Does Socio-Economic Inequality Act as A Barrier to Medical Treatment? the Case of Vietnam

Du Van Nguyen

School of Government, College of Economics, Law and Government, University of Economics , Ho Chi Minh City, 72407 Ho Chi, Minh City, Vietnam, Research Group Public Governance and Developmental Issues, University of Economics Ho Chi , Minh City, 72407 Ho Chi Minh City, Vietnam ORCID: https://orcid.org/0000-0002-3431-9322
Email: dunv@ueh.edu.vn

Khai Cong Dinh

University of Economics Ho Chi Minh City, 72407 Ho Chi Minh City, Vietnam, Research Group Public Governance and Developmental Issues, University of Economics Ho Chi, Minh City, 72407 Ho Chi Minh City, Vietnam, ORCID: https://orcid.org/0000-0002-7546-4067
Email: khai@ueh.edu.vn

Thanh Quang Ngo*

Research Group Public Governance and Developmental Issues, University of Economics Ho Chi, Minh City, 72407 Ho Chi Minh City, Vietnam ORCID: https://orcid.org/0000-0001-8357-1957, Email: thanhnq@ueh.edu.vn

Abstract

In Vietnam, the pursuit of equitable healthcare underscores a fundamental public health imperative. Nevertheless, the realization of this goal is marked by conspicuous challenges pertaining to the accessibility of medical treatment. Given the imperative to gauge horizontal inequality in crafting healthcare policies that foster equity, this study endeavours to examine the role of socio-economic disparities as a barrier to medical treatment within the Vietnamese context. Data has been sourced from the Vietnam Household Living Standards Survey (VHLSS) spanning eight years (2008-2018). Initially, a concentration curve is delineated, serving as a foundation for the estimation of concentration indices. These indices facilitate the assessment of trends in inequality. Moreover, health disparity is quantified alongside the decomposition of inequality, aiding in the identification of factors contributing to disparate health outcomes. Concentration indices pertaining to medical treatment unveil a concentration among individuals of higher socioeconomic standing. Interestingly, the findings were

deemed statistically insignificant in the year 2008. However, a pro-poor trend in healthcare inequality emerged in 2010, 2012, 2016, and 2018, while instances of horizontal inequity were evident in 2008 and 2014. Through a comprehensive analysis, we have discerned pivotal determinants influencing the utilization of medical treatment, encompassing variables such as health insurance coverage, marital status, employment conditions, and income levels. Decomposition analysis underscores the significant role of various factors including health status, age, marital status, educational attainment, employment status, ethnic background, income levels, urbanization status, and geographical location in shaping disparities within the realm of medical treatment. The findings underscore the noteworthy influence of demographic variables including age, marital status, educational attainment, ethnicity, health status, employment status, and income level on the socio-economic disparity observed in access to medical treatment.

Keywords: Medical Treatment; Decomposition Analysis, Horizontal Inequalities, Socio-Economic Determinants, Vietnam.

Introduction

By 2030, the Sustainable Development Goals, particularly Goals 3, 4, 5, and 10, pledge to foster healthy lives by addressing factors contributing to inequality (UN, 2015). Goal 3.8 specifically aims at achieving universal health coverage, encompassing various aspects such as access to essential healthcare services, affordable medications, and vaccinations (UN, 2015). Despite notable policy efforts and reforms aimed at enhancing healthcare systems, marked disparities persist in access to and utilization of healthcare services in developing countries (Huda et al., 2018; Omotoso & Koch, 2018; Samuel et al., 2021; Victora et al., 2018).

Vietnam has made significant strides in improving the health of its population over recent decades (Wagstaff et al., 2003). However, despite these advancements, disparities in healthcare services persist (Nguyen & Wilson, 2017; Pham et al., 2019; Thoa et al., 2013). (Kim et al., 2020) conducted an exploration of the factors influencing unmet healthcare needs in Vietnam, highlighting the essential requirement for healthcare services and insurance coverage to meet standards in both rural and urban areas of the country. Some studies have suggested that the expansion of private healthcare has led to increased equity in health access (Nguyen et al., 2017). Inequality in the utilization of delivery care services, with a bias towards women or households with lower incomes, remains a prominent concern in healthcare strategies within Vietnam (Pham et al., 2019;

Thoa et al., 2013). Moreover, Pham et al. (2019) indicated that disparities in income growth may contribute to inequalities in healthcare services utilization.

Viewed through the lens of the Sustainable Development Goals (SDGs), the reduction of socio-economic inequality is a fundamental objective. Consequently, information pertaining to socio-economic factors, particularly within healthcare, is crucial for understanding how trends in these factors impact patterns and behaviours related to medical treatment (Wagstaff et al., 2019). Despite this, there remains a scarcity of literature addressing the identified issues in medical treatment in Vietnam. Furthermore, existing studies have not thoroughly examined factors such as wealth (especially at the group level) and educational attainment in accounting for socio-economic inequalities in medical treatment within the country.

Hence, this study endeavours to rectify the gaps identified in prior literature by focusing on the period spanning 2008 to 2018. The primary objective is to assess and analyse disparities within medical treatment concerning socio-economic factors. To address this aim, the study poses two interrelated questions: firstly, "What are the prevailing trends and patterns in socio-economic inequalities regarding medical treatment?" and secondly, "Which factors are implicated in driving socio-economic disparities in medical treatment?" Utilizing nationally representative data sourced from the Vietnam Household Living Standards Surveys (VHLSS), the study conducts an in-depth examination to elucidate these inquiries.

The paper follows the subsequent structure: Section 2 introduces the data sources and outlines the methods employed for analysing healthcare treatment in Vietnam. Section 3 encompasses the empirical findings and ensuing discussions. Finally, Section 5 comprises the conclusion and implications drawn from the study.

Material and Methods

Data

The study encompasses nine two-year cycles of the "Vietnam Household Living Standards Survey (VHLSS)," spanning from 2008 to 2018. The VHLSS constitutes a nationally representative repeated cross-sectional survey, typically administered biennially. Employing a "multi-stage stratified random sampling" approach, the VHLSS gathers comprehensive data on household demographic and socioeconomic attributes, encompassing factors such as health insurance status,

household income, and expenditure patterns. Defined as individuals cohabiting and sharing meals within the same residential unit, households constitute the primary unit of analysis. Following procedures to address missing data, the final sample size utilized for the study comprised 217,779 individuals.

In this study, the assessment of health treatment relied on data extracted from the specific question in the VHLSS: "What are the reasons for visiting medical establishments?" Responses indicating "Medical treatment" were utilized as the primary measure for analysing healthcare utilization.

Analytical Approach

Concentration Indices

The concentration index (CI) in this context elucidates "the extent and characteristics of disparities in medical treatment" as expressed in Equation (1) (Wagstaff et al., 2007).

$$CI = \frac{2}{\mu} cov(y_i r_i) \qquad (1)$$

Where,
y = medical treatment,
r_i = fractional rank in the living standards distribution,
cov = covariance

μ = the medical treatment variable mean

It should be noted that the CI ranges between -1 and +1. A value of 0 indicates no inequality. A negative CI suggests that the variable of medical treatment is disproportionately concentrated among the poorest individuals, whereas a positive value indicates that the inequality is concentrated among the wealthiest. Therefore, as the CI approaches either -1 or +1, the level of inequality becomes more pronounced.

