

BMJ Open Impact of health insurance on healthcare utilisation patterns in Vietnam: a survey-based analysis with propensity score matching method

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ABSTRACT

Objectives The study aims to evaluate the impact of the Revised Health Insurance Law 2014 on the utilisation of outpatient and inpatient care services, healthcare services utilisation at different levels of providers, types of providers and types of visits across different entitlement groups.

Design/setting Secondary data from two waves of the Vietnam Household Living Standard Survey (VHLSS) 2016, VHLSS 2014 were used. A cross-sectional study applying propensity score matching was conducted.

Participants A total of 4900 individuals who reported using healthcare services are analysed.

Outcomes measure Numbers of outpatient and inpatient visits, frequency of healthcare service utilisation at commune health stations, district hospitals, provincial hospitals, public and private health facilities, number of visits at health facility for medical treatment and health checks per year.

Results The result indicates that health insurance (HI) policy increased the number of outpatient visits for the enrolled between 0.87 and 1.29. The greatest impact was found on participants of heavily subsidised health insurance (HSHI) programmes with 1.29 visits per person per year. Similarly, an increase between 0.08 and 0.16 in the number of inpatient admissions was because of participation in HI. With regard to type of healthcare providers, the study found that participation in HI has the most effect on the use of healthcare services at district hospitals. However, the study demonstrated that the impacts of HI on the increase in the frequency of visiting commune health stations, number of visits at the provincial hospital for HSHI groups, and number of visits at health facilities for health check and consultation were sensitive to unobserved characteristics.

Conclusion Our findings imply that policy-makers in Vietnam could continue expanding health insurance coverage to increase access to healthcare services for citizens, especially vulnerable groups. In addition, the government should draw more attention to primary healthcare level.

INTRODUCTION

Access to basic healthcare services plays an important role in the development of nations and the overall well-being of people. Healthcare is considered an essential need and also

Strengths and limitations of study

- This is the first comprehensive study to assess the impact of health insurance on healthcare utilisation patterns in Vietnam after the Revised Health Insurance Law 2014 has been introduced.
- The data are derived from the large population sample size—Vietnam Household Living Standard Survey (VHLSS), which can be regarded as representative of the overall population. The findings can be generalised to the Vietnam population and provide valuable experience for other low-income and middle-income countries.
- The study used secondary data from the VHLSS survey; therefore, some factors would be useful for evaluating the impact of health insurance, such as supply-side factors, and health security was not included in the dataset. There might also be recall bias related to self-reported data.
- Using the propensity score matching method to measure the causal effect, the estimated results may be biased if unobserved confounders affect both the outcome and treatment variables. Besides, the interval after the revision of the law may have been short to evaluate its impacts.

a basic human right.¹ However, in low-income and middle-income countries (LMICs) where poverty and inequalities affect health status and hinder the provision of and access to healthcare, accessibility to healthcare services remains highly restricted.¹ Accordingly, LMICs' governments have sought to accelerate progress towards Universal Health Coverage (UHC) by introducing and expanding non-profit health insurance (HI) schemes to increase healthcare coverage and financial protection.^{2 3}

Vietnam has gained remarkable achievements in increasing HI coverage reaching above 85% in 2017.⁴ Although the HI coverage rate is high among high-income and low-income groups, including the civil servants and the poor, the figures for the

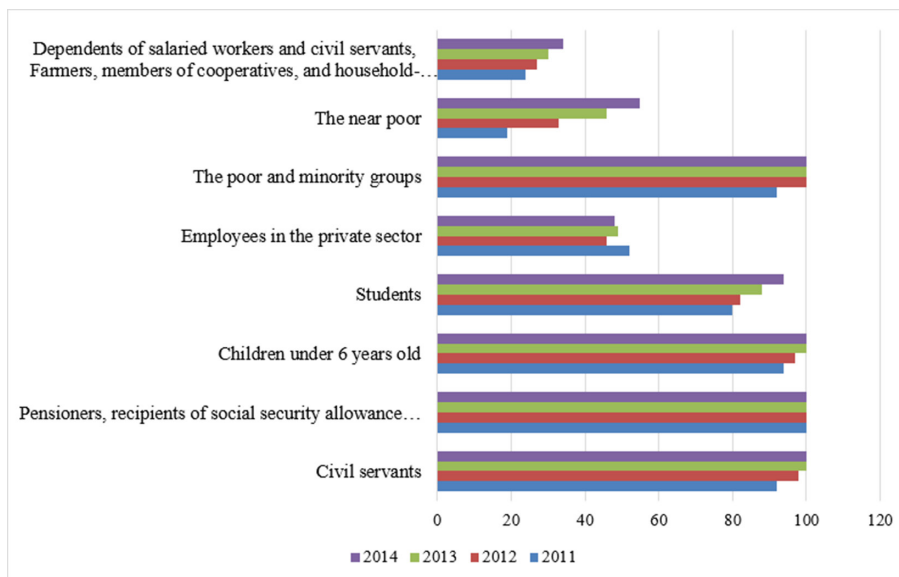


Figure 1 Trends of health insurance coverage among different groups in Vietnam.^{5 6}

informal sector and the near-poor are still low (figure 1). Reaching these groups is a major challenge for Vietnam, and they should be focused to achieve UHC by 2025.⁵

