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THE IMPACT OF VOLUNTARY HEALTH INSURANCE ON HEALTH CARE UTILIZATION AND OUT-OF-POCKET PAYMENTS: NEW EVIDENCE FOR VIETNAM

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SUMMARY

Vietnam aims to achieve full coverage of health insurance in 2015. An increasing type of health insurance in Vietnam is voluntary health insurance. Although there are many studies on the implementation of voluntary health insurance in Vietnam, little is known on the causal impact of voluntary health insurance. This paper measures the impact of voluntary health insurance on health care utilization and out-of-pocket payments using Vietnam Household Living Standard Surveys in 2004 and 2006. It was found out that voluntary health insurance helps the insured people increase the annual outpatient and inpatient visits by around 45% and 70%, respectively. However, the effect of voluntary health insurance on out-of-pocket expenses on health care services is not statistically significant. Copyright © 2011 John Wiley & Sons, Ltd.

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1. INTRODUCTION

Together with economic development, health insurance has been increasingly developed in all the countries. There is no doubt that health insurance has a very important role in health care and financial protection, especially for the poor. Health insurance helps the insured people access costly health care services. It also protects people from financial burdens and poverty that are caused by health shocks (e.g., see Whitehead *et al*., 2001; Wagstaff, 2005a, 2005b).

Vietnam has achieved remarkable reduction of poverty during the past 10 years. However, the incidence of poverty remains rather high, especially in rural areas. According to Vietnam Household Living Standard Survey (VHLSS) in 2006, the incidence of rural poverty was around 20%. One of the important reasons for poverty is health shocks. In all Participatory Poverty Assessment studies, illness has always been described by the poor as one of the main reasons for their severe difficulties (World Bank, 2000). Households affected by health shocks suffer from the burden of medical expenses. According to the 2004 VHLSS, around 10% of households spent more than 16% of their consumption for health care. High out-of-pocket payments on health care are also found in several studies such as Narayan *et al*. (2000), World Bank (2001), Wagstaff (2002), Wagstaff and van Doorslaer (2003). Health shocks can lead to decrease in employment, thereby decreasing income and expenditure as well (e.g., Wagstaff, 2005b).[1]

The adverse impacts of health shocks can be mitigated if people have health insurance. Yet, there is a large proportion of the population not having health insurance in Vietnam. According to the 2006 VHLSS, the uninsured people accounted for 46% of the population in 2006. Similar to other developing countries, the government of Vietnam aims to achieve the full coverage of health insurance to protect

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[1]In other developing countries, health shocks are a burden to people, especially the poor (e.g., see Whitehead *et al*., 2001; Wagstaff, 2005a).

people against catastrophic health spending. It is expected that by the year 2015, all the Vietnamese population will be covered by different types of health insurance including compulsory health insurance, student (school) health insurance, free health insurance for the poor and other beneficiaries, and voluntary health insurance.

Although the coverage of health insurance is increasing in Vietnam, health insurance is sometimes to blame for provision of poor health care services (e.g., Khiet, 2008; Tien, 2008). A large proportion of the insured individuals still do not use health insurance when using care services. According to the 2006 VHLSS, the percentage of annual outpatient contacts using health insurance is only 52%. The proportion of the insured people using health insurance for health care services is around 60%. It means that up to 40% of the insured did not use health insurances when having health care treatments in 2006. Thus, impact evaluation of health insurance can provide the government with helpful information to increase the effectiveness of health insurance.

There is a large number of empirical studies measuring the impact of health insurance on health care utilization and spending in developing countries. However, the findings are still contradictory. Positive impacts of health insurance on health care demand and utilization have been found in several studies such as Newhouse (1993), Waters (1999), Bertranou (1998), Ron (1999), Harmon and Nolan (2001), Yip and Berman (2001), Wagstaff and Pradhan (2005), and Wagstaff *et al*. (2009). On the contrary, the effect of health insurance can be negligible if the coverage and benefit package of health insurances are limited. For example, Sapelli and Vial (2003) found a negligible impact of Chilean health insurance on hospitalization. Ekman (2007) found that health insurance did not help financial protection from the catastrophic spending on health care in Zambia. Carrin *et al*. (1999) found a very limited impact of health insurance on reduction of health care expenditure burden in China. King *et al*. (2009) did not find a significant effect of a universal health insurance program in Mexico on medication spending and health care utilization. A possible explanation for the difference in findings on the impact of health insurance is that the above empirical studies were conducted in different countries in which the health insurance system and health behaviors of people are different.

The impact of health insurance in Vietnam has been evaluated quantitatively in several studies. Again, the empirical results are not consistent. Wagstaff and Pradhan (2005) measured impact of all types of health insurance using Vietnam Living Standard Surveys 1993 and 1998. They found that health insurance increased the probability of using health care services and the number of hospital visits. Health insurance also helped reduction of annual out-of-pocket health expenditures. Sepehri *et al*. (2006) also used the same data sets to measure impact of health insurance on health care spending. They found that health insurance reduced the out-of-pocket expenditures by around 36% to 45%. Jowett *et al*. (2003) measured the impact of voluntary and student health insurance using a small household survey in 1999. The findings were that health insurance decreased the average out-of-pocket expenditures remarkably. The impact of free health insurance for the poor was assessed in Bales *et al*. (2007) and Wagstaff (2007). Although, Wagstaff (2007) found a positive impact of the health insurance on health care utilization, he did not find a significant impact on out-of-pocket health expenditures. On the contrary, Bales *et al*. (2007) did not find a significant impact of health insurance on health care utilization. In Bales *et al*. (2007), health insurance helped the insured reduce the inpatient treatment expenses. A possible reason for different findings between Bales *et al*. (2007) and Wagstaff (2007) is that Bales *et al*. (2007) used difference-in-differences matching with panel data from VHLSSs 2002 and 2004, whereas Wagstaff (2007) relied on single matching using cross-sectional data of the 2004 VHLSS. Recently, when using three rounds of VHLSS in 2002, 2004 and 2006 and a method called triple differencing with matching, Wagstaff (2009) found similar findings as Bales *et al*. (2007), that is, the free health insurance reduced out-of-pocket spending significantly but not health care utilization.