Horizontal Inequality

To gauge horizontal inequality, the study adjusted the inequality in medical treatment to account for differences in need. Subsequently, any residual inequality was interpreted as health inequality (HI). A positive HI value indicates a pro-rich distribution, while a negative value suggests a pro-poor distribution (Wagstaff et al., 2007). In estimating the concentration index as delineated in Equation 1, the study employed a similar methodology. The HI value was computed by subtracting the CI

of medical treatment from the CI of the need for medical treatment (CN). Thus, a positive H1 value underscores a favourable distribution of medical treatment for the affluent, whereas a negative value signifies a bias towards the disadvantaged.

$$HI = CI - C_N \qquad (2)$$

Concentration Index Decomposition

According to (Wagstaff, 2005), the concentration index interval tends to decrease when the outcome variable is binary, potentially leading to a significant impact on changes in socioeconomic inequality (Erreygers, 2009). Therefore, to address this issue, the study incorporates the Erreygers Index (EI) as a normalized version of the CI, aiming to mitigate this concern (Erreygers, 2009).

$$EI = 4\mu CI \qquad (3)$$

The decomposition of medical treatment inequality relies on the assumption that medical treatment is fundamentally a linear function, which is a result of outcome variables (Wagstaff et al., 2003). This linear function with explanatory variables (x) is expressed as:

$$y = a + \sum_k \beta_k x_k + \varepsilon \qquad (4)$$

Therefore, adhering to Wagstaff et al. (2003) criteria, the standard measurement of the concentration index (CI) can be calculated using the Equation 5.

$$CI(y) = \sum_k (\beta_k \overline{x_k}/\mu) C_k + GCI_\varepsilon/\mu \qquad (5)$$

Where,
$\bar{x}_k$ = mean of x_k,
C_k = CI for x_k,
μ = mean of y,
GCI = generalized CI

By utilizing equation 5, the Erreygers Index can be disaggregated into a "weighted sum of the socioeconomic inequality in the determinants for medical treatment." Here, the weight represents "the sensitivity of utilization for each covariate," denoted by bj, which defines $\overline{X} j$. Given that the outcome variable of the study is binary, the decomposition of EI can be expressed as Equation 6.

$$EI = 4 \left[\sum_{j=1}^{J} \beta_j \overline{X}_J * CI_j + GCI_\varepsilon \right] \qquad (6)$$

Where,
β_j = partial effects of medical treatment determinants. It is crucial to note that a positive value of EI indicates a distribution of medical treatment favouring wealthier households. As previously discussed, a multi-stage survey design was employed to conduct descriptive analyses, regression analyses, and decomposition analyses using Stata.

Models

Outcome Variables

Medical treatment was utilized as the focal point for analysing socioeconomic disparities in medical treatment within Vietnam. This variable was operationalized as a binary dummy variable, assigned a value of one if an individual received healthcare treatment during the survey period, and zero otherwise.

Explanatory Variables

Horizontal inequity refers to the unequal treatment of individuals with equal levels of need (Jenkins, 1988). According to Van Lerberghe (2008), Culyer and Wagstaff (1993), Culyer (1995), and Wagstaff et al. (2007), explanatory variables are typically classified into two categories: "need" variables and "non-need" variables. "Need" factors are those expected to influence healthcare utilization decisions, while "non-need" factors are those that should not.

In the current study, "need" variables include gender, age, and health status. Health status is defined as the frequency of severe injuries leading to the individual needing care from a bedside caregiver or being unable to carry out daily activities. Non-need variables consist of income per capita, education level, marital status, ethnicity, employment status, access to free healthcare, residential status (rural/urban), and regional location.

Following the approach of prior studies (Lim et al., 2018; Zhao et al., 2020), explanatory variables such as gender, age, health status, education, marital status, ethnicity, and employment status were considered as exposure variables due to their conceptual association with the outcome variables. Additionally, controlling variables include possession of a free healthcare certificate, residential status (rural/urban), and regional location.

In this study, ten age-sex groups and the frequency of severe injuries were included as need factors. Conversely, variables such as residential status (urban or rural), regional location (Northwest, Northeast, Red River Delta, North Central Coast, South Central Coast, Central Highlands, Southeast, Mekong River Delta),

marital status (single, married, widow, divorced, separated), employment occupation (leaders/managers, professionals/technicians, clerks/service workers, agriculture/forestry/fishery, skilled workers/machine operators, unskilled workers, not working), education level (no degree, primary school, lower secondary school, upper secondary school, college and above), and possession of free healthcare insurance (yes or no) were considered as non-need factors.

Empirical Results and Discussion

Descriptive Statistics

The current paper examines the dichotomous outcome variable of medical treatment, alongside various covariates encompassing individual characteristics (age, gender, ethnicity, schooling, and occupation), health status, health insurance status, wealth status, regional location, and geographic residence. A summary of the utilized variables is provided in Table 1. The sample comprises all household members, totalling around 217,779 respondents who completed the VHLSS survey questionnaire between 2008 and 2018.

Regarding medical treatment, approximately 29% of respondents reported receiving medical treatment in the 12 months prior to the survey in 2008, with a slight decrease to 27% in 2018. The age distribution of the sample indicates a relatively young population, with nearly 31-32% of respondents aged less than 44 years for both males and females throughout the years 2008-2018.

In terms of marital status, around 45% of respondents reported being never married, while approximately 48% confirmed being married in 2008. However, in 2018, 40% of respondents indicated being single, and the proportion of individuals who were married increased to 53%.

Education-wise, approximately one-third (33%) of respondents had no formal education, while over one-quarter (26%) had primary education, and one-fifth had junior secondary education (24%) in 2008. The proportion of individuals with no formal education decreased to nearly 32% in 2018, while the proportions of those with upper secondary education, college, and above increased over the study period.

Table 1: Individual Characteristics of VHLSS Survey in Vietnam, 2008-2018.

Variable	2008		2010		2012		2014		2016		2018	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Treatment (yes=1)	0.2864	0.4521	0.3217	0.4671	0.2935	0.4554	0.2747	0.4464	0.2867	0.4522	0.2707	0.4443
Health status: number of times being injured	2.3102	16.9652	2.6791	4.2553	1.1458	2.7769	0.1007	0.6174	0.1337	0.6811	0.1289	0.7013
1 Less than 18 (yes =1): male	0.1518	0.3589	0.1528	0.3598	0.1433	0.3504	0.1409	0.3479	0.1421	0.3492	0.1415	0.3486
2 From 18 to less than 34 (yes =1): male	0.1303	0.3366	0.1318	0.3383	0.1308	0.3372	0.1247	0.3304	0.1129	0.3164	0.1048	0.3063
3 From 34 to less than 44 (yes =1): male	0.0701	0.2554	0.0710	0.2568	0.0713	0.2573	0.0693	0.2539	0.0690	0.2535	0.0695	0.2543
4 From 44 to less than 64 (yes =1): male	0.0997	0.2996	0.1002	0.3002	0.1069	0.3090	0.1149	0.3190	0.1213	0.3265	0.1270	0.3329
5 From 64 to less than 74 (yes =1): male	0.0186	0.1351	0.0161	0.1258	0.0168	0.1285	0.0187	0.1354	0.0212	0.1439	0.0245	0.1546
6 Over 74 (yes =1): male	0.0141	0.1181	0.0129	0.1128	0.0148	0.1208	0.0149	0.1212	0.0163	0.1266	0.0163	0.1265
1 Less than 18 (yes =1): female	0.1430	0.3501	0.1418	0.3488	0.1361	0.3429	0.1332	0.3397	0.1331	0.3396	0.1322	0.3387
2 From 18 to less than 34 (yes =1): female	0.1226	0.3279	0.1315	0.3380	0.1259	0.3318	0.1196	0.3245	0.1116	0.3149	0.1018	0.3024
3 From 34 to less than 44 (yes =1): female	0.0740	0.2617	0.0737	0.2613	0.0739	0.2616	0.0739	0.2616	0.0714	0.2575	0.0731	0.2602
4 From 44 to less than 64 (yes =1): female	0.1135	0.3172	0.1107	0.3137	0.1153	0.3193	0.1238	0.3294	0.1307	0.3371	0.1354	0.3421
5 From 64 to less than 74 (yes =1): female	0.0251	0.1563	0.0220	0.1466	0.0243	0.1540	0.0244	0.1544	0.0280	0.1650	0.0332	0.1793
6 Over 74 (yes =1): female	0.0239	0.1527	0.0221	0.1471	0.0250	0.1562	0.0269	0.1618	0.0284	0.1660	0.0268	0.1616
1 Single (yes=1)	0.4561	0.4981	0.4429	0.4967	0.4274	0.4947	0.4137	0.4925	0.4060	0.4911	0.3975	0.4894
2 Married (yes=1)	0.4782	0.4995	0.4950	0.5000	0.5070	0.5000	0.5168	0.4997	0.5198	0.4996	0.5249	0.4994
3 Widow (yes=1)	0.0552	0.2284	0.0502	0.2184	0.0531	0.2242	0.0557	0.2294	0.0584	0.2345	0.0602	0.2379
4 Divorced (yes=1)	0.0069	0.0830	0.0087	0.0928	0.0090	0.0946	0.0100	0.0997	0.0127	0.1122	0.0140	0.1173
5 Separated (yes=1)	0.0036	0.0600	0.0032	0.0569	0.0035	0.0590	0.0037	0.0608	0.0031	0.0554	0.0034	0.0586
1 No degree (yes=1)	0.3271	0.4692	0.3504	0.4771	0.3408	0.4740	0.3334	0.4714	0.3278	0.4694	0.3172	0.4654
2 Primary school (yes=1)	0.2557	0.4363	0.2360	0.4246	0.2361	0.4247	0.2327	0.4225	0.2303	0.4210	0.2265	0.4186
3 Lower Secondary School (yes=1)	0.2381	0.4259	0.2239	0.4168	0.2213	0.4151	0.2222	0.4157	0.2295	0.4205	0.2330	0.4227
4 Upper Secondary School (yes=1)	0.1445	0.3516	0.1447	0.3518	0.1493	0.3563	0.1484	0.3555	0.1433	0.3504	0.1479	0.3551
5 College and above (yes=1)	0.0346	0.1828	0.0450	0.2073	0.0525	0.2231	0.0633	0.2436	0.0690	0.2535	0.0753	0.2639
1 Leaders/Managers (yes=1)	0.0083	0.0907	0.0496	0.2170	0.0453	0.2080	0.0394	0.1945	0.0412	0.1988	0.0062	0.0783
2 Professionals/Technicians (yes=1)	0.0375	0.1900	0.0273	0.1630	0.0272	0.1627	0.0286	0.1668	0.0329	0.1783	0.0432	0.2032
3 Clerks/Service Workers (yes=1)	0.0299	0.1702	0.1192	0.3241	0.1184	0.3231	0.1207	0.3258	0.1250	0.3307	0.0903	0.2867
4 Agriculture/Forestry/Fishery (yes=1)	0.3225	0.4674	0.0028	0.0530	0.0028	0.0527	0.0030	0.0543	0.0029	0.0538	0.2491	0.4325
5 Skilled Workers/Machine Operators (yes=1)	0.0802	0.2716	0.0039	0.0621	0.0038	0.0615	0.0042	0.0649	0.0042	0.0646	0.1232	0.3287
6 Unskilled Workers (yes=1)	0.1105	0.3135	0.0010	0.0316	0.0010	0.0309	0.0015	0.0391	0.0013	0.0366	0.0396	0.1951