Vietnam is facing many challenges to achieve the goal of UHC by 2025. First, approximately 15% of the population does not have any form of financial protection, such as HI. Most out-of-pocket health expenditures (OOP) are paid for inpatient medical services (55.8%) and self-medication (43.7%).^{5 6} Second, the rate of using HI cards among the insured when visiting health facilities is still modest, with 60%–70% for outpatient care and only 40% for inpatient admission in 2013, except for the insured of the poorest quintile group.⁶ The reason might be that before introducing the Revised Health Insurance Law in 2014, the insured must go to the medical facilities specified on the insurance card; otherwise, they have to pay all medical expenses. As a result, patients with severe conditions often skip grassroots level facilities and go directly to central or specialised hospitals without following the referral process, and do not use the HI card. Third, patients often visit private health facilities for outpatient care (about 34%), which are not covered by HI or do self-treatment.^{6 7} The reasons for this tendency can be long waiting time and attitude towards patients of health workers.⁸ Consequently, they might incur high OOP. Fourth, the rate of using healthcare services at a higher level of providers increases, whereas this rate tends to decrease at a lower level, leading to overcrowding at tertiary hospitals. In particular, the rate of outpatient services utilisation at hospitals in 2014 was 43.1%, higher than the rate of 28.8% in 2006. The rate of inpatient visits at these facilities also increased, reaching 85.7% in 2014, compared with 78.1% in 2006. However, the frequency of outpatient visits at commune health stations decreased from 25.9% in 2006 to 20.2% in 2014.⁹ The barriers to low uptake of services at the grassroots level facilities are likely to be associated with the quality

of medical services, equipment, lack of essential medicines, and low qualifications of health workers.¹⁰ Last but not least, there is inequality in the pattern of visiting health facilities between rural and urban areas, between the rich and the poor, and ethnicity.⁷ Poor households of ethnic minorities are more likely to visit commune health stations than provincial hospitals (67% vs 2%). However, the non-poor frequently seek care at provincial/central hospitals (14%).⁷

Therefore, like many LMICs, Vietnam has approved HI as one of the possible options to achieve the UHC goal. In 2014, the Revised HI Law in Vietnam had been introduced and officially took effect from January 2015. Table 1 presents the summary of the Revised HI Law and its major changes.^{6 11 12}

Although a large and growing body of literature has been done to examine the impact of HI on healthcare services utilisation in LMIC, findings from the studies are still inconsistent.¹³ The positive impact of HI on access and usage of medical services has been demonstrated in the studies of Hangoma *et al*,¹⁴ Balamiento,¹ Zhao¹⁵ and Sparrow *et al*.¹⁶ However, the study on the impact of medical insurance for the poor in Georgia indicated that there was no impact of the programme on the utilisation of health services.¹⁷ Similarly, a study by Thornton *et al* about the effect of social security HI for the informal sector workers in Nicaragua found that there was no increase in the use of services among the newly insured.¹⁸ This inconsistency may be because these empirical studies were carried out in different settings with different health financing mechanisms and citizens' health-seeking behaviours.

In Vietnam, Wagstaff¹⁹ found that the HI programme for the poor had no impact on healthcare utilisation, while Sepehri *et al*²⁰ investigated that the insured had a higher length of hospital stay than those without insurance. Also, Nguyen showed that voluntary health insurance

Table 1 Health insurance of target groups in Vietnam after adopting revised HI Law

Target groups	Description	Premium and subsidies	Co-payment rate
First group—contributions are made by employees and employers	<ul style="list-style-type: none"> ▶ Employees with an indefinite term labour contract, and those signing labour contracts from 3 months or more ▶ Employers of enterprises ▶ Civil servants and public employees 	4.5% of payroll tax (3% employers, 1.5% employees)	20%
Second group—contributions are 100% subsidised by the government	<ul style="list-style-type: none"> ▶ People from poor households, and those from ethnic minority ▶ People living in areas with difficult socioeconomic conditions ▶ Meritorious people ▶ Children under 6 years old ▶ People serving in the army and the police 	100% subsidy by the government (the premium contribution is equal to 4.5% of the monthly salary, or 4.5% of minimum salary depending on each target group)	Reduced from 5% to 0% (exempted from co-payment and are entitled to use free medical examination and treatment services)
Third group—contributions are partly subsidised by the government	<ul style="list-style-type: none"> ▶ The near-poor ▶ Student ▶ Households working in agriculture, forestry, fishery with medium income 	Minimum subsidy level is 70% of minimum salary Minimum subsidy level is 30% of minimum salary Minimum subsidy level is 50% of minimum salary	Reduced from 20% to 5% 20% 20%
Fourth group—contributions are paid by social insurance fund	<ul style="list-style-type: none"> ▶ Retirees ▶ People receiving monthly social insurance benefits due to labour accidents, occupational diseases ▶ Female employees are on leave during maternity regime 	<ul style="list-style-type: none"> ▶ 4.5% of monthly pension ▶ 4.5% of minimum salary ▶ 4.5% of the monthly salary before the maternity leave 	20% 20% 20%
Fifth group—contributions are based on unit subscription of the family	Informal sector	<ul style="list-style-type: none"> ▶ The first person contributes a premium of 4.5% of minimum salary ▶ The second person pays 70% of the of the first person's contribution ▶ The third person pays 60% of the first person's contribution ▶ The fourth person contributes 50% of the first person's contribution ▶ The fifth person pays 40% of the first person's contribution 	20%
Copayment rate when the insured go to health facilities without referral	District hospital (inpatient treatment)	Provincial hospital (inpatient treatment)	Central hospital (inpatient treatment)
Before 2014	30%	40%	60%
After 2014	0%	40%	60%
	100% for outpatient care		
Provider payment method			
Capitation (application for primary health facilities).			
Fee-for-service (FFS)—prevalent method in Vietnam.			
Case-based diagnostic-related groups (DRGs)—being tested in several provinces.			
Benefit health insurance package			
<ul style="list-style-type: none"> ▶ Medical examination, treatment and rehabilitation. ▶ Periodic pregnancy examination and delivery. ▶ Examination for screening and early diagnosis of some diseases. ▶ Transportation of patients who need to be transferred to the higher level of care. 			