A main problem in impact evaluation of health insurance is the endogeneity of health insurance. The participation in health insurance can be correlated with unobserved characteristics of people such as risk attitude and health status, which are also correlated with health care utilization and spending. A widely used method to deal with endogeneity of health insurance is the difference-in-differences with matching (e.g., Wagstaff and Pradhan, 2005; Johar, 2009; Wagstaff *et al*., 2009). An advantage of the matching method is that it does not rely on a

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specific functional form of the outcome, thereby avoiding assumptions on functional form. However, the difference-in-differences with matching method requires panel data with baseline data before health insurance. Baseline data are not always available in reality. Instead, panel data with two periods are often collected after health insurance begins. In this paper, we will show that under certain assumptions, the difference-in-differences with matching method can still be applied with two-period panel data after health insurance to measure the impact of health insurance.

The main objective of this paper is to measure to what extent voluntary health insurance affects health care utilization and out-of-pocket health care expenses on the insured people in Vietnam. The paper focuses on voluntary health insurance, because voluntary health insurance is increasing and is expected to cover a large proportion in the future. In addition, quantitative impact evaluation of voluntary health insurance in Vietnam has not been investigated so far. Most empirical studies focus on free health insurance and general health insurance. Perhaps, an exceptional study which examines the impact of the voluntary health insurance is the study by Jowett *et al*. (2003). However, there are three main differences between Jowett *et al*. (2003) and our study. Firstly, Jowett *et al*. (2003) used a small data sample collected from three provinces in 1999,[2] whereas we used nationally representative data in 2004 and 2006. Secondly, the main type of voluntary health insurance addressed by Jowett *et al*. (2003) is student health insurance. In 1999, the voluntary health insurance was mainly provided for students and pupils. Since 2003, voluntary health insurance has been expanded widely in Vietnam. In our study, the voluntary health insurance of interest does not include student health insurance because voluntary health insurance for non-students is totally different from student health insurance. They have different targeted people, different premium and benefit package. Thirdly, Jowett *et al*. (2003) examined the impact of health insurance on health spending, but not health care utilization, whereas our study investigates the impact of health insurance on both health care spending and utilization.

Thus, the paper is expected to contribute empirical findings to the debate on health insurance impacts. To do so, the paper will employ the method of propensity score matching using panel data from the most two recent VHLSS in 2004 and 2006.

The remainder of this paper is organized as follows. Section 2 introduces data sources used in this study. Section 3 introduces health insurance schemes in Vietnam. Section 4 describes the impact evaluation methodology. Section 5 presents estimation results and Section 6 concludes.

2. DATA SET

The study relies on data from the two most recent VHLSSs, which were conducted by the General Statistical Office of Vietnam (GSO) with technical support from the World Bank (WB) in the years 2004 and 2006. The 2004 and 2006, VHLSSs covered 9188 and 9189 households, respectively. The samples are representative for the national, rural and urban, and regional levels. The 2004 and 2006 VHLSSs resulted in a panel of 4216 households for which data is available for both years. At the individual level, the panel data covered 16,685 people.

The surveys collected information by means of household and community level questionnaires. Information on households include basic demography, employment and labor force participation, education, health, income, expenditure, housing, fixed assets and durable goods, and participation of households in poverty alleviation programs. Especially, expenditure and income per capita are collected using detailed questions. The surveys also contain information on health insurance of household members, the number of annual outpatient and inpatient visits to hospitals and clinics, and out-of-pocket expenses for outpatient and inpatient services. However, detailed information on out-of-pocket payments for health care is not available. It means that the out-of-

[2]Data used in Jowett *et al*. (2003) were collected in the provinces of Hai Phong, Ninh Binh and Dong Thap.

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pocket payments defined in VHLSSs include not only the treatment fees, but also all costs related to treatments, such as bonus for doctors, service charge for additional medicine requirement, equipment, transport, etc.

Commune data include basic information on demography, socioeconomic characteristics, and infrastructures of communes. The commune data can be linked to the household data. However, in VHLSSs, commune data were collected only for the rural communes. There were no data on urban communes.

3. HEALTH INSURANCE IN VIETNAM

In Vietnam, health insurance has been implemented by the government since 1992. Initially, health insurance included compulsory health insurance and voluntary health insurance. Nowadays, health insurance schemes consist of compulsory health insurance, free health insurance, student health insurance, and voluntary health insurance schemes. Compulsory health insurance is applied for civil servants, state enterprise workers, and workers in private enterprises with more than 10 workers, and pensioners. Free health insurance is provided free of charge for the poor and other targeted groups, such as ethnic minorities and policy households. All the children under 6 years old also have free health insurance. School or student health insurance is applied for students in schools, colleges and universities. Voluntary health insurance is intended for the remaining population.[3]

Before 2005, voluntary health insurance was very limited, because people had to buy voluntary health insurance through their communes or unions. Voluntary health insurance was not provided unless at least 10% of the population of a commune or 30% of members of a union agreed to buy voluntary health insurance. Since 2005, voluntary health insurance has been remarkably growing. One reason for this increase is an easier access to voluntary health insurance since 2005. Between 2005–2007, relatives of people who were insured by compulsory health insurance were allowed to buy voluntary health insurance individually.[4] Table I shows that the percentage of people above 5 years old having voluntary health insurance increased from 1% to 4.5% during 2004–2006.[5]

The premium of voluntary health insurance is not high. The health insurance premium is around 240 and 320 thousand VND for the rural and urban people, respectively. According to VHLSS 2006, the average per capita income in the rural and urban areas was 6711 and 11,495 thousand VND in 2006, respectively. Thus, the ratio of the health insurance premium to per capita income was around 3.6% and 2.8% for the rural and urban areas in 2006, respectively.

The benefit package provided by voluntary health insurance has been changed overtime. Before 2008, health insurance covered 100% of payment for health care treatment, which had cost less than 7 million VND per treatment. For treatments costing from 7 million VND and above, voluntary health insurance covered only 60% of the payments, and patients paid the rest. Since early 2008, voluntary health insurance had been paying 100% of outpatient treatment fees lower than 100 thousand VND. For outpatient treatments costing from 100 thousand VND and above and all inpatient treatments, only 80% of payment was covered by health insurance, and patients had to pay 20%. People who did not have health insurance had to pay 100% of their bills for health care services.