7 Not working (yes=1)	0.3301	0.4703	0.7962	0.4028	0.8016	0.3988	0.8026	0.3981	0.7925	0.4056	0.4485	0.4973
Ethnic (Kinh majority=1)	0.8149	0.3884	0.7967	0.4024	0.7969	0.4023	0.8023	0.3983	0.7963	0.4028	0.7963	0.4028
Free healthcare certificate (yes=1)	0.5778	0.4939	0.6103	0.4877	0.6567	0.4748	0.7057	0.4557	0.7853	0.4106	0.8882	0.3151
Urban (urban=1)	0.2501	0.4331	0.2733	0.4457	0.2823	0.4501	0.2944	0.4558	0.2983	0.4575	0.2955	0.4563
Northwest (yes=1)	0.1920	0.3939	0.1839	0.3874	0.1811	0.3851	0.1851	0.3884	0.1844	0.3878	0.1796	0.3839
Northeast (yes=1)	0.1439	0.3510	0.1486	0.3557	0.1485	0.3556	0.1504	0.3575	0.1509	0.3579	0.1550	0.3619
Red River Delta (yes=1)	0.0567	0.2314	0.0535	0.2250	0.0549	0.2279	0.0546	0.2272	0.0548	0.2276	0.0574	0.2327
North Central Coast (yes=1)	0.1066	0.3087	0.1054	0.3070	0.1041	0.3053	0.1043	0.3057	0.1045	0.3059	0.0987	0.2983
South Central Coast (yes=1)	0.0930	0.2905	0.0925	0.2897	0.0903	0.2867	0.0896	0.2856	0.0871	0.2819	0.0916	0.2884
Central Highlands (yes=1)	0.0730	0.2602	0.0760	0.2651	0.0734	0.2609	0.0740	0.2618	0.0749	0.2633	0.0779	0.2680
Southeast (yes=1)	0.1326	0.3391	0.1386	0.3455	0.1401	0.3471	0.1421	0.3491	0.1426	0.3496	0.1432	0.3503
Mekong River Delta (yes=1)	0.2021	0.4015	0.2015	0.4011	0.2075	0.4055	0.1999	0.3999	0.2009	0.4007	0.1965	0.3974
Number of observations	38,241		36,990		36,655		35,897		35,767		34,229	

Source: Authors' estimation from the VHLSS

Regarding employment status, close to one-third (33%) of respondents not employed in 2008, while over one-quarter were unskilled workers (13%), and less than one-tenth were skilled workers (8%). However, by 2018, nearly half (45%) of respondents were not working, with an increase observed in the proportions of skilled workers and professional technicians over the study period.

The majority of respondents (approximately 70%) resided in rural areas in 2018, compared to 75% in 2008, indicating a relatively rapid urbanization trend. Furthermore, around four-fifths of the respondents belonged to the Kinh ethnic group throughout the years 2008-2018. A notable increase in the possession of free healthcare certificates was observed between 2008 and 2018.

Determinants of Medical Treatment

Table 2 presents the regression results of the probit model, while Table 3 displays the marginal effects derived from the probit models. The findings indicate that both men's and women's ages are significantly associated with increased probabilities of utilizing medical treatment, with the effects being consistently largest for respondents aged 64 years or older. Additionally, a positive and significant association between health status and medical treatment utilization is observed.

Table 2: Determinants Of Medical Treatment in Vietnam, Coefficients of the Probit Model: 2008-2018.

Variables	2008	2010	2012	2014	2016	2018
Health Status: number of times being injured	0.011***	0.035***	0.529***	1.048***	0.862***	0.895***
	(0.002)	(0.003)	(0.022)	(0.065)	(0.057)	(0.065)
From 18 to less than 34 (yes =1): male	-0.216***	-0.175***	0.112***	-0.177***	-0.287***	-0.148***
(Base: Less than 18: male)	(0.039)	(0.036)	(0.039)	(0.041)	(0.043)	(0.048)
From 34 to less than 44 (yes =1): male	0.018	0.053	0.346***	0.116**	-0.063	0.112*
	(0.052)	(0.047)	(0.053)	(0.052)	(0.052)	(0.059)
From 44 to less than 64 (yes =1): male	0.238***	0.312***	0.488***	0.293***	0.238***	0.316***
	(0.049)	(0.044)	(0.050)	(0.048)	(0.048)	(0.053)
From 64 to less than 74 (yes =1): male	0.562***	0.690***	0.470***	0.538***	0.491***	0.695***
	(0.071)	(0.069)	(0.110)	(0.075)	(0.069)	(0.075)
Over 74 (yes =1): male	0.580***	0.629***	0.813***	0.850***	0.648***	0.726***
	(0.081)	(0.078)	(0.095)	(0.084)	(0.083)	(0.089)
From 18 to less than 34 (yes =1): female	-0.104***	-0.065*	-0.127***	-0.110**	-0.237***	-0.105**
(Base: Less than 18: female)	(0.040)	(0.037)	(0.045)	(0.044)	(0.046)	(0.051)
From 34 to less than 44 (yes =1): female	0.184***	0.269***	0.336***	0.274***	0.110**	0.164***
	(0.049)	(0.045)	(0.052)	(0.050)	(0.051)	(0.055)
From 44 to less than 64 (yes =1): female	0.399***	0.500***	0.548***	0.530***	0.402***	0.463***
	(0.046)	(0.042)	(0.049)	(0.046)	(0.046)	(0.052)
From 64 to less than 74 (yes =1): female	0.478***	0.649***	0.615***	0.748***	0.652***	0.646***
	(0.068)	(0.066)	(0.091)	(0.071)	(0.066)	(0.068)
Over 74 (yes =1): female	0.488***	0.628***	0.656***	0.684***	0.431***	0.552***
	(0.072)	(0.070)	(0.078)	(0.076)	(0.074)	(0.079)
Single (yes=1)	0.165	0.087	0.120	-0.015	-0.147	-0.012
(Base: Separated)	(0.152)	(0.148)	(0.153)	(0.142)	(0.174)	(0.170)
Married (yes=1)	0.330**	0.214	-0.000	0.012	-0.046	0.100
	(0.149)	(0.145)	(0.150)	(0.139)	(0.171)	(0.167)
Widow (yes=1)	0.411***	0.196	0.089	-0.012	-0.045	0.114
	(0.154)	(0.151)	(0.158)	(0.146)	(0.176)	(0.173)
Divorced (yes=1)	0.271	-0.054	0.062	0.098	-0.046	0.063
	(0.179)	(0.167)	(0.173)	(0.166)	(0.187)	(0.184)
Primary school (yes=1) (Base: No degree)	-0.185***	-0.154***	-0.121***	-0.173***	-0.227***	-0.219***
	(0.022)	(0.022)	(0.026)	(0.024)	(0.024)	(0.026)
Lower Secondary School (yes=1)	-0.213***	-0.179***	-0.137***	-0.219***	-0.292***	-0.267***