(VHI) increased outpatient and inpatient visits among the enrollees.²¹ Likewise, a recent study conducted by Nguyen found that there was a positive impact of student HI on the frequency of healthcare visits.²² However, these studies did not evaluate the effects of HI on healthcare utilisation at different levels of providers, type of providers and type of visits. In addition, although in Vietnam, a considerable amount of literature has been published on evaluating the impact of non-profit HI programmes on

the utilisation of healthcare services, the research results are not always consistent.

To my knowledge, in Vietnam, until now, there has been no comprehensive study evaluating the impact of the Revised HI Law in 2014 on healthcare utilisation patterns, including frequency of outpatient and inpatient visits, health facilities utilisation (community health centres, district hospital, public and private health facilities) and types of visiting health facilities (treatment or

consultation and health check). Therefore, evaluating the HI policy effects on healthcare services utilisation for making recommendations to improve the HI scheme and strengthening the health system is imperative. Furthermore, findings from the present study might offer policy-makers not only in Vietnam but also in LMIC useful information to improve the HI scheme making healthcare services available and affordable to citizens, especially disadvantaged people.

METHODS

Sampling and data source

A cross-sectional study was conducted to assess the impact of the HI policy on the use of healthcare services. The study used the data from the Vietnam Household Living Standards Survey (VHLSS) 2016 and VHLSS 2014. The surveys were carried out every 2 years by the General Statistics Office of Vietnam (GSO) with technical assistance and funding from the World Bank. The VHLSS 2014 included 9399 households and 35 920 individuals from 3130 communes. The VHLSS 2016 embraced 9399 households with 35 793 individuals selected from 3133 communes in which 50% of the enumeration areas were selected from the VHLSS 2014, and 50% were newly selected from the master sample. The pre-treatment (pre-programme) characteristics of the insured and non-insured were obtained from the VHLSS 2014, whereas the outcomes and treatment variables were derived from VHLSS 2016. I included only individuals who reported outpatient and/or inpatient visits in the last 12 months. Thus, the number of observations in this study reduced sustainably and included 4900 individuals.

The survey collected enormous information on households in Vietnam. However, in this study, we used data related to incomes and household expenditures, including expenses for food, clothing, accommodation, education, health and other expenses. Other information such as demographic characteristics (age, gender, ethnicity, marital status); education; occupation; and electricity, water, and sanitary conditions were extracted from the survey. Data related to health status, health insurance enrolment of household members, number of outpatient and inpatient visits, and reasons for visiting different health facilities were also used.

Definition of variables

Control group includes individuals who are non-insured in 2016.

Treatment groups

To evaluate whether the impacts of the HI scheme on a number of outcome variables are heterogeneous across the entitlement categories, and to lessen the possibility of mismatching, we divided the insured into two subgroups, classified as voluntary health insurance (VHI) subsample and heavily subsidised health insurance (HSHI) subsample (the poor, the near-poor, policy beneficiaries) based

on the amendments of HI policy. Students' VHI is not part of the VHI subsample. The full sample includes all individuals having HI. The treatment groups are those who have HI in 2016.

Outcome variables

I assess the HI scheme's impact on the frequency of outpatient and inpatient visits. In addition, the study aims to point out whether amendments in HI policy, such as allowing admission at the tertiary level without a referral letter, affect the intensity of visiting health facilities at different providers' levels. Also, the effect of the HI on the frequency of healthcare utilisation at public and private health facilities was evaluated. Besides, the study examines the impact of the scheme on types of visits, including the intensity of using medical facilities for treatment and health check-up.

Explanatory variables

To ensure that explanatory variables are exogenous with HI participation, the covariates in 2014 VHLSS were used instead of 2016 VHLSS—pre-treatment variables.^{21 23–25} Explanatory variables should contain covariates which affect simultaneously the treatment (enrolment) status and the outcomes of interest.²⁶

Explanatory variables including education level, age groups, sex, gender, marital status, ethnicity, occupation status, availability of clean water, electricity, access to toilet, household size, a household composition such as the number of children under 6 years of age and number of elderly are controlled for. Besides, expenditure quintiles; HI status; the number of motorcycles, telephones, radios, TVs or computers; and a residential area owned by households are selected. Importantly, illness status, number of illness times and days per year are also controlled in different specifications. In addition, covariates include seven socioeconomic regions of Vietnam and places of residence (rural or urban). These control variables have been used in a large and growing volume of public studies.^{1 15 19 21 24 27–29} The definition of variables is provided in online supplemental appendix 1.

Statistical analysis

When evaluating policies, we encounter selection bias problems, which means that enrolment in HI scheme is not random for some groups such as the informal sector workers, the farmers, the elderly or the near-poor due to the voluntary nature per se of the programme.^{23 30 31} There are confounding factors that may affect the participation in HI. If these characteristics are systematically correlated with the outcome variables, it may lead to biased estimates.^{23 24} For instance, potential health risks, age and income can simultaneously affect demands for health services and health insurance enrolment.^{1 24} This may result in overestimation or underestimation of the impact of the HI programme. Although we do not face the self-selection problem in estimating the effect of the

HI programme on the poor, the assignment is not random because they are selected through predefined criteria.³²

The effect of the HI scheme can be estimated by comparing the use of health services when people join HI and when they do not participate. However, it is difficult to estimate this effect in observational research because we do not know how the insured would have used medical services if they had not enrolled in HI. Accordingly, we employed the propensity score matching (PSM) method, which was introduced by Rosenbaum and Rubin³³ to address this problem. This method was applied in a number of studies such as Mebratie *et al.*,²⁴ Gustafsson-Wright *et al.*,³⁴ Palmer,³⁵ Nguyen²¹ and Axelson *et al.*²⁷ The PSM builds a statistical comparison group based on the likelihood of involving in the HI programme, depending on the observed traits.²³ The idea of PSM is to find individuals not participating in the programme whose characteristics are similar to those of the participants. These characteristics are not affected by the programme, for example, preprogramme characteristics.²³ The PSM is based on two assumptions.