The health services in Vietnam are provided by both public and private health providers, in which the public ones play a key role, especially in inpatient treatment (World Health Organization, 2009). The private sector has grown steadily during the recent years, but mainly provides outpatient health service and is still much smaller than the public sector.[6] To receive fee reduction and exemption from health insurance, patients have to use health care services in health care establishments that registered with Vietnam Health Insurance. Up to 2010, there are 7600 public and 200 private health care establishments, which registered with Vietnam Health

[3]Although, school health insurance is also voluntary, in this paper voluntary health insurance does not include school health insurance.
[4]Relatives of a person can include her/his parents, children, spouse, and siblings.
[5]For more information on the legal framework of health insurance in general and voluntary health insurance in Vietnam, see Ministry of Health of Vietnam (2005, 2007).
[6]In 2004, there were 77 private hospitals in the country, accounting for 6.86% of the total number of hospitals nationwide, with 5412 beds, accounting for 3.4% of the total number of hospital beds nationwide (Ministry of Health of Vietnam, 2008).

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Table I. Distribution of population above 5 years old by health insurance status (%)

	Year	
Health insurance (HI) types	2004	2006
Poor	16.1	22.5
Compulsory HI	6.2	10.3
Student	15.5	16.0
Voluntary HI	1.0	4.5
Other types of HI	0.4	0.1
No HI	60.8	49.0
Total	100.0	100.0

Source: Estimation from VHLSSs 2004 and 2006.

Insurance to provide health care services for the insured (Dung, 2010). As a result, the proportion of using private health care services is much higher for the uninsured than the insured. According to the 2006 VHLSS, the proportion of the number of outpatient contacts in private health establishments to the total number of outpatient contacts was 23% for people having voluntary health insurance. The figure for the uninsured people was 43%.[7] Because inpatient treatments are mainly provided by the public health sector, the proportion of private inpatient contacts to the total inpatient contacts was only 1.2% and 3.6% for the insured and uninsured people, respectively.

Table I shows that the proportion of the uninsured people above 5 years old was reduced by 12 percentage points from 61% to 49% during the period 2004–2006. Student health insurance was almost unchanged at around 16%. Other schemes of health insurance experienced an increase over this period. More specifically, the percentage of people having compulsory and free health insurance increased by around 6.2% and 16.1% to 10.3% and 22.5%, respectively. The increase in compulsory health insurance suggests that formal sectors tend to increase overtime.

4. IMPACT EVALUATION METHOD

4.1. Parameter of interest

The main objective of the paper is to measure the impact of voluntary health insurance on the health care utilization and health care spending of the insured people. Let D be a binary variable indicating participation in voluntary health insurance, that is, $D=1$ if one has voluntary health insurance, and $D=0$ otherwise. Let Y denote observed outcome, that is, health care utilization and health expenditures. This variable can receive one of the two potential values: $Y=Y_1$ if $D=1$, and $Y=Y_0$ if $D=0$. The most popular parameter in impact evaluation is the average treatment effect on the treated (ATT), which is defined as follows (Heckman *et al*., 1999):

$$\text{ATT} = E(Y_1|D=1) - E(Y_0|D=1). \quad (1)$$

This is the average impact of the voluntary health insurance on the insured people's outcome. In Equation (1), $E(Y_0|D=1)$ is not observed, thus, estimation of ATT is not straightforward. The next section discusses how to estimate ATT using the matching method with panel data.

4.2. Propensity score matching using panel data

When panel data on insured and uninsured people are available before and after voluntary health insurance, ATT can be estimated using a method of difference-in-differences with matching. Suppose that in our panel

[7]For people who were insured by other health insurance types, the proportion of the number of outpatient contacts in private health establishments to the total number of outpatient contacts was around 22%.

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data of VHLSSs 2004–2006, the 2004 and 2006 outcomes are pre-health-insurance and post-health-insurance outcomes, respectively. Let Y_0^{2004} denote outcome in 2004 (i.e., outcome before voluntary health insurance). Let Y_1^{2006} and Y_0^{2006} denote potential outcomes in states of voluntary health insurance and no voluntary health insurance in 2006 (i.e., outcome after voluntary health insurance), respectively. The difference-in-differences with matching method relies on an assumption that conditional on some observed variables X, difference in outcome expectations between people with and without voluntary health insurance is time-invariant:

$$E\left(Y_0^{2004}|X, D=1\right)-E\left(Y_0^{2004}|X, D=0\right) = E\left(Y_0^{2006}|X, D=1\right)-E\left(Y_0^{2006}|X, D=0\right). \tag{2}$$

Then, we can identify the parameter ATT conditional on X (denoted by $\mathrm{ATT}_{(X)}$) because

$$\begin{aligned}\mathrm{ATT}_{(X)} &= E\left(Y_1^{2006}|X, D=1\right)\text{-}E\left(Y_0^{2006}|X, D=1\right) \\ &= E\left(Y_1^{2006}|X, D=1\right)\text{-}E\left(Y_0^{2006}|X, D=1\right)\text{-}\left[E\left(Y_0^{2004}|X, D=1\right)-E\left(Y_0^{2004}|X, D=0\right)\right] \\ &\quad +\left[E\left(Y_0^{2006}|X, D=1\right)-E\left(Y_0^{2006}|X, D=0\right)\right] \\ &= \left[E\left(Y_1^{2006}|X, D=1\right)\text{-}E\left(Y_0^{2006}|X, D=0\right)\right]\text{-}\left[E\left(Y_0^{2004}|X, D=1\right)-E\left(Y_0^{2004}|X, D=0\right)\right]\end{aligned} \tag{3}$$

As a result, ATT is also identified, because

$$\mathrm{ATT} = \int_{X|D=1}\mathrm{ATT}_{(X)}\mathrm{d}F(X|D=1). \tag{4}$$

It should be noted that in this paper, the parameters refer to the impact in 2006.