	(0.025)	(0.024)	(0.028)	(0.027)	(0.027)	(0.028)
Upper Secondary School (yes=1)	-0.326***	-0.306***	-0.276***	-0.358***	-0.370***	-0.397***
	(0.034)	(0.032)	(0.038)	(0.035)	(0.036)	(0.038)
College and above (yes=1)	-0.346***	-0.445***	-0.582***	-0.478***	-0.473***	-0.467***
	(0.065)	(0.046)	(0.066)	(0.046)	(0.046)	(0.055)
Leaders/Managers (yes=1)	-0.232**	-0.094**	0.027	-0.182***	-0.070	-0.034
(Base: Not working)	(0.097)	(0.039)	(0.046)	(0.048)	(0.047)	(0.128)
Professionals/Technicians (yes=1)	-0.140**	-0.046	0.084	-0.083	0.013	-0.196***
	(0.062)	(0.052)	(0.058)	(0.057)	(0.054)	(0.065)
Clerks/Service Workers (yes=1)	-0.126**	-0.067**	0.006	-0.038	-0.074**	-0.129***
	(0.053)	(0.027)	(0.034)	(0.029)	(0.029)	(0.041)
Agriculture/Forestry/Fishery (yes=1)	-0.053*	0.042	0.207	-0.221	0.106	0.019
	(0.028)	(0.158)	(0.155)	(0.168)	(0.151)	(0.032)
Skilled Workers/Machine Operators (yes=1)	-0.133***	-0.189	-0.185	-0.363***	0.010	-0.111***
	(0.040)	(0.142)	(0.148)	(0.125)	(0.121)	(0.039)
Unskilled Workers (yes=1)	-0.101***	-0.109	0.145	-0.389	-0.079	-0.104*
	(0.034)	(0.246)	(0.304)	(0.239)	(0.241)	(0.054)
Ethnic (Kinh majority=1)	0.169***	0.179***	0.153***	0.198***	0.228***	0.156***
	(0.028)	(0.027)	(0.029)	(0.031)	(0.030)	(0.031)
Lowest (yes=1)	0.013	-0.137***	-0.052	-0.152***	0.032	-0.136***
(Base: Highest (yes=1))	(0.031)	(0.030)	(0.036)	(0.035)	(0.034)	(0.036)
Second (yes=1)	0.009	-0.020	0.047	-0.049	-0.010	-0.069**
	(0.028)	(0.028)	(0.032)	(0.030)	(0.031)	(0.032)
Middle (yes=1)	0.042	-0.025	0.065**	-0.081***	0.050*	-0.043
	(0.029)	(0.027)	(0.032)	(0.029)	(0.029)	(0.031)
Fourth (yes=1)	0.002	-0.008	0.029	0.034	0.047	-0.024
	(0.027)	(0.026)	(0.032)	(0.028)	(0.029)	(0.031)
Free healthcare certificate (yes=1)	0.338***	0.391***	0.207***	0.338***	0.289***	0.318***
	(0.020)	(0.019)	(0.022)	(0.022)	(0.024)	(0.034)
Urban (urban=1)	-0.079***	-0.135***	-0.123***	-0.048**	0.024	-0.014
	(0.022)	(0.020)	(0.023)	(0.021)	(0.021)	(0.023)
Northwest (yes=1)	-0.615***	-0.493***	-0.378***	-0.688***	-0.644***	-0.690***
(Base: Mekong River Delta)	(0.026)	(0.026)	(0.030)	(0.028)	(0.028)	(0.030)
Northeast (yes=1)	-0.716***	-0.645***	-0.539***	-0.843***	-0.899***	-0.781***
	(0.030)	(0.030)	(0.034)	(0.032)	(0.031)	(0.032)
Red River Delta (yes=1)	-0.841***	-0.779***	-0.519***	-0.886***	-1.053***	-0.908***

	(0.047)	(0.048)	(0.055)	(0.051)	(0.056)	(0.050)
North Central Coast (yes=1)	-0.759***	-0.585***	-0.413***	-0.789***	-0.919***	-0.776***
	(0.032)	(0.032)	(0.035)	(0.034)	(0.033)	(0.036)
South Central Coast (yes=1)	-0.322***	-0.220***	-0.213***	-0.507***	-0.505***	-0.381***
	(0.030)	(0.029)	(0.036)	(0.033)	(0.032)	(0.036)
Central Highlands (yes=1)	-0.274***	-0.088***	-0.000	-0.289***	-0.389***	-0.328***
	(0.034)	(0.033)	(0.042)	(0.037)	(0.036)	(0.036)
Southeast (yes=1)	-0.365***	-0.188***	-0.176***	-0.407***	-0.438***	-0.311***
	(0.029)	(0.027)	(0.031)	(0.029)	(0.030)	(0.032)
Constant	-0.699***	-0.725***	-1.340***	-0.589***	-0.464**	-0.695***
	(0.159)	(0.154)	(0.165)	(0.151)	(0.181)	(0.180)
Observations	38,241	36,990	36,655	36,072	35,767	34,229
Wald chi-squared	2937	3193	2409	3097	3311	2772
P-value for model test	0	0	0	0	0	0
Log likelihood	-2.160e+08	-2.140e+08	-1.470e+08	-1.940e+08	-1.990e+08	-1.880e+08
Pseudo-R-squared	0.103	0.0977	0.374	0.168	0.177	0.183

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Source: Authors' estimation from the VHLSS

Table 3: Determinants of Medical Treatment in Vietnam, Marginal Effects of the Probit Model: 2008-2018.

VARIABLES	2008	2010	2012	2014	2016	2018
Health status: number of times being injured	0.00367***	0.0119***	0.171***	0.323***	0.270***	0.268***
	(0.000546)	(0.00102)	(0.00780)	(0.0207)	(0.0187)	(0.0203)
From 18 to less than 34 (yes =1): male	-0.0651***	-0.0571***	0.0372***	-0.0520***	-0.0825***	-0.0424***
(Base: Less than 18: male)	(0.0110)	(0.0111)	(0.0132)	(0.0113)	(0.0111)	(0.0132)
From 34 to less than 44 (yes =1): male	0.00590	0.0184	0.122***	0.0371**	-0.0193	0.0348*
	(0.0167)	(0.0163)	(0.0197)	(0.0172)	(0.0157)	(0.0190)
From 44 to less than 64 (yes =1): male	0.0807***	0.113***	0.174***	0.0973***	0.0789***	0.103***
	(0.0173)	(0.0165)	(0.0191)	(0.0168)	(0.0166)	(0.0186)
From 64 to less than 74 (yes =1): male	0.205***	0.263***	0.171***	0.191***	0.175***	0.249***
	(0.0280)	(0.0274)	(0.0432)	(0.0292)	(0.0268)	(0.0298)
Over 74 (yes =1): male	0.212***	0.239***	0.306***	0.315***	0.237***	0.262***
	(0.0323)	(0.0311)	(0.0372)	(0.0332)	(0.0330)	(0.0353)
From 18 to less than 34 (yes =1): female	-0.0325***	-0.0219*	-0.0399***	-0.0329**	-0.0695***	-0.0305**