First, participation in the programme is completely based on observable features, which is called unconfoundedness²³:

$$(Y_i^T, Y_i^C) \perp T_i \mid X_i$$

where T_i is treatment variable, $T_i = 1$ if the individual participates in the HI programme, $T_i = 0$ otherwise. Y_i^T , Y_i^C stand for outcome variables of interest for the enrolled (treatment group) and the non-enrolled (control group); X_i presents covariates affecting both self-selection and outcome variables.

The second assumption is common support, which is the area where the propensity scores of both the treatment group and control group are estimated. It is assumed that the probability of enrolment, conditional on the covariates X belongs to 0 and 1, $0 < P(T_i = 1 \mid X_i) < 1$.²³ Every enrolled individual will be compared with the corresponding non-enrolled which has the same propensity scores; then the average difference in outcomes between two groups is calculated to determine the impact of the policy. This effect is the average treatment effect on the treated (ATT). The ATT can be defined as follows²³:

$$ATT_{PSM} = E_{P(X) \mid T=1} \left\{ E \left[Y_i^T \mid T_i = 1, P(X) \right] - E \left[Y_i^C \mid T_i = z, P(X) \right] \right\} \quad (1)$$

where $P(X)$ represents propensity scores, given the observed characteristics of participants and non-participants, which are estimated from logit regression in this study.

Supposed that ATT on the number of outpatient visits is 1.25, we can interpret that after matching treated and control individuals, the HI programme's effect is to increase the number of outpatient visits by 1.25. In other words, people who participate in HI make greater outpatient care use than those who did not enrol in the HI programme.

The World Bank suggests that, identically, to calculate the propensity score and match the participants

and non-participants based on the propensity score, pre-programme data should be used.²³ Therefore, pre-programme baseline data (VHLSS 2014) on the insured and non-insured were used to calculate the propensity scores and match them. I used different matching estimators to check the robustness of estimation results, including nearest-neighbour matching (NN), kernel matching and radius calliper matching. The calliper was determined by dividing the SD of the propensity score by 4.³⁶ I used the bandwidths of 0.04, which was applied in the study of Palmer for this study.³⁵

STATA software (V.14) was used to extract, merge data and estimate results.

Patient and public involvement

Patients were not involved in this study.

RESULTS

Estimated effects of health insurance reform on healthcare utilisation outcomes

The descriptive statistics and the means comparison tests between the insured and the uninsured regarding characteristics that may affect both the probability of enrolling in different HI programmes and the outcome variables are provided in [table 2](#). Descriptive statistics showed significant differences in a number of factors across the participating and non-participating HI groups. The statistical description of patterns in utilisation of health services at different health facilities for the non-insured group and different HI subsamples of interest is provided in [table 3](#). Similarly, there were also differences in a range of outcome variables across different groups.

To calculate the propensity scores, I estimated the factors affecting the probability of enrolling in the HI scheme by using a logit model for different treatment and control groups (online supplemental appendix 2). The results indicated that variables influencing the probability of joining the HI programme varied depending on the treatment subsamples. In general, age, gender, ethnicity, marital status, education level, occupation, household size, household composition, expenditure, assets, number of illness days and place of residence were factors determining the odds of participating in the HI scheme.

[Table 4](#) shows the ATTs of the HI scheme for a range of outcomes across different subpopulations. There was a statistically significant positive impact of the policy on the frequency of using outpatient health services across all subpopulations. The estimated results showed that the HI policy increased the number of outpatient visits for the enrolled between 0.87 and 1.29. The greatest impact was found on participants of HSHI programmes with 1.29 visits per person per year (with NN matching). Similarly, an increase between 0.08 and 0.16 in the number of inpatient admissions was because of participation in HI. The largest increase in the frequency of using inpatient care services among the insured of the poor, near-poor or policy beneficiaries was due to the policy (0.16

Table 2 Descriptive statistics across different treatment and control groups before matching

