the estimated effects across multiple matching algorithms strengthens the causal interpretation of the results under the maintained assumptions of the propensity score matching framework. The evidence suggests that cash transfers function as an informal social protection mechanism that complements existing healthcare and social assistance programs in rural Vietnam.

6. Conclusion and Policy implementation

This study examines the impact of cash transfers on healthcare utilization among elderly households in rural Vietnam using nationally representative household survey data. The findings show that cash transfers significantly improve healthcare utilization by increasing both the likelihood of healthcare facility visits and total healthcare expenditure. These results highlight the role of cash transfers in reducing financial barriers to healthcare access for older individuals.

From a policy perspective, the findings suggest that strengthening cash transfer mechanisms—both formal social assistance programs and informal family-based transfers—can contribute to improved healthcare access for the elderly in rural areas. Integrating cash transfer policies with healthcare and aging strategies may help address the challenges posed by population aging and persistent rural–urban disparities in healthcare access. In particular, policies targeting vulnerable elderly populations, including ethnic minority households, could enhance the effectiveness of social protection systems and improve health outcomes in disadvantaged regions. In addition, promoting digital financial services may help reduce remittance transaction costs and improve the timeliness and reliability of transfers to elderly recipients in rural areas.

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