(Base: Less than 18: female)	(0.0122)	(0.0124)	(0.0137)	(0.0129)	(0.0124)	(0.0143)
From 34 to less than 44 (yes =1): female	0.0615***	0.0965***	0.118***	0.0912***	0.0357**	0.0516***
	(0.0172)	(0.0170)	(0.0195)	(0.0178)	(0.0171)	(0.0183)
From 44 to less than 64 (yes =1): female	0.139***	0.185***	0.197***	0.184***	0.138***	0.155***
	(0.0171)	(0.0162)	(0.0190)	(0.0174)	(0.0168)	(0.0189)
From 64 to less than 74 (yes =1): female	0.172***	0.247***	0.228***	0.274***	0.238***	0.230***
	(0.0264)	(0.0263)	(0.0361)	(0.0284)	(0.0262)	(0.0266)
Over 74 (yes =1): female	0.176***	0.238***	0.244***	0.249***	0.152***	0.193***
	(0.0280)	(0.0278)	(0.0310)	(0.0299)	(0.0283)	(0.0305)
Single (yes=1)	0.0529	0.0297	0.0391	-0.00451	-0.0458	-0.00352
(Base: Separated)	(0.0487)	(0.0504)	(0.0498)	(0.0437)	(0.0535)	(0.0510)
Married (yes=1)	0.106**	0.0726	-6.01e-05	0.00368	-0.0145	0.0300
	(0.0478)	(0.0493)	(0.0484)	(0.0428)	(0.0535)	(0.0499)
Widow (yes=1)	0.145**	0.0695	0.0294	-0.00378	-0.0138	0.0355
	(0.0588)	(0.0557)	(0.0536)	(0.0446)	(0.0536)	(0.0558)
Divorced (yes=1)	0.0937	-0.0180	0.0203	0.0312	-0.0143	0.0193
	(0.0658)	(0.0551)	(0.0582)	(0.0546)	(0.0567)	(0.0577)
Primary school (yes=1) (Base: No degree)	-0.0573***	-0.0512***	-0.0382***	-0.0515***	-0.0678***	-0.0624***
	(0.00667)	(0.00702)	(0.00804)	(0.00689)	(0.00689)	(0.00697)
Lower Secondary School (yes=1)	-0.0652***	-0.0589***	-0.0433***	-0.0646***	-0.0861***	-0.0754***
	(0.00722)	(0.00770)	(0.00856)	(0.00745)	(0.00735)	(0.00756)
Upper Secondary School (yes=1)	-0.0956***	-0.0971***	-0.0835***	-0.100***	-0.105***	-0.106***
	(0.00898)	(0.00931)	(0.0105)	(0.00876)	(0.00897)	(0.00896)
College and above (yes=1)	-0.0980***	-0.132***	-0.154***	-0.125***	-0.126***	-0.119***
	(0.0160)	(0.0115)	(0.0133)	(0.00970)	(0.0102)	(0.0114)
Leaders/Managers (yes=1)	-0.0682***	-0.0312**	0.00891	-0.0527***	-0.0213	-0.0101
(Base: Not working)	(0.0258)	(0.0126)	(0.0150)	(0.0129)	(0.0142)	(0.0375)
Professionals/Technicians (yes=1)	-0.0429**	-0.0154	0.0278	-0.0248	0.00420	-0.0548***
	(0.0179)	(0.0171)	(0.0197)	(0.0165)	(0.0169)	(0.0167)
Clerks/Service Workers (yes=1)	-0.0386**	-0.0225**	0.00184	-0.0116	-0.0227***	-0.0370***
	(0.0157)	(0.00903)	(0.0109)	(0.00880)	(0.00878)	(0.0114)
Agriculture/Forestry/Fishery (yes=1)	-0.0169*	0.0144	0.0710	-0.0627	0.0342	0.00577
	(0.00875)	(0.0551)	(0.0560)	(0.0432)	(0.0506)	(0.00957)
Skilled Workers/Machine Operators (yes=1)	-0.0409***	-0.0607	-0.0561	-0.0969***	0.00328	-0.0323***
	(0.0119)	(0.0426)	(0.0417)	(0.0281)	(0.0380)	(0.0109)
Unskilled Workers (yes=1)	-0.0313***	-0.0359	0.0488	-0.102**	-0.0239	-0.0300**

	(0.0103)	(0.0782)	(0.107)	(0.0518)	(0.0714)	(0.0149)
Ethnic (Kinh majority=1)	0.0519***	0.0586***	0.0480***	0.0580***	0.0678***	0.0451***
	(0.00826)	(0.00851)	(0.00881)	(0.00859)	(0.00832)	(0.00866)
Lowest (yes=1)	0.00425	-0.0455***	-0.0167	-0.0453***	0.0102	-0.0395***
(Base: Highest (yes=1))	(0.00991)	(0.00979)	(0.0114)	(0.00999)	(0.0109)	(0.0102)
Second (yes=1)	0.00290	-0.00667	0.0153	-0.0151*	-0.00317	-0.0202**
	(0.00910)	(0.00947)	(0.0105)	(0.00918)	(0.00967)	(0.00933)
Middle (yes=1)	0.0134	-0.00852	0.0214**	-0.0246***	0.0159*	-0.0128
	(0.00927)	(0.00903)	(0.0108)	(0.00875)	(0.00939)	(0.00913)
Fourth (yes=1)	0.000762	-0.00266	0.00945	0.0106	0.0149	-0.00705
	(0.00868)	(0.00868)	(0.0103)	(0.00877)	(0.00922)	(0.00925)
Free healthcare certificate (yes=1)	0.106***	0.129***	0.0656***	0.0990***	0.0850***	0.0860***
	(0.00604)	(0.00613)	(0.00685)	(0.00614)	(0.00649)	(0.00803)
Urban (urban=1)	-0.0248***	-0.0449***	-0.0391***	-0.0149**	0.00761	-0.00406
	(0.00681)	(0.00654)	(0.00732)	(0.00643)	(0.00667)	(0.00675)
Northwest (yes=1)	-0.170***	-0.152***	-0.113***	-0.181***	-0.174***	-0.173***
(Base: Mekong River Delta)	(0.00596)	(0.00713)	(0.00814)	(0.00596)	(0.00629)	(0.00610)
Northeast (yes=1)	-0.182***	-0.184***	-0.149***	-0.196***	-0.211***	-0.180***
	(0.00583)	(0.00679)	(0.00776)	(0.00531)	(0.00531)	(0.00562)
Red River Delta (yes=1)	-0.193***	-0.201***	-0.139***	-0.189***	-0.213***	-0.185***
	(0.00680)	(0.00838)	(0.0116)	(0.00652)	(0.00623)	(0.00621)
North Central Coast (yes=1)	-0.192***	-0.170***	-0.119***	-0.187***	-0.215***	-0.178***
	(0.00590)	(0.00745)	(0.00869)	(0.00577)	(0.00542)	(0.00586)
South Central Coast (yes=1)	-0.0932***	-0.0706***	-0.0649***	-0.131***	-0.133***	-0.100***
	(0.00766)	(0.00887)	(0.0102)	(0.00685)	(0.00685)	(0.00816)
Central Highlands (yes=1)	-0.0801***	-0.0293***	-6.47e-05	-0.0808***	-0.107***	-0.0874***
	(0.00914)	(0.0108)	(0.0137)	(0.00930)	(0.00843)	(0.00855)
Southeast (yes=1)	-0.107***	-0.0615***	-0.0547***	-0.114***	-0.122***	-0.0859***
	(0.00754)	(0.00847)	(0.00936)	(0.00722)	(0.00725)	(0.00795)
Observations	38,241	36,990	36,655	36,072	35,767	34,229

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' estimation from the VHLSS

Individuals belonging to the Kinh ethnic majority exhibit a higher likelihood of accessing medical treatment. Moreover, there is a positive correlation between lower wealth status and increased utilization of medical treatment. Individuals holding free healthcare certificates tend to utilize medical treatment more frequently. Conversely, urban residents are less likely to seek medical treatment. In terms of regional differences, individuals residing in the Mekong River Delta demonstrate a higher propensity to utilize medical treatment. Furthermore, those with higher levels of education and employment are less likely to seek medical treatment.