The matching estimator is based on Equation (3). After we construct a comparison (control) group that has similar distribution of X as the treatment group, we can estimate the impact by computing the difference in differences in average outcomes between the treatment and control groups before and after the voluntary health insurance.[8]

A problem in applying the difference-in-differences with matching method in the case of voluntary health insurance is that we do not have true baseline data. Although voluntary health insurance has been increased mainly since 2005, there were a proportion of people still having voluntary health insurance before 2005. In our panel data of VHLSSs 2004–2006, there were some individuals having voluntary health insurance in both 2004 and 2006. To apply the difference-in-differences with matching method straightforwardly, we have to drop observations with voluntary health insurance in 2004. However, dropping observations can lead to a biased estimate of ATT for the year 2006. To illustrate the issue more explicitly, let D_{2004} and D_{2006} denote the binary variables of voluntary health insurance in the years 2004 and 2006, respectively. In 2004, let Y_1^{2004} and Y_0^{2004} denote potential outcomes with and without voluntary health insurance, respectively. In 2006, let Y_1^{2006} and Y_0^{2006} denote the potential outcomes with and without voluntary health insurance, respectively. We are interested in ATT in the recent year, that is, 2006[9]:

$$\mathrm{ATT}_{2006} = E\left(Y_1^{2006}|D_{2006}=1\right)-E\left(Y_0^{2006}|D_{2006}=1\right). \tag{5}$$

Equation (5) can be written as follows:

$$\mathrm{ATT}_{2006} = \Pr(D_{2004}=1|D_{2006}=1)\mathrm{ATT}_{2006\_a} + \Pr(D_{2004}=0|D_{2006}=1)\mathrm{ATT}_{2006\_b}, \tag{6}$$

where $\Pr(D_{2004}=1|D_{2006}=1)$ and $\Pr(D_{2004}=0|D_{2006}=1)$ are the proportion of individuals with and without voluntary health insurance in 2004 among individuals who have voluntary health insurance in 2006. The ATT_{2006_a} and ATT_{2006_b} are defined as follows:

[8]To find the comparison group, we requires a so-called common support assumption, that is, $0 < P(D=1|X) < 1$. This assumption means that there are non-participants who have the X variables similar to those of the participants in the health insurance program.

[9]One can be interested in ATT for 2004, that is, $\mathrm{ATT}_{2004} = E\left(Y_1^{2004}|D_{2004}=1\right)-E\left(Y_0^{2004}|D_{2004}=1\right)$. The identification and estimation strategy of ATT_{2004} is similar to that of ATT_{2006}.

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$$\mathrm{ATT}_{2006\_a} = E\left(Y_1^{2006}|D_{2006}=1, D_{2004}=1\right) - E\left(Y_0^{2006}|D_{2006}=1, D_{2004}=1\right) \tag{7}$$

$$\mathrm{ATT}_{2006\_b} = E\left(Y_1^{2006}|D_{2006}=1, D_{2004}=0\right) - E\left(Y_0^{2006}|D_{2006}=1, D_{2004}=0\right) \tag{8}$$

ATT_{2006_a} is the average effect of health insurance on people who had health insurance in both 2004 and 2006, whereas ATT_{2006_b} can be regarded as the average effect of voluntary health insurance on the newly insured people in 2006 (in 2004, these people can have other health insurance but not voluntary health insurance). ATT_{2006_a} and ATT_{2006_b} will be equal to ATT_{2006} under an assumption that the participation in voluntary health insurance in 2004 is uncorrelated with the participation in voluntary health insurance in 2006. If this assumption does not hold, we need to invoke other assumptions to identify ATT_{2006}.

First, let us write ATT_{2006} conditional on X as follows:

$$\begin{aligned}\mathrm{ATT}_{2006,X} = {} & \Pr(D_{2004}=1|X, D_{2006}=1)\left[E\left(Y_1^{2006}|X, D_{2004}=1, D_{2006}=1\right) - E\left(Y_0^{2006}|X, D_{2004}=1, D_{2006}=1\right)\right] \\ & + \Pr(D_{2004}=0|X, D_{2006}=1)\left[E\left(Y_1^{2006}|X, D_{2004}=0, D_{2006}=1\right) - E\left(Y_0^{2006}|X, D_{2004}=0, D_{2006}=1\right)\right].\end{aligned} \tag{9}$$

$\mathrm{ATT}_{2006,X}$ can been seen as a weighted average of the effect of voluntary health insurance on the newly insured people in 2006 and the effect of voluntary health insurance on the insured people in both 2004 and 2006 (conditional on X).

Equation (9) suggests two identification assumptions as follows:

$$\begin{aligned}&\left[E\left(Y_0^{2006}|X, D_{2004}=0, D_{2006}=1\right) - E\left(Y_0^{2006}|X, D_{2004}=0, D_{2006}=0\right)\right] \\ &\quad = \left[E\left(Y_0^{2004}|X, D_{2004}=0, D_{2006}=1\right) - E\left(Y_0^{2004}|X, D_{2004}=0, D_{2006}=0\right)\right],\end{aligned} \tag{10}$$

$$\begin{aligned}&\left[E\left(Y_0^{2006}|X, D_{2004}=1, D_{2006}=1\right) - E\left(Y_1^{2004}|X, D_{2004}=1, D_{2006}=1\right)\right] \\ &\quad = \left[E\left(Y_0^{2006}|X, D_{2004}=1, D_{2006}=0\right) - E\left(Y_1^{2004}|X, D_{2004}=1, D_{2006}=0\right)\right].\end{aligned} \tag{11}$$

The first assumption means that difference in the no-health-insurance outcome (conditional on X) between people uninsured in both the years and those insured only in the year 2006 is unchanged overtime. In other words, the change over time in health care utilizations for people who lost the insurance is the same as for people who kept it if they had lost it. This assumption is similar to the assumption of the method of difference-in-differences with matching. The second assumption means that difference between the no-health-insurance outcome in the year 2006 and the health-insurance outcome in the year 2004 is the same for people insured in both the years and those insured in the year 2004 but not in the year 2006.

Substitute Equations (10) and (11) into Equation (9) and rewrite Equation (9) as follows:

$$\begin{aligned}\mathrm{ATT}_{2006,X} = {} & \Pr(D_{2004}=1|X, D_{2006}=1)\{\left[E\left(Y_1^{2006}|X, D_{2004}=1, D_{2006}=1\right) - E\left(Y_0^{2006}|X, D_{2004}=1, D_{2006}=0\right)\right] \\ & - \left[E\left(Y_1^{2004}|X, D_{2004}=1, D_{2006}=1\right) - E\left(Y_1^{2004}|X, D_{2004}=1, D_{2006}=0\right)\right]\} \\ & + \Pr(D_{2004}=0|X, D_{2006}=1)\{\left[E\left(Y_1^{2006}|X, D_{2004}=0, D_{2006}=1\right) - E\left(Y_0^{2006}|X, D_{2004}=0, D_{2006}=0\right)\right] \\ & - \left[E\left(Y_0^{2004}|X, D_{2004}=0, D_{2006}=1\right) - E\left(Y_0^{2004}|X, D_{2004}=0, D_{2006}=0\right)\right]\}\end{aligned} \tag{12}$$

$\mathrm{ATT}_{2006,X}$ is identified because all terms in Equation (12) are observed. The unconditional parameter is also identified by Equation (4).