Variables	The non-insured (control group) N=760 (1)		The insured of VHI subsample (treatment group) N=1022 (2)		P value H ₀ : (2)=(1)	The insured of heavily subsidised subsample (treatment group) N=1209 (3)		P value H ₀ : (3)=(1)	The insured of full sample (treatment group) N=4140 (4)		P value H ₀ : (4)=(1)
	n	%	n	%		n	%		n	%	
Age	Mean 44.7	SD 16.2	Mean 53.3	SD 14.6	0.000	Mean 53.9	SD 21.8	0.000	Mean 42.1	SD 25.6	0.006
Age group					0.000			0.000			0.000
≤30	124	16.3	66	6.5		171	14.1		1318	31.8	
31–40	173	22.8	123	12.0		120	9.9		405	9.8	
41–50	196	25.8	223	21.8		159	13.2		560	13.5	
51–60	152	20.0	294	28.8		249	20.6		765	18.5	
≥61	115	15.1	316	30.9		510	42.2		1092	26.4	
Gender (male)	307	40.4	331	32.4	0.000	504	41.7	0.570	1669	40.3	0.967
Ethnicity (Kinh and Hoa)	727	95.7	999	97.8	0.012	952	78.7	0.000	3577	86.4	0.000
Marital status (married)	559	78.8	809	79.2	0.861	780	64.5	0.000	2369	57.2	0.000
Education level					0.654			0.000			0.000
Not complete primary school	230	30.3	329	32.2		558	46.2		1828	44.2	
Primary school	205	27.0	266	26.0		290	24.0		850	20.5	
Lower secondary	222	29.2	268	26.2		208	17.2		669	16.2	
Upper secondary	51	6.7	80	7.8		64	5.3		250	6.0	
Vocational school	38	5.0	57	5.6		62	5.1		289	7.0	
College, University, Master, PhD	14	1.8	22	2.2		27	2.2		254	6.1	
Occupation status					0.000			0.000			0.000
Leaders/managers	0	0	1	0.1		5	0.4		32	0.8	
Professionals/technicians	11	1.5	19	1.9		9	0.7		177	4.3	
Service and sales staff	114	15.0	177	17.3		89	7.4		350	8.5	
Labourers in agriculture/forestry/fishery	83	10.9	110	10.8		118	9.8		279	6.7	
Manual labourers and machine operators	113	14.9	97	9.5		57	4.7		283	6.8	
Unskilled workers	291	38.3	341	33.4		502	41.5		1180	28.5	
Others	148	19.5	277	27.1		429	35.5		1839	44.4	
Household size	Mean 3.97	SD 1.5	Mean 3.93	SD 1.6	0.617	Mean 3.83	SD 1.86	0.067	Mean 4.1	SD 1.7	0.081
Household composition											
Share of children below 6 years old	Mean 7.4%	SD 13.0%	Mean 6.1%	SD 11.2%	0.006	Mean 7.4%	SD 11.9%	0.382	Mean 10.2%	SD 14.1%	0.000
Share of the elder above 60 years old	Mean 12.4%	SD 25.1%	Mean 21.60%	SD 31.2%	0.000	Mean 30.5%	SD 37.6%	0.000	Mean 20.8	SD 31.7	0.000
Access to clear water	582	76.6	855	83.7	0.000	775	64.1	0.000	3093	74.7	0.274
Toilet access	524	68.9	806	78.9	0.000	626	51.8	0.000	2815	68.0	0.605
Expenditure quintiles					0.000			0.000			0.000
First expenditure quintile group (poorest)	131	17.2	129	12.6		444	36.7		852	20.6	
Second expenditure quintile group	196	25.8	191	18.7		230	19.0		781	18.9	
Third expenditure quintile group	167	22.0	229	22.4		201	16.6		815	19.7	
Fourth expenditure quintile group	159	20.9	221	21.6		170	14.1		819	19.8	
Fifth expenditure quintile group (richest)	107	14.1	252	24.7		164	13.6		873	21.1	
No of motorcycles	Mean 1.3	SD 0.84	Mean 1.5	SD 0.88	0.001	Mean 1.0	SD 0.85	0.000	Mean 1.34	SD 0.89	0.572
No of telephones	Mean 1.7	SD 1.0	Mean 1.9	SD 1.1	0.000	Mean 1.4	SD 1.1	0.000	Mean 1.8	SD 1.1	0.109
No of radios, TVs or computers	Mean 1.2	SD 0.5	Mean 1.4	SD 0.8	0.000	Mean 1.1	SD 0.6	0.013	Mean 1.3	SD 0.76	0.000

Continued

Table 2 Continued

Variables	The non-insured (control group) N=760 (1)		The insured of VHI subsample (treatment group) N=1022 (2)		P value H ₀ : (2)=(1)	The insured of heavily subsidised subsample (treatment group) N=1209 (3)		P value H ₀ : (3)=(1)	The insured of full sample (treatment group) N=4140 (4)		P value H ₀ : (4)=(1)
	n	%	n	%		n	%		n	%	
Total residential area (m ²)	Mean 81.2	SD 45.1	Mean 90.4	SD 59.2	0.000	Mean 74.0	SD 45.9	0.000	Mean 84.4	SD 53.9	0.128
Illness status in last 12 months	85	11.2	209	20.4	0.000	289	23.9	0.000	759	18.3	0.000
No of illness times in last 12 months	Mean 0.16	SD 0.55	Mean 0.36	SD 0.9	0.000	Mean 0.5	SD 1.4	0.000	Mean 0.34	SD 1.08	0.000
No of illness days in last 12 months	Mean 1.52	SD 9.82	Mean 5.05	SD 24.8	0.000	Mean 4.98	SD 14.4	0.000	Mean 4.38	SD 19.7	0.000
Place of residence (urban)	193	25.4	366	35.8	0.000	179	14.8	0.000	1243	30.0	0.010
Region					0.364			0.000			0.000
Red River Delta	145	19.1	190	18.6		201	16.6		788	19.0	
Northern Midlands and Mountains	41	5.4	75	7.3		191	15.8		607	14.7	
North and South Central Coast	138	18.2	196	19.2		340	28.1		885	21.4	
Central Highlands	51	6.7	58	5.7		71	5.9		240	5.8	
South East	80	10.5	123	12.0		74	6.1		470	11.4	
Mekong River Delta	305	40.1	380	37.2		332	27.5		1150	27.8	

in the NN matching algorithm). The figure was also high for the VHI group. However, the impact was not statistically significant for the entire sample, except for the NN matching estimator.

Furthermore, the magnitude of HI's impact on health-care utilisation at different providers varied from the VHI to the HSHI group and the group of participants of different HI programmes (full sample). For example, the HI programme contributed to increases of 0.92 in the number of visits at district hospitals for the VHI group,

and 0.64 for the full sample (NN matching). While the HI increased the number of visits at provincial hospitals for the VHI group by 0.55 times per person per year, this figure for the HSHI group was 0.20 (radius matching). The HI programme increased the frequency of use of services at commune health stations among the HSHI group more than other groups (0.53 in kernel and radius matching). Concerning the type of providers, the policy resulted in a substitution effect, which means that the decline of from 0.39 to 0.51 in frequency of visiting