Concentration Indices and Inequalities in Medical Treatment
Medical Treatment Concentration Indices

Table 4 delineates the concentration indices pertaining to medical treatment across the years 2008 to 2018. The indices reveal that medical treatment allocation during this period exhibited a notable concentration among individuals of higher socioeconomic status. However, it is noteworthy that the statistical significance of this concentration was not evident at conventional thresholds in 2008.

Specifically, the concentration indices for medical treatment in 2008 and 2018 were recorded at 0.03 and 0.04, respectively. These values signify a persistent concentration of medical treatment services among the affluent demographic over the specified timeframe, indicating a relative stability in inequality between 2008 and 2018. In essence, these findings denote a continuation of pro-wealth disparities in medical treatment distribution, with no discernible reduction in inequality observed over the examined period.

Table 4: Concentration Indices of Medical Treatment in Vietnam, 2008-2018.

	CI	Robust SE.	p-value
2008	.0029815	.002871	0.299
2010	.0194253	.0029209	0.000
2012	.0192766	.002866	0.000
2014	.00899	.0029116	0.002
2016	.0184558	.0029991	0.000
2018	.036612	.0063849	0.000

Source: Authors' estimation from the VHLSS

Inequalities in Medical Treatment

Table 5 illustrates that inequality estimates were consistently positive throughout the years 2008 to 2018, with the exception of the year 2012. This outcome implies that the allocation of medical treatment was predominantly concentrated among households of higher socioeconomic status in the years 2008, 2010, 2014, 2016, and 2018. However, in 2006 and notably in 2012, the distribution of medical treatment exhibited an even greater skew towards affluent households.

Table 5: Horizontal inequality in medical treatment in Vietnam, 2008-2018.

	2008	2010	2012	2014	2016	2018
EI	.0219	.0079	-.0365	.0247	.0016	.0048
Observations	38,241	36,990	36,655	35,897	35,767	170,452

Decomposing Inequalities in Medical Treatment

Tables 6 and 7 present decomposition results for each year, including elasticity, CI, absolute contribution, and percentage contribution of explanatory variables. Positive contribution percentages indicate a bias towards the affluent, while negative values suggest a bias towards the impoverished.

In Table 6, a robust positive association is observed between health status (measured by injury frequency) and medical treatment. Additionally, significant contributors to socioeconomic disparity in medical treatment include age and gender. Notably, males aged 44 to under 64 contributed approximately 12.4% to inequality in 2008 and 39.79% in 2018, while females in the same age group contributed around 29.01% in 2008 and 63.38% in 2018. In 2008, health status emerged as the most significant contributor, whereas in 2018, the most substantial contribution stemmed from females aged 44 to under 64.

Table 6 illustrates the contribution of need-based factors, wherein the presence of negative values for categories such as males aged 18 to under 34, males aged over 74, females aged 18 to under 34, and females aged over 74 from 2008 to 2018, suggests that if medical treatment were solely determined by need factors, it would exhibit a pro-poor bias.

Table 6: Contributing Factors of Inequality in Medical Treatment in Vietnam: Need Variables, 2010-2018.

Variables	2010				2012				2014				2016				2018			
	E	CI	AC	PC	E	CI	AC	PC	E	CI	AC	PC	E	CI	AC	PC	E	CI	AC	PC
Health status: number of times being injured	0.132	0.062	0.008	42.52	0.301	0.059	0.018	92.09	0.057	-0.087	-0.005	-55.08	0.078	-0.007	-0.001	-2.88	0.027	0.014	0.0004	2.69
2 From 18 to less than 34 (yes =1): male	-0.049	0.041	-0.002	-10.55	-0.037	0.050	-0.002	-9.70	-0.055	0.026	-0.002	-16.15	-0.057	0.029	-0.002	-9.02	-0.043	0.038	-0.001	-12.03
3 From 34 to less than 44 (yes =1): male	-0.010	0.0003	0	-0.01	-0.003	-0.002	0	0.02	-0.007	0.0024	0	-0.20	-0.012	-0.003	0	0.17	-0.006	-0.003	0	0.12
4 From 44 to less than 64 (yes =1): male	0.021	0.146	0.003	15.55	0.015	0.143	0.002	11.10	0.024	0.135	0.003	36.55	0.023	0.134	0.003	16.82	0.043	0.127	0.006	39.79
5 From 64 to less than 74 (yes =1): male	0.013	0.082	0.001	5.59	0.009	0.081	0.001	3.64	0.012	0.027	0.0003	3.71	0.014	0.035	0.001	2.60	0.024	-0.001	0	-0.23
6 Over 74 (yes =1): male	0.010	-0.050	-0.001	-2.65	0.011	-0.064	-0.001	-3.66	0.017	-0.044	-0.001	-8.11	0.015	-0.051	-0.001	-4.11	0.021	-0.092	-0.002	-13.98
2 From 18 to less than 34 (yes =1): female	-0.033	0.024	-0.001	-4.00	-0.036	0.017	-0.001	-3.12	-0.040	0.017	-0.001	-7.60	-0.046	0.011	-0.001	-2.70	-0.034	0.020	-0.001	-4.90
3 From 34 to less than 44 (yes =1): female	0.011	0.0155	0.0002	0.81	0.006	0.015	0.0001	0.49	0.009	0.024	0.0002	2.36	0.004	0.010	0	0.24	0.009	0.023	0.0002	1.41
4 From 44 to less than 64 (yes =1): female	0.055	0.128	0.007	35.90	0.040	0.120	0.005	24.74	0.065	0.108	0.007	77.73	0.058	0.114	0.007	35.87	0.084	0.105	0.009	63.38
5 From 64 to less than 74 (yes =1): female	0.018	0.016	0.0003	1.47	0.015	-0.022	-0.0003	-1.73	0.025	-0.040	-0.001	-10.93	0.024	-0.024	-0.001	-3.16	0.036	-0.056	-0.002	-14.49
6 Over 74 (yes =1): female	0.019	-0.064	-0.001	-6.16	0.016	-0.131	-0.002	-10.63	0.028	-0.117	-0.003	-35.86	0.024	-0.124	-0.003	-16.21	0.033	-0.139	-0.005	-33.28

Note: E: Elasticity; CI: Concentration Index; AC: Absolute Contribution; PC: Percentage Contribution

Source: Authors' estimation from the VHLSS

In Table 7, decomposition of estimates from Table 2 for non-need variables reveals negative contributions from 2010 to 2018, indicating a pro-poor inequality trend during this period. Factors such as ethnicity, marital status, and urban location significantly contribute to socioeconomic inequality in medical treatment. Ethnicity emerges as the primary contributor throughout the study period. Additionally, household wealth among the bottom 20% explains a considerable portion of socioeconomic inequality, notably 73.51% in 2010 and 50.64% in 2016. Employment status also plays a role, with socioeconomic disparities worsening health inequality from 2010 to 2018. In sum, variations in health inequalities across the study's time periods are consistently explained by socioeconomic disparities associated with various determinants including health status, age, marital status, education, employment, ethnicity, income, urbanization, and geography.

Table 7: Contributing Factors of Inequality in Medical Treatment in Vietnam: Non-Need Variables, 2010-2018.