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Equation (12) can be rewritten as follows:

$$\begin{aligned}\mathrm{ATT}_{2006,X} = &\begin{bmatrix}\Pr(D_{2004}=1|X,D_{2006}=1)E\left(Y_1^{2006}|X,D_{2004}=1,D_{2006}=1\right)\\ +\Pr(D_{2004}=0|X,D_{2006}=1)E\left(Y_1^{2006}|X,D_{2004}=0,D_{2006}=1\right)\end{bmatrix}\\ &-\begin{bmatrix}\Pr(D_{2004}=1|X,D_{2006}=1)E\left(Y_0^{2006}|X,D_{2004}=1,D_{2006}=0\right)\\ +\Pr(D_{2004}=0|X,D_{2006}=1)E\left(Y_0^{2006}|X,D_{2004}=0,D_{2006}=0\right)\end{bmatrix}\\ &-\begin{bmatrix}\Pr(D_{2004}=1|X,D_{2006}=1)E\left(Y_1^{2004}|X,D_{2004}=1,D_{2006}=1\right)\\ +\Pr(D_{2004}=0|X,D_{2006}=1)E\left(Y_0^{2004}|X,D_{2004}=0,D_{2006}=1\right)\end{bmatrix}\\ &+\begin{bmatrix}\Pr(D_{2004}=1|X,D_{2006}=1)E\left(Y_1^{2004}|X,D_{2004}=1,D_{2006}=0\right)\\ +\Pr(D_{2004}=0|X,D_{2006}=1)E\left(Y_0^{2004}|X,D_{2004}=0,D_{2006}=0\right)\end{bmatrix}\end{aligned} \tag{13}$$

Equation (13) suggests that we can express ATT_{2006} conditional on X and D_{2004} as follows:

$$\begin{aligned}\mathrm{ATT}_{2006,X,D_{2004}} = &\left[E\left(Y_1^{2006}|X,D_{2004},D_{2006}=1\right)-E\left(Y_0^{2006}|X,D_{2004},D_{2006}=0\right)\right]\\ &-\left[E\left(Y^{2004}|X,D_{2004},D_{2006}=1\right)-E\left(Y^{2004}|X,D_{2004},D_{2006}=0\right)\right],\end{aligned} \tag{14}$$

where Y^{2004} is the observed outcome in 2004. We can obtain $\mathrm{ATT}_{2006,X}$ by taking the expectation of $\mathrm{ATT}_{2006,X,D_{2004}}$ across the distribution of D_{2004} conditional on X.

Equation (14) is rather similar to Equation (3). Writing the parameter of ATT_{2006} conditional on X and D_{2004} in Equation (14) suggests a simple way of matching. The treatment group is people who had voluntary health insurance in 2006. The comparison group includes people who did not have voluntary health insurance in 2006, but had the observed characteristics (the X variables) and voluntary health insurance status in 2004 (the D_{2004} variable) similar to those of the treatment group.[10] In other words, we have to control not only X but also D_{2004}. Compared with Equation (3), Equation (14) differs in an aspect that voluntary health insurance status in 2004 is controlled in Equation (14).

A remaining problem is how to match the uninsured with the insured. Since the publication of a paper by Rosenbaum and Rubin (1983), the matching was often performed based on the probability of being assigned into the program, which is called the propensity score.[11] The propensity score is used to balance the X covariates between the participants and matched non-participants. In this paper, the matching based on the propensity score is employed, and the propensity score is the probability of being insured in 2006 given variables X and D_{2004}. In addition, depending on the number of non-participants who are matched with a participant, we can have different matching estimators. In this paper, we use nearest-neighbors and kernel matching estimators. The standard errors are calculated using bootstrap techniques.[12]

In this paper, we will use the proposed matching method to estimate parameters ATT_{2006} and ATT_{2006_b}. We cannot estimate the ATT_{2006_a} parameter, because there are only 61 individuals who had voluntary health insurance in both 2004 and 2006. In this matching, the treatment group includes individuals having voluntary health insurance in 2006, and the control group includes individuals not having any health insurance in 2006. However, both the treatment and control groups are allowed to have health insurance in 2004. In addition, we

[10]To find the control group, we also require a common support assumption as follows: $0 < P(D_{2006}=1|X,D_{2004}) < 1$.

[11]Other matching methods can be subclassification and covariate matching (Rubin, 1979).

[12]This bootstrap is implemented by repeatedly drawing samples from the original sample of the VHLSS panel data. Because the VHLSSs sample selection follows stratified random cluster sampling, communes instead of households are bootstrapped in each stratum (Deaton, 1997). In other words, the bootstrap is made of communes (i.e., clusters) within strata. The number of replications is 500. We also tried to bootstrap households instead of communes, and the results of both possibilities are very similar. Abadie and Imbens (2008) showed that bootstrap can give invalid standard errors for the nearest neighbor matching estimator. However, there has not been any evidence on the validity of standard errors for other matching estimators using bootstrap. Most of empirical studies rely on the bootstrap to estimate standard errors of matching estimators.

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also use the traditional method of the difference-in-differences and matching, which is based on Equation (3). To perform this method, we drop individuals who had any health insurance in 2004 in our data sample. As a result, the treatment and control groups did not have any health insurance in 2006 but not 2004. The impact parameter which is estimated from this method can be denoted as ATT'_{2006_b}. It measures the effect of voluntary health insurance on those who had voluntary health insurance in 2006, but did not have any health insurance in 2004. These people were newly enrolled in health insurance in 2006.

ATT'_{2006_b} is slightly different from ATT_{2006_b}, which is defined as the average treatment effect of voluntary health insurance on individuals who had voluntary health insurance in 2006 and did not have voluntary health insurance in 2004. However, some individuals of this treatment group can have another health insurance type in 2004, and they moved to voluntary health insurance in 2008 (the other individuals in this treatment group did not have any health insurance in 2004).