Table 3 Descriptive statistics of outcome variables across different groups

Outcome variables (in last 12 months)	The non-insured (1)		The insured of VHI subsample (2)		P value H ₀ : (2)=(1)	The insured of heavily subsidised subsample (3)		P value H ₀ : (3)=(1)	The insured of full sample (4)		P value H ₀ : (4)=(1)
	Mean	SD	Mean	SD		Mean	SD		Mean	SD	
No of outpatient visits	2.507	2.395	3.878	4.791	0.000	3.415	4.642	0.000	3.164	4.052	0.000
No of inpatient visits	0.132	0.537	0.266	0.785	0.000	0.373	1.128	0.000	0.271	0.858	0.000
No of visits at commune health station	0.192	0.720	0.330	1.550	0.023	0.828	2.353	0.002	0.589	1.788	0.000
No of visits at district hospital	0.393	1.343	1.612	4.073	0.000	1.370	3.443	0.000	1.082	3.052	0.000
No of visits at provincial hospital	0.418	1.490	1.063	2.730	0.000	0.692	2.176	0.000	0.752	2.236	0.000
No of visits at state health facilities	0.834	1.923	2.758	4.551	0.000	2.178	3.939	0.000	1.930	3.622	0.000
No of visits at private health facilities	1.447	2.134	0.855	2.544	0.000	0.601	1.937	0.000	0.764	2.132	0.000
No of visits at health facility for medical treatment	2.222	2.505	3.503	4.715	0.000	3.079	4.819	0.000	2.702	4.085	0.002
No of visits at health facility for health check and consultation	0.329	1.027	0.574	2.151	0.004	0.664	1.920	0.000	0.589	1.866	0.000
No of observations	760		1022			1209			4140		

VHI, voluntary health insurance.

**Table 4** Estimated average treatment effects on the treated (ATTs) of HI scheme on healthcare utilisation across different samples with PSM method in Vietnam

Outcome variable (in last 12 months)	Matching algorithm	VHI subsample		Heavily subsidised subsample		Full sample	
		ATT	95% CI	ATT	95% CI	ATT	95% CI
No of outpatient visits	NN	0.991*** (0.214)	0.629 to 1.639	1.289*** (0.266)	0.715 to 1.410	0.897*** (0.188)	0.630 to 1.013
	Kernel	1.199*** (0.193)	0.843 to 1.561	1.179*** (0.197)	0.830 to 1.704	0.859*** (0.141)	0.953 to 1.560
	Radius	1.177*** (0.190)	0.750 to 1.629	1.173*** (0.196)	0.855 to 1.363	0.866*** (0.145)	0.826 to 1.365
No of inpatient visits	NN	0.127*** (0.034)	0.035 to 0.269	0.156*** (0.058)	-0.014 to 0.271	0.112*** (0.041)	0.061 to 0.304
	Kernel	0.107*** (0.037)	0.019 to 0.171	0.082* (0.045)	0.011 to 0.259	0.051 (0.031)	0.008 to 0.225
	Radius	0.106*** (0.036)	0.756 to 0.188	0.083* (0.044)	0.087 to 0.226	0.041 (0.032)	0.097 to 0.362
No of visits at commune health station	NN	0.170*** (0.069)	-0.024 to 0.268	0.310*** (0.079)	0.466 to 0.726	0.209*** (0.055)	0.403 to 0.506
	Kernel	0.123** (0.061)	0.021 to 0.245	0.527*** (0.080)	0.391 to 0.738	0.414*** (0.047)	0.399 to 0.695
	Radius	0.129** (0.060)	0.022 to 0.286	0.528*** (0.079)	0.433 to 0.719	0.417*** (0.048)	0.498 to 0.672
No of visits at district hospital	NN	0.920*** (0.161)	0.619 to 1.394	1.019*** (0.167)	0.821 to 1.146	0.641*** (0.107)	0.445 to 0.697
	Kernel	1.075*** (0.145)	0.728 to 1.380	0.863*** (0.129)	0.656 to 1.049	0.627*** (0.085)	0.634 to 1.001
	Radius	1.086*** (0.144)	0.869 to 1.471	0.868*** (0.129)	0.788 to 1.082	0.617*** (0.087)	0.783 to 1.148
No of visits at provincial hospital	NN	0.476*** (0.122)	0.421 to 0.829	0.308*** (0.128)	0.126 to 0.426	0.367*** (0.102)	0.022 to 0.489
	Kernel	0.567*** (0.114)	0.369 to 0.931	0.209* (0.108)	0.026 to 0.422	0.221*** (0.085)	0.017 to 0.488
	Radius	0.548*** (0.112)	0.136 to 0.931	0.202* (0.108)	0.036 to 0.367	0.193* (0.088)	0.067 to 0.445
No of visits at state health facilities	NN	1.455*** (0.192)	1.159 to 2.167	1.321*** (0.197)	0.756 to 1.667	1.085*** (0.141)	0.767 to 1.164
	Kernel	1.669*** (0.173)	1.095 to 1.998	1.162*** (0.162)	0.724 to 1.544	0.916*** (0.116)	0.932 to 1.680
	Radius	1.661*** (0.171)	1.262 to 2.205	1.160*** (0.162)	0.854 to 1.511	0.879*** (0.119)	1.021 to 1.565
No of visits at private health facilities	NN	-0.475*** (0.146)	-0.919 to -0.032	-0.448*** (1.415)	-0.676 to -0.484	-0.433*** (0.125)	-0.702 to -0.357
	Kernel	-0.482*** (0.134)	-0.853 to -0.279	-0.474*** (0.139)	-0.632 to -0.244	-0.426*** (0.117)	-0.532 to -0.311
	Radius	-0.511*** (0.130)	-0.788 to -0.189	-0.473*** (0.138)	-0.779 to -0.464	-0.395*** (0.121)	-0.796 to -0.316
No of visits at health facility for medical treatment	NN	0.838*** (0.211)	0.495 to 1.819	1.233*** (0.271)	0.779 to 1.306	0.800*** (0.191)	0.341 to 0.855
	Kernel	1.074*** (0.195)	0.551 to 1.313	0.901*** (0.205)	0.727 to 1.376	0.634*** (0.147)	0.537 to 1.623
	Radius	1.031*** (0.191)	0.702 to 1.377	0.889*** (0.204)	0.825 to 1.121	0.636*** (0.151)	0.567 to 1.225
No of visits at health facility for consultation and health check	NN	0.240*** (0.101)	0.025 to 0.382	0.231** (0.098)	0.231 to 0.519	0.157** (0.074)	0.312 to 0.334
	Kernel	0.338*** (0.219)	0.112 to 0.378	0.362*** (0.083)	0.210 to 0.472	0.243*** (0.061)	0.215 to 0.569
	Radius	0.238*** (0.083)	0.149 to 0.489	0.364*** (0.083)	0.234 to 0.440	0.238*** (0.063)	0.264 to 0.448
Observations		Treated	Control	Treated	Control	Treated	Control