Variables	2010				2012				2014				2016				2018			
	E	CI	AC	PC	E	CI	AC	PC	E	CI	AC	PC	E	CI	AC	PC	E	CI	AC	PC
1 Single (yes=1)	-0.142	-0.043	0.006	31.75	-0.219	-0.042	0.009	47.74	-0.279	-0.043	0.012	134.06	-0.143	-0.045	0.006	34.73	-0.223	-0.042	0.009	67.19
2 Married (yes=1)	0.061	0.041	0.003	12.77	-0.004	0.042	0	-0.92	-0.093	0.041	-0.004	-41.76	0.067	0.040	0.003	14.41	-0.039	0.038	-0.002	-10.84
3 Widow (yes=1)	0.028	-0.030	-0.001	-4.22	0.028	-0.067	-0.002	-9.53	0.019	-0.070	-0.001	-14.61	0.035	-0.061	-0.002	-11.36	0.033	-0.069	-0.002	-16.34
4 Divorced (yes=1)	0	0.068	0	0.11	0	0.033	0	0.05	-0.002	0.068	0	-1.60	0.002	0.090	0.000	0.72	-0.001	0.051	0	-0.40
2 Primary school (yes=1)	-0.055	-0.060	0.003	16.95	-0.074	-0.065	0.005	24.80	-0.060	-0.085	0.005	56.43	-0.072	-0.087	0.006	33.58	0	-0.064	0	0
3 Lower Secondary School (yes=1)	-0.062	0.054	-0.003	-16.98	-0.075	0.044	-0.003	-16.92	-0.065	0.041	-0.003	-29.58	-0.094	0.040	-0.004	-20.59	-0.003	0.045	0	-1.12
4 Upper Secondary School (yes=1)	-0.066	0.269	-0.018	-91.87	-0.090	0.275	-0.025	-127.90	-0.079	0.260	-0.021	-228.78	-0.083	0.252	-0.021	-113.73	-0.008	0.222	-0.002	-12.08
5 College and above (yes=1)	-0.026	0.653	-0.017	-86.03	-0.043	0.622	-0.027	-139.6	-0.043	0.597	-0.025	-282.9	-0.051	0.547	-0.028	-150.7	-0.006	0.530	-0.003	-22.12
1 Leaders/ Managers (yes=1)	-0.005	0.009	0	-0.26	-0.005	0.084	0.000	-2.06	-0.012	0.199	-0.002	-26.00	-0.012	0.204	-0.002	-12.77	-0.017	0.197	-0.003	-24.47
2 Professionals/ Technicians (yes=1)	-0.005	0.301	-0.002	-7.49	-0.004	0.314	-0.001	-6.67	-0.006	0.289	-0.002	-19.53	-0.006	0.299	-0.002	-9.52	-0.011	0.296	-0.003	-23.78
3 Clerks/Service Workers (yes=1)	-0.017	0.227	-0.004	-19.30	-0.014	0.221	-0.003	-16.57	-0.016	0.206	-0.003	-35.77	-0.023	0.219	-0.005	-27.34	-0.039	0.206	-0.008	-58.16
4 Agriculture/ Forestry/Fishery (yes=1)	0	0.460	0	-0.77	0	0.283	0	0.47	-0.001	0.347	0	-1.78	0	0.257	0.000	-0.05	-0.001	0.298	0	-1.27
5 Skilled Workers / Machine Operators (yes=1)	-0.001	0.546	0	-2.06	-0.001	0.536	0	-2.17	-0.001	0.508	-0.001	-5.05	0	0.455	0.000	0.34	-0.002	0.467	-0.001	-6.62
6 Unskilled Workers (yes=1)	0	0.547	0	0.01	0	0.395	0	0.27	0.000	0.427	0	-0.90	0	0.337	0.000	-0.55	-0.001	0.315	0.000	-1.13
Ethnic (Kinh majority=1)	0.190	0.119	0.023	115.62	0.242	0.129	0.031	161.61	0.215	0.123	0.026	293.17	0.254	0.126	0.032	173.05	0.158	0.132	0.021	150.25
Lowest (yes=1)	-0.042	-0.793	0.033	171.04	-0.060	-0.801	0.048	247.88	-0.042	-0.787	0.033	370.09	-0.012	-0.787	0.009	50.64	0.016	-0.779	-0.012	-88.13
Second (yes=1)	-0.013	-0.399	0.005	25.96	-0.021	-0.413	0.009	44.82	-0.010	-0.419	0.004	47.76	-0.015	-0.402	0.006	32.91	0.017	-0.405	-0.007	-50.91
Middle (yes=1)	-0.007	-0.001	0	0.04	-0.017	-0.011	0.000	0.94	-0.016	-0.018	0	3.25	-0.008	-0.010	0	0.42	0.011	-0.018	0	-1.43
Fourth (yes=1)	-0.003	0.397	-0.001	-5.87	-0.016	0.409	-0.007	-33.65	0.002	0.403	0.001	9.86	0.001	0.392	0	1.62	0.005	0.390	0.002	12.97
Free healthcare certificate (yes=1)	0.285	-0.035	-0.010	-51.25	0.312	-0.036	-0.011	-57.99	0.363	-0.016	-0.006	-66.24	0.360	-0.012	-0.004	-24.03	0.455	-0.006	-0.003	-18.98
Urban (urban=1)	-0.023	0.361	-0.008	-43.44	-0.010	0.350	-0.004	-17.93	-0.020	0.347	-0.007	-78.20	0.011	0.352	0.004	20.94	0.005	0.328	0.002	11.50
Northwest (yes=1)	-0.109	0.165	-0.018	-92.93	-0.124	0.205	-0.026	-132.40	-0.140	0.208	-0.029	-323.05	-0.133	0.229	-0.030	-164.69	-0.162	0.215	-0.035	-251.26
Northeast (yes=1)	-0.111	-0.183	0.020	104.10	-0.128	-0.190	0.024	125.88	-0.144	-0.191	0.028	305.48	-0.150	-0.180	0.027	146.06	-0.167	-0.187	0.031	225.58
Red River Delta (yes=1)	-0.051	-0.415	0.021	107.85	-0.049	-0.480	0.024	121.95	-0.058	-0.437	0.025	279.08	-0.057	-0.446	0.025	136.91	-0.067	-0.484	0.032	232.66
North Central Coast (yes=1)	-0.071	-0.202	0.014	74.37	-0.076	-0.161	0.012	63.50	-0.090	-0.165	0.015	165.47	-0.099	-0.185	0.018	98.64	-0.090	-0.141	0.013	91.84
South Central Coast (yes=1)	-0.029	0.004	0.000	-0.64	-0.042	0.022	-0.001	-4.82	-0.053	0.021	-0.001	-12.54	-0.052	0.031	-0.002	-8.60	-0.049	0.022	-0.001	-7.63
Central Highlands (yes=1)	-0.015	-0.146	0.002	11.62	-0.024	-0.065	0.002	7.99	-0.032	-0.116	0.004	41.62	-0.041	-0.138	0.006	30.36	-0.045	-0.191	0.009	62.05
Southeast (yes=1)	-0.027	0.288	-0.008	-39.45	-0.031	0.288	-0.009	-46.81	-0.065	0.293	-0.019	-212.77	-0.047	0.299	-0.014	-75.69	-0.053	0.295	-0.015	-111.90

Note: E: Elasticity; CI: Concentration Index; AC: Absolute Contribution; PC: Percentage Contribution
Source: Authors' estimation from the VHLSS

Discussion

The examination of factors influencing medical treatment utilization indicates that, across all survey rounds, medical treatment tends to exhibit lower concentration among male individuals aged 18 to 44 compared to those below 18 years old, but higher concentration among older individuals aged 44 and above. A similar trend is observed among female individuals. Single individuals exhibit lower propensity for medical treatment compared to those who are married, widowed, divorced, or separated, consistent with findings by Kien et al. (2014). Poor health status increases the likelihood of medical treatment utilization. The Kinh ethnic majority demonstrates higher medical treatment reporting. Contrary to the observations by Kien et al. (2014), individuals from lower socioeconomic strata exhibit higher rates of medical treatment, possibly attributed to the utilization of a more comprehensive and representative dataset in our study. Those possessing free healthcare certificates are more inclined towards medical treatment. Urban residents tend to report lower instances of medical treatment. Regarding geographic region, individuals residing in the Mekong River Delta report higher rates of medical treatment. Furthermore, individuals with higher levels of education and employment exhibit lower likelihood of reporting medical treatment utilization.

The study sought to assess and elucidate socioeconomic disparities in medical treatment access within Vietnam spanning the years 2008 to 2018. The results indicate the presence of wealth-related inequalities in medical treatment utilization. Specifically, the estimates reveal that these disparities favoured individuals from economically disadvantaged backgrounds in 2010, 2012, 2016, and 2018. However, instances of pro-rich inequalities in medical treatment access were observed in 2008 and 2014. These findings align with prior research, such as that by Kim et al. (2020), which similarly identified pro-rich disparities in medical treatment access within the Vietnamese context.