Putting it differently, ATT_{2006} is the effect of voluntary health insurance. ATT'_{2006_b} and ATT_{2006_b} can be regarded as the effect of buying voluntary health insurance 'for the first time'. However, for ATT'_{2006_b}, the treatment group did not have any health insurance in 2004, whereas for ATT_{2006_b}, the treatment group could have health insurance (rather than voluntary health insurance) in 2004.

Different parameters measure the effect of voluntary health insurance in 2006 on different groups who differ in the health insurance status in 2004. By the same token, we can examine whether the effect of voluntary health insurance in the current period depends on the health insurance status in the previous period.

It should be noted that the proposed matching method will fail to eliminate all endogeneity bias if assumptions (10) and (11) do not hold. Instrumental variable methods are more robust to deal with endogeneity problems. However, finding good instrumental variables, which are correlated with outcomes, but uncorrelated with error terms in the outcome equations, is not an easy task. Using an invalid instrumental variable can even increase the bias. In addition, variables that are uncorrelated with the error terms are often weakly correlated with the treatment variable (voluntary health insurance), and using weak instruments may result in estimates with large standard errors in small samples.

5. IMPACT ESTIMATION RESULTS

5.1. Estimation of propensity scores

The first step in estimating impact of voluntary health insurance is to derive the propensity scores for individuals covered in our data set. In this paper, we use logit regression to estimate the propensity score. The dependent variable in the logit regression is a dummy, which is equal to one for the treatment group and equal to zero for the control group. The main problem that we are faced with is how to select the set of explanatory variables. Two requirements need to be taken into account. First, the explanatory variables should be exogenous to voluntary health insurance (Heckman *et al*. 1999; Ravallion, 2001). Therefore, we should use variables in the 2004 VHLSS instead of in the 2006 VHLSS. Second, the explanatory variables should affect both the outcome variables we are interested in (i.e., health care utilization and out-of-pocket expenditures) and voluntary health insurance (Ravallion, 2001). Explanatory variables selected in the logit regression include income, health insurance status in 2004, age, gender, ethnicity, health status, education, occupation, and having a relative enrolled in compulsory health insurance, regional and urban dummy variables (all in 2004).[13]

[13]We do not use characteristics of household heads such as education and occupation of heads in the explanatory variable set. Because voluntary health insurance is targeted mainly at adults (children are covered mainly by school health insurance), and enrolment in voluntary health insurance is the decision of the insured people. In addition, individuals include household heads. Thus, there is very high multicollinearity between heads' characteristics and individuals' characteristics.

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Table II. Logit regression of voluntary health insurance

Explanatory variables	ATT_{2006}		ATT_{2006_b}		ATT'_{2006_b}	
	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Per capita income in 2004 (million VND)	0.0154***	0.0055	0.0158***	0.0060	0.0117*	0.0068
Have voluntary health insurance in 2004 (yes = 1)	1.6819***	0.2940				
Have other health insurance types in 2004 (yes = 1)	0.4672***	0.1471	0.5556***	0.1579		
Having relatives covered by compulsory health insurance in 2004	0.7709***	0.1158	0.7930***	0.1244	0.7561***	0.1394
Age in 2004	0.0316***	0.0025	0.0326***	0.0026	0.0315***	0.0029
Gender (Male = 1; Female = 0)	−0.4315***	0.0874	−0.4020***	0.0933	−0.4277***	0.1007
Ethnic minority (Ethnic minority = 1; Kinh = 0)	−1.2229***	0.3130	−1.1487***	0.3192	−0.9827***	0.3315
Being sick during the past 12 month (in 2004)	0.5016***	0.0919	0.5162***	0.0982	0.4744***	0.1050
Being sick during the past 4 weeks (in 2004)	0.4189***	0.1278	0.4747***	0.1389	0.4941***	0.1460
Not complete primary school			Base			
Completed primary school	0.3489***	0.1181	0.3056**	0.1256	0.2729**	0.1316
Completed lower-secondary school	0.3957***	0.1291	0.3695***	0.1369	0.2714*	0.1467
Completed upper secondary school	0.7533***	0.1662	0.7663***	0.1774	0.6642***	0.1953
Completed technical degree	0.4348**	0.2029	0.4503**	0.2192	0.3904	0.2407
Completed college/university	0.6401*	0.3764	0.3567	0.4282	−0.1839	0.5975
Leaders/Managers			Base			
Professionals/technicians	−1.0578*	0.5664	−1.0245*	0.5821	−1.9752***	0.7651
Clerks/service workers	−1.3474***	0.4617	−1.3792***	0.4785	−1.6848***	0.5271
Agriculture/forestry/fishery	−1.6872***	0.4264	−1.6592***	0.4349	−2.0854***	0.4877
Skilled workers/machine operators	−1.7073***	0.4390	−1.7527***	0.4488	−2.2160***	0.5033
Unskilled workers	−1.7481***	0.4303	−1.6936***	0.4383	−2.0916***	0.4893
Not working	−2.1425***	0.4330	−2.1173***	0.4420	−2.4896***	0.4968
Household in Red River Delta			Base			
Household in North East	0.4009**	0.1685	0.3478**	0.1769	0.3886**	0.1959
Household in North West	0.9781***	0.3027	0.8968***	0.3131	0.7895**	0.3821
Household in North Central Coast	0.2950*	0.1580	0.0003	0.1687	−0.0733	0.1882
Household in South Central Coast	0.5622***	0.1552	0.5999***	0.1579	0.6277***	0.1686
Household in Central Highlands	−0.3297	0.2490	−0.1694	0.2676	−0.2411	0.2980
Household in South East	0.2128	0.1463	0.3525**	0.1571	0.4167**	0.1684
Household in Mekong River Delta	0.3796***	0.1264	0.3630***	0.1303	0.3749***	0.1420
Household in urban areas (yes = 1)	0.4140***	0.1032	0.3124***	0.1145	0.3347***	0.1237
Constant	−2.8331***	0.4703	−2.8956***	0.4801	−2.3428***	0.5268
Observations	8070		8001		6780	
Pseudo R2	0.12		0.11		0.09	

*significant at 10%, **significant at 5%, ***significant. Standard errors in brackets. Source: Estimation from panel data of VHLSSs 2004 and 2006.