Continued

Table 4 Continued

Outcome variable (in last 12 months)	Matching algorithm	VHI subsample		Heavily subsidised subsample		Full sample	
		ATT	95% CI	ATT	95% CI	ATT	95% CI
	Before matching	1022	760	1204	760	4106	760
After matching	NN	575	760	480	760	750	760
	Kernel	1002	760	1173	760	4093	760
	Radius	1002	760	1173	760	4093	760

ATT—the average treatment effect on the treated; ATT after performing PSM and bootstrap were presented. SEs in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. NN, nearest-neighbour matching; PSM, propensity score matching; VHI, voluntary health insurance.

private health facilities among the insured transferred to the growth between 0.88 and 1.70 in their intensity of seeking medical services at public facilities. This shift was pronounced among participants of VHI, followed by the HSHI group. In terms of types of visits, the policy was responsible for significant increases from 0.84 to 1.07 in the number of visits for medical treatment among VHI participants and about 0.89–1.23 among the participants of HSHI programmes. The increased trend was held for the number of health facilities visits to do health checks, which fluctuated around 0.2 across different HI participants.

The quality of the matching process and robustness were checked. The results showed that across different matching algorithms there were sharp reductions in standardised mean bias ranging between 69.54% and 86.14% (online supplemental appendix 3). Besides, the hypothesis H_0 for no systematic difference in the distribution of covariates between the treatment and control groups after matching was not rejected for VHI and HSHI subsamples with different matching algorithms, and for the full sample with NN matching. In addition, the t-tests for the balance of means that matched the treated and untreated groups in VHI and HSHI subsamples showed insignificant differences for most of the covariates (online supplemental appendix 4).

I calculated Rosenbaum bounds to check the sensitivity of results, which determines the strength of the unobservable heterogeneity that might affect the estimation results.³¹ Rosenbaum boundary estimation results are shown in online supplemental appendix 5. Our results were generally robust except for the ATTs on outcomes of the number of visits at commune health stations and the number of visits at health facilities for health check for some groups. Likewise, under the outcome of the number of outpatient visits, the ATTs were uncertain for the full sample. Similarly, there was hidden bias in the ATTs of the number of visits at the provincial hospital for the HSHI subsample.

DISCUSSION

This study examined the impact of the Revised HI Law 2014 on the use of healthcare services among different entitlement groups. The results showed that the HI scheme had

a positive effect on healthcare utilisation. However, the magnitude of influence on outpatient and inpatient care, types of providers and types of visits was heterogeneous. It was also different between VHI and HSHI groups. The programme has affected the use of outpatient services more than the use of inpatient services. The programme most affected the use of health services at the district level. In terms of using health services at hospitals, the HI scheme had a higher effect on the VHI group than the HSHI group. Concerning the type of providers, the policy had a positive impact on using public health facilities while reducing the frequency of private health facility utilisation.

In particular, the result indicated that the HI scheme was estimated to increase the use of both outpatient and inpatient services for VHI, HSHI groups, and full sample. This finding is consistent with that of Balamiento, who found that the Indigent HI programme for the poor in the Philippines increases the likelihood of outpatient visits by 5.2 to 6.6 percentage points, and inpatient admissions by 3.8 to 4.9 percentage points.¹ Similarly, in Vietnam, Nguyen found that enrolment in VHI leads to an increase in the number of outpatient and inpatient visits by approximately 0.914 and 0.078, respectively.²¹ Our results could be related to the fact that according to the Revised HI Law 2014, the poor are entitled to 100% free of user fees, and the near-poor—95%, thus may reduce financial barriers to medical service utilisation.³⁷ For VHI groups, contributions are based on the family's unit subscription, which reduces premiums for household members. The inability to pay the premium is one of the significant determinants of low uptake of VHI in Vietnam.³⁸ Before the Revised HI law was introduced, the HI premium for the VHI group participants was 6% of the minimum salary. However, after the Revised HI law has been enacted, the family-based contribution has been introduced where the premium of the first member is 4.5% of the minimum salary. The premiums of the second, third, fourth and fifth members are 70%, 60%, 50% and 40% of the first member's contribution.³⁷ A decreased HI premium is also likely to remove barriers to access to health facilities, and therefore, increasing the rate of services utilisation for both outpatient and inpatient care.



The increase in healthcare service utilisation might also reveal that the vulnerable groups experience a higher burden of disease or that there might be some moral hazard involved.^{39–41} In particular, in our study the participants in HSHI programmes had higher self-reported illness days (4.98 illness days per year—table 2) than those without HI (1.52 illness days per year). The study of Minh showed a substantial moral hazard among the insured older group, with 1.45 visits per year on average compared with 0.39 times among the uninsured.³⁹ In addition, the popularity of fee-for-service payment method that has not been adjusted much in the Revised HI Law might also be the reason for increased visits of health facilities in Vietnam. Indeed, this method triggers supply-induced demand problem, which means that healthcare providers can give needless diagnosis and treatment to patient.^{6 7 42} In a qualitative study, Minh and Löfgren⁴² documented: “doctors can determine the diagnosis and treatment protocols, and as such, doctors can suggest patients undergo numerous high-tech diagnostic tests and therapies, many of which might be not so relevant..., the overprovision of tests and therapies and the overuse of high-tech equipment, the increase in patients’ length of stay in hospitals is the other tactic hospitals often use to generate revenues”.