The analysis of healthcare inequalities supplements our probit model findings, highlighting the significance of health insurance, marital status, employment, and income levels in explaining disparities in medical treatment access. This aligns with previous studies: Kim et al. (2020) found that insured individuals were more likely to seek healthcare, while Thuong (2020) indicated that health insurance policies increased

outpatient visits. Additionally, Kim et al. (2020) noted that females and married individuals were more likely to have unmet healthcare needs. Similarly, Pham et al. (2019) revealed that farmers and health insurance holders were more inclined towards outpatient services, whereas self-employed individuals and those with higher incomes were less likely to undergo regular health check-ups. A comparison between China and Vietnam by X. Liu et al. (2012) demonstrated that health insurance membership in China was associated with increased inpatient service utilization, especially among higher-income groups. Conversely, in Vietnam, health insurance members exhibited higher service utilization rates compared to non-members, particularly among lower-income groups.

Conclusion

This study examined socioeconomic disparities in medical treatment in Vietnam from 2008 to 2018 using the VHLSS dataset. Through indirect standardization, it controlled for variations in need factors like health status, age, and sex, delineating differences between horizontal inequity and overall inequality. The equity analysis conducted offers vital insights for Vietnamese policymakers aiming to address medical treatment equity. Our findings underscore the necessity of policies targeting the impoverished, ensuring adequate healthcare resource allocation, and expanding insurance coverage to prioritize healthcare needs. However, limitations include potential recall bias in self-reported health status and the cross-sectional nature of the analysis, hindering causal interpretations.

Author Contributions: Du Van Nguyen, Thanh Quang Ngo, and Khai Cong Dinh: collected and analyzed the data and prepared the manuscript draft.

Declarations

Conflict of interest: The authors declare no conflict of interest.

Ethics approval: The VHLSS surveys were conducted and cleared for ethical use before transferring to the authors and public audiences. In addition, privacy and confidentiality of the highest standard were maintained throughout the study by keeping the respondents and their data anonymous.

References

Culyer, A. (1995). Need: The Idea Won't Do--but We Still Need It. *Social Science and Medicine, 40*(6), 727-730. https://doi.org/10.1016/0277-9536(94)00307-f

Culyer, A. J., & Wagstaff, A. (1993). Equity and equality in health and health care. *Journal of Health Economics, 12*(4), 431-457. https://doi.org/10.1016/0167-6296(93)90004-X

Erreygers, G. (2009). Correcting the Concentration Index. *Journal of Health Economics, 28*(2), 504-515. https://doi.org/10.1016/j.jhealeco.2008.02.003

Huda, T. M., Hayes, A., & Dibley, M. J. (2018). Examining horizontal inequity and social determinants of inequality in facility delivery services in three South Asian countries. *Journal of Global Health, 8*(1), 010416. https://doi.org/10.7189%2Fjogh.08.010416

Jenkins, S. P. (1988). Empirical measurement of horizontal inequity. *Journal of Public Economics, 37*(3), 305-329. https://doi.org/10.1016/0047-2727(88)90044-8

Kien, V. D., Van Minh, H., Giang, K. B., Weinehall, L., & Ng, N. (2014). Horizontal inequity in public health care service utilization for non-communicable diseases in urban Vietnam. *Global Health Action, 7*(1), 24919. https://doi.org/10.3402/gha.v7.24919

Kim, J. Y., Kim, D. I., Park, H. Y., Pak, Y., Tran, P. N. H., Thai, T. T., Thuy, M. T. T., & Dung, D. V. (2020). Unmet healthcare needs and associated factors in rural and suburban Vietnam: a cross-sectional study. *International journal of environmental research and public health, 17*(17), 6320. https://doi.org/10.3390/ijerph17176320

Lim, B. H., Lee, H.-S., & Shin, Y. H. (2018). The effects of pre-/post-retirement downside consumption constraints on optimal consumption, portfolio, and

retirement. *Finance Research Letters, 25*, 213-221. https://doi.org/10.1016/j.frl.2017.10.029

Liu, X., Tang, S., Yu, B., Phuong, N. K., Yan, F., Thien, D. D., & Tolhurst, R. (2012). Can rural health insurance improve equity in health care utilization? A comparison between China and Vietnam. *International Journal for Equity in Health, 11*, 1-9. https://doi.org/10.1186/1475-9276-11-10

Nguyen, M. P., & Wilson, A. (2017). How could private healthcare better contribute to healthcare coverage in Vietnam? *International journal of health policy and management, 6*(6), 305–308. https://doi.org/10.15171%2Fijhpm.2017.05

Omotoso, K. O., & Koch, S. F. (2018). Assessing changes in social determinants of health inequalities in South Africa: A decomposition analysis. *International Journal for Equity in Health, 17*, 1-13. https://doi.org/10.1186/s12939-018-0885-y

Pham, T., Nguyen, N. T. T., ChieuTo, S. B., Pham, T. L., Nguyen, T. X., Nguyen, H. T. T., Nguyen, T. N., Nguyen, T. H. T., Nguyen, Q. N., & Tran, B. X. (2019). Gender differences in quality of life and health services utilization among elderly people in rural Vietnam. *International journal of environmental research and public health, 16*(1), 69. https://doi.org/10.3390/ijerph16010069

Samuel, O., Zewotir, T., & North, D. (2021). Decomposing the urban–rural inequalities in the utilisation of maternal health care services: evidence from 27 selected countries in Sub-Saharan Africa. *Reproductive Health, 18*, 1-12. https://doi.org/10.1186/s12978-021-01268-8

Thoa, N. T. M., Thanh, N. X., Chuc, N. T. K., & Lindholm, L. (2013). The impact of economic growth on health care utilization: a longitudinal study in rural Vietnam. *International Journal for Equity in Health, 12*, 1-6. https://doi.org/10.1186/1475-9276-12-19

Thuong, N. T. T. (2020). Impact of health insurance on healthcare utilisation patterns in Vietnam: a survey-based analysis with propensity score matching method. *BMJ open, 10*(10), e040062. https://doi.org/10.1136/bmjopen-2020-040062

UN. (2015). Transforming our world: the 2030 Agenda for Sustainable Development. *New York*. https://sdgs.un.org/sites/default/files/publications/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf

Van Lerberghe, W. (2008). *The world health report 2008: primary health care: now more than ever*. World Health Organization. https://iris.who.int/handle/10665/43949

Victora, C. G., Joseph, G., Silva, I. C., Maia, F. S., Vaughan, J. P., Barros, F. C., & Barros, A. J. (2018). The inverse equity hypothesis: analyses of institutional deliveries in 286 national surveys. *American journal of public health, 108*(4), 464-471. https://doi.org/10.2105/ajph.2017.304277

Wagstaff, A. (2005). The bounds of the concentration index when the variable of interest is binary, with an application to immunization inequality. *Health economics, 14*(4), 429-432. https://doi.org/10.1002/hec.953

Wagstaff, A., Eozenou, P., Neelsen, S., & Smitz, M.-F. (2019). Introducing the World Bank's 2018 health equity and financial protection indicators database. *The Lancet Global Health, 7*(1), e22-e23. https://doi.org/10.1016/S2214-109X(18)30437-6

Wagstaff, A., O'Donnell, O., Van Doorslaer, E., & Lindelow, M. (2007). *Analyzing health equity using household survey data: A guide to techniques and their implementation*. World Bank Publications. https://doi.org/10.1596/978-0-8213-6933-3

Wagstaff, A., van Doorslaer, E., & Watanabe, N. (2003). On decomposing the causes of health sector inequalities with an application to malnutrition inequalities in Vietnam. *Journal of Econometrics, 112*(1), 207-223. https://doi.org/10.1016/S0304-4076(02)00161-6

Zhao, G., Cao, X., & Ma, C. (2020). Accounting for horizontal inequity in the delivery of health care: A framework for measurement and decomposition. *International Review of Economics & Finance, 66*, 13-24. https://doi.org/10.1016/j.iref.2019.10.010