As mentioned, we will estimate the three impact parameters using matching methods. For estimation of ATT_{2006}, the treatment group includes all individuals having voluntary health insurance in 2006, and the control group is those not having any health insurance in 2006.[14] It means that individuals who had other schemes of health insurance, rather than voluntary health insurance in 2006, are dropped. However, this method allows the treatment and control groups to have health insurance in 2004. The number of observations in the treatment and control group is 720 and 7350, respectively.

[14]As presented in Section 4, ATT_{2006} is the effect of voluntary health insurance. ATT'_{2006_b} and ATT_{2006_b} can be regarded as the effect of buying voluntary health insurance for the first time'. However, for ATT'_{2006_b}, the treatment group did not have any health insurance in 2004, whereas for ATT_{2006_b}, the treatment group could have health insurance (rather than voluntary health insurance) in 2004.

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For estimation of ATT_{2006_b}, the treatment group includes all individuals having voluntary health insurance in 2006 but not in 2004. The control group is those not having any health insurance in 2006. Individuals having voluntary health insurance in 2004 are dropped. However, the treatment and control groups can have other types of health insurance in 2004. The number of observations in the treatment and control group is 685 and 7313, respectively.

For estimation of ATT'_{2006_b}, the treatment group includes only individuals who had voluntary health insurance in 2006 and did not have any health insurance in 2004. The control group is formed from people who did not have any health insurance in both 2004 and 2006. In this case, the number of observations in the treatment and control group is 583 and 6197, respectively.

Table II presents the logit regressions of voluntary health insurance for the estimation of different parameters. The insured and uninsured people are statistically different in several characteristics. As expected, people who have higher income are more likely to have voluntary health insurance. People with health insurance in 2004 tend to have voluntary health insurance in 2006. Being ethnic minorities reduces the probability of having voluntary health insurance. People who were sick during the past 4 weeks and 12 months are more likely to purchase voluntary health insurance. This finding can imply adverse selection. It is interesting that women are more likely to be insured than men. It might be because women are the spouses (relatives) of individuals with compulsory health insurance.[15] Education and occupation have expected sign. Higher education and better occupation tend to increase the probability of having voluntary health insurance. Finally, living in urban areas has a significant positive effect on voluntary health insurance enrollment.

It should be noted that the predicted propensity score is a means to overcome the multidimensionality problem of matching by control variables. The quality of a constructed comparison group should be assessed by testing whether the distribution of characteristic covariates is similar between the comparison and treatment groups given the predicted propensity scores. We test the equality of the mean of covariates between the treatment and comparison using a *t*-test. To examine the sensitivity of the impact estimates in different matching schemes, we use different matching estimators including 1 nearest neighbor, 5 nearest neighbors, kernel matching with different bandwidths (0.01; 0.03 and 0.05).[16] The results show that we cannot reject the equality of the mean of X between the treatment and matched groups for these matching estimators.[17] Reasons for high quality of the matching can be that there is a large common support between the insured and uninsured people, and the number of the uninsured is much higher that the number of the insured.

5.2. Impact estimation

The nearest-neighbor matching and kernel matching methods yield very similar estimates. Because bootstrapping for the nearest-neighbor matching might not provide accurate standard errors (Abadie and Imbens, 2008), we report the estimates from the kernel matching in this paper. We will use the estimates from the kernel matching with bandwidth of 0.01 for interpretation. The estimates from the kernel matching with other bandwidth are similar and presented in Tables AI and AIII in Appendix A.

[15]Among individuals insured by compulsory health insurance in 2004, men account for 53%. It means that women account a larger proportion of spouses of the insured by compulsory health insurance and more likely to have voluntary health insurance.

[16]We relied on the Stata command called "psmatch2" to perform the matching estimators. However, we do not use the original command for the estimation, because the command does not allow sampling weights. We revised the command to allow for sampling weights. We also tried to estimate the health insurance impact without sampling weights. The results are very similar to those using the sampling weights.

[17]Results from balancing tests are not presented, but they can be provided on request.

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Table III. Impact estimates of voluntary health insurance: ATT_{2006}(kernel matching with bandwidth of 0.01)

Annual health utilization and out-of-pocket expenses	2006			2004			
	Treatment	Matched control	Difference	Treatment	Matched control	Difference	Diff-in-diff
Outpatient visits	2.9278***	1.5313***	1.3965***	1.9847***	1.5019***	0.4828*	0.9137***
	[0.2809]	[0.0904]	[0.2887]	[0.2456]	[0.0876]	[0.2561]	[0.2840]
Inpatient visits	0.1875***	0.0845***	0.1030***	0.1417***	0.1164***	0.0253	0.0777**
	[0.0277]	[0.0089]	[0.0298]	[0.0203]	[0.0106]	[0.0224]	[0.0367]
Total visits	3.1153***	1.6169***	1.4984***	2.1264***	1.6177***	0.5087*	0.9897***
	[0.2802]	[0.0921]	[0.2886]	[0.2481]	[0.0901]	[0.2577]	[0.2866]
Out-of-pocket expenses per outpatient visit (thousand VND)	69.40***	78.28***	−8.87	78.00***	59.86***	18.14	−27.01
	[9.15]	[14.49]	[17.20]	[11.15]	[4.30]	[12.10]	[21.00]
Out-of-pocket expenses per inpatient visit (thousand VND)	198.80***	120.53***	56.32*	217.57***	142.62***	74.95	−18.62
	[36.33]	[20.69]	[34.20]	[56.20]	[18.17]	[59.47]	[68.35]
Out-of-pocket expenses per visit (thousand VND)	176.85***	155.08***	21.77	232.02***	147.74***	84.28	−62.51
	[25.97]	[21.31]	[33.63]	[52.21]	[13.31]	[54.47]	[62.08]

*significant at 10%, **significant at 5%, ***significant at 1%.
Figures in brackets are standard errors. Standard errors are corrected for sampling weights and estimated using bootstrap (non-parametric) with 500 replications. Source: Estimation from panel data of VHLSSs 2004 and 2006.