The study demonstrated that the effect of HI policy on the number of outpatient visits was greater than that of inpatient visits. This may be because of the fact that hospitalisation requires a relative to accompany and care, and other indirect costs which are not covered by HI may arise such as travel costs, informal costs, or some hospital services and medicines, leading to increased out-of-pocket expenditures.^{42 43} Using data from 300 inpatients of different hospitals in northern Vietnam, Vuong⁴³ demonstrated that the probability of falling into debt among the insured non-resident patients is approximately 63.3%. In contrast, this figure for the insured resident is only 18%. Besides, informal payments such as ‘envelopes’ or under-the-table payment are popular in public hospitals in Vietnam.⁴² Concerning accessibility, in a study conducted in remote and mountainous areas in Vietnam, Tran *et al*⁴⁴ demonstrated that distance is a risk factor for access to health services (OR 3.6, 95% CI 1.5 to 8.3). Therefore, the poor and the near-poor or low-income people are likely to delay inpatient admissions.

The study showed that HI participation increased healthcare services utilisation at district and provincial hospital levels of provider, and the impact was higher for district hospitals. There are several possible explanations for this result. First, this can be explained by the changes in the referral system. Before the revised HI Law 2014, the insured had to visit healthcare providers designated in the HI card; otherwise, they had to pay the full cost of the examination. However, after the revised HI Law has been enacted, the enrollees can go to any district and commune health facility.³⁷ Second, the current provider payment system is another possible explanation for the findings. The capitation payment method, which is

implemented differently in Vietnam from international features, puts the district hospitals at risk of bearing the full cost of referring patients to the higher healthcare level; therefore, they try to keep the patients.⁷ Third, changes in copayment are likely to contribute to the substantial increase in healthcare utilisation at district hospitals. If the insured receive care from the higher level without referral letter, they have to pay higher copayment rates, for example, 40% of inpatient medical expenditures at provincial hospitals and 60% at central hospitals, and they have to pay the full cost of outpatient care.^{6 37}

We observed the intensity of visiting hospitals to be relatively higher for the VHI group than the HSHI group. This result also accords with our earlier observations, which showed that in Vietnam, the people from the lowest quintile and ethnic minorities make up a significant share of commune health station visits.^{7 10} In particular, in my study, most the enrollees of the HSHI group are from the poorest quintile (36.7%), come from rural areas (85.2%) and are ethnic minorities (21.3%) (table 2). In contrast, participants of VHI are better-off with around 22.4% being from the third quintile group. Besides, approximately 35.8% of the insured live in urban areas and only 2.2% of them are ethnic minorities (table 2). Therefore, the insured of the VHI group have more choices of alternative health facilities than those joining HSHI programmes and make greater use of hospitals.

The study also found that the HI programme produced a substitution effect between public and private health facilities. In particular, the decrease in consuming private care has been compensated by an increase in consuming public care. This might be because, in Vietnam, only a small number of private health facilities are covered by HI.⁶ This finding was also reported by Palmer.³⁵

With regard to type of visits, I found that ATTs of HI was sensitive to unobserved characteristics for the outcomes of frequency of visiting health facility for consultation and health check. This result is likely to be related to the fact that health check-up is not part of HI benefits package.³⁷ Besides, although preventive consultation services are financed by state budget, investment in the primary care level in Vietnam is still modest.¹⁰

The most important limitation of this study lies in the fact that using the PSM method to measure the HI scheme’s causal effect, the estimated results may be biased if variables affecting both the outcome and treatment status are omitted: unobserved confounders. Specifically, the study failed to control supply-side factors, such as the quality and availability of health workers, attitude of medical staff towards patients, availability of medicines and equipment in different health facilities, and the number and distribution of healthcare facilities between regions. Other health security problems, such as re-emerging communicable diseases, pollution and natural disasters, happened around the time of the Revised HI Law’s introduction, were also not considered in this study. For example, measles and dengue fever outbreaks, and A(H5N1) avian influenza in humans

occurred in 2014.^{45 46} Also, the introduction of Government Decree 16/ND-CP 2015 on the autonomy of public hospitals, which is likely to be responsible for the increase in healthcare service utilisation,⁴² was not controlled. Bias associated with self-reported data is another limitation of this study. Finally, the interval after the revision of the law may have been short to evaluate its impacts. Future research may address these issues using longitudinal data with other specifications, such as instrumental variables or difference-in-difference.

CONCLUSION

The HI scheme significantly increased both outpatient and inpatient healthcare utilisation for different HI groups of interest. The findings have several practical implications. The government could continue increasing HI coverage for low coverage rate groups such as informal sector workers, farmers, fishers and other near-poor groups by subsidising premium contributions. Besides, Vietnam Social Security (VSS) might regularly monitor hospitals in terms of drug lists and medical services reimbursed by the HI fund to avoid possible supply-induced demand problem. The study also found that the effect was more marked for the district hospital level of care than the provincial level. This finding suggests the government could give priorities for the primary level of care by investing in health resources, including health workers, equipment, medicines and appropriate distribution of health facilities to optimise the referral system. The results also demonstrated that the participants of the VHI group visited hospitals more intensively. This suggests that VSS could strengthen monitoring hospitals to ensure appropriate examination and treatment. VSS might also adjust payment method aiming to combine capitation and diagnostic-related group methods. I also found the substitution effect of using private health services for state health services. There is potential room for reducing the overload of tertiary care level by expanding HI contracts and enhancing collaboration with the private health sector.

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