Tables III through V present estimates of different parameters of voluntary health insurance impacts using the difference-in-differences with matching method. The impact estimates are reported in the last column Diff-in-diff'. Table II presents the impact estimates of ATT_{2006}. It shows that the impact of voluntary health insurance on health care utilization is positive and statistically significant. More specifically, voluntary health insurance increases the average annual outpatient visits of the insured by 0.91 to 2.93. It implies that the outpatient visits of the insured would have been 2.02 (2.93 minus 0.91). Thus, the annual outpatient visits increased by around 45% because of voluntary health insurance. Voluntary health insurance also increases the average annual inpatient visits of the insured by 0.077 from 0.111 to 0.188. In other words, the average annual inpatient visits increased by around 70%. As a result, the total annual visits (the sum of outpatient visits and inpatient visits) increased on average by 0.99 (approximately 46%) from 2.13 to 3.12.

Table III shows that the impact estimate of voluntary health insurance on out-of-pocket expenses per outpatient visit as well as per inpatient visit has a negative sign and small magnitude. These estimates are not statistically significant. One of the possible reasons for the insignificant effect of voluntary health insurance on health care expenditures might be that the out-of-pocket expenditures defined in our paper include not only the treatment fees but also all costs related to the treatment such as bonus for doctors, service charge for additional medicine requirements, equipments, and transportation. Health insurance is expected to cover only health care fees and drugs. In addition, out-of-pocket expenditure data might be subject to large measurement errors, which can also increase the standard errors of the estimates.

Table IV presents the impact estimates of ATT_{2006_b}. The point estimates of this parameter tend to be smaller than those of ATT_{2006}. However, these differences are not statistically significant. Similarly, voluntary health insurance has a positive significant effect on health care utilization, both outpatient and inpatient utilization. The effect on out-of-pocket expenses per treatment is negative, but not statistically significant. The findings of similar estimates imply that the impact of voluntary health insurance on those who have been continuing to be insured since the previous period is similar to the impact of voluntary health insurance on those newly insured in the current period.

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Table IV. Impact estimates of voluntary health insurance: ATT_{2006_b} (kernel matching with bandwidth of 0.01)

Annual health utilization and out-of-pocket expenses	2006			2004			Diff-in-diff
	Treatment	Matched control	Difference	Treatment	Matched control	Difference	
Outpatient visits	3.1950***	1.5979***	1.5971***	2.5221***	1.5817***	0.9404**	0.6567**
	[0.3699]	[0.0893]	[0.3729]	[0.4135]	[0.1066]	[0.4010]	[0.3267]
Inpatient visits	0.2020***	0.0877***	0.1143***	0.1473***	0.1228***	0.0244	0.0899***
	[0.0354]	[0.0090]	[0.0366]	[0.0186]	[0.0104]	[0.0204]	[0.0406]
Total visits	3.3970***	1.6869***	1.7102***	2.6694***	1.7036***	0.9658**	0.7444**
	[0.3757]	[0.0906]	[0.3785]	[0.4170]	[0.1078]	[0.4036]	[0.3149]
Out-of-pocket expenses per outpatient visit (thousand VND)	84.42***	99.28***	−14.86	82.51***	64.86***	17.65	−32.52
	[16.18]	[27.41]	[32.96]	[15.24]	[4.89]	[15.56]	[33.90]
Out-of-pocket expenses per inpatient visit (thousand VND)	215.60***	119.91***	95.69***	274.19***	154.95***	119.23	−23.54
	[43.37]	[18.38]	[38.31]	[80.67]	[20.16]	[80.55]	[89.26]
Out-of-pocket expenses per visit (thousand VND)	198.17***	170.55***	27.62	288.02***	163.48***	124.54	−96.92
	[34.21]	[28.74]	[49.34]	[79.52]	[14.85]	[79.34]	[93.68]

*significant at 10%, **significant at 5%, ***significant at 1%.
Figures in brackets are standard errors. Standard errors are corrected for sampling weights and estimated using bootstrap (non-parametric) with 500 replications. Source: Estimation from panel data of VHLSSs 2004 and 2006.

Table V. Impact estimates of voluntary health insurance: ATT'_{2006_b} (kernel matching with bandwidth of 0.01)

Annual health utilization and out-of-pocket expenses	2006			2004			Diff-in-diff
	Treatment	Matched control	Difference	Treatment	Matched control	Difference	
Outpatient visits	3.3042***	1.6619***	1.6423***	2.7046***	1.7416***	0.9630**	0.6793*
	[0.3993]	[0.0907]	[0.4038]	[0.5030]	[0.1414]	[0.4802]	[0.3839]
Inpatient visits	0.1946***	0.0897***	0.1049***	0.1502***	0.1208***	0.0294	0.0756**
	[0.0327]	[0.0098]	[0.0341]	[0.0239]	[0.0142]	[0.0285]	[0.0446]
Total visits	3.4988***	1.7516***	1.7472***	2.8547***	1.8603***	0.9944**	0.7528**
	[0.4016]	[0.0923]	[0.4069]	[0.5066]	[0.1415]	[0.4907]	[0.3359]
Out-of-pocket expenses per outpatient visit (thousand VND)	75.50***	66.92***	8.58	83.93***	66.58***	17.35	−8.77
	[9.03]	[6.63]	[11.06]	[16.80]	[4.64]	[17.01]	[20.73]
Out-of-pocket expenses per inpatient visit (thousand VND)	239.87***	118.63***	89.29**	294.79***	153.53***	141.26	−51.97
	[56.63]	[17.20]	[41.04]	[110.31]	[20.53]	[112.23]	[117.28]
Out-of-pocket expenses per visit (thousand VND)	207.92***	137.42***	70.51*	320.16***	158.29***	161.87	−91.36
	[38.12]	[11.66]	[40.52]	[107.79]	[15.34]	[109.03]	[114.69]

*significant at 10%, **significant at 5%, ***significant at 1%.
Figures in brackets are standard errors. Standard errors are corrected for sampling weights and estimated using bootstrap (non-parametric) with 500 replications. Source: Estimation from panel data of VHLSSs 2004 and 2006.

Table V presents the estimates of ATT'_{2006_b}, which are very similar to the estimates of ATT_{2006_b}. Similar estimates of different parameters mean a common effect of voluntary health insurance in 2006 across people with different health insurance status in 2004. The impact of current voluntary health insurance does not depend on the status as well as the type of health insurance in the previous period.

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5.3. Robustness analysis

In this study, we examined the robustness of the impact estimates of voluntary health insurance from the matching method by several ways. Firstly, we examined different models, which mostly varied in the number of control variables they included in the estimation of the propensity score, and the results were quite similar.[18]

Secondly, we ran individual fixed-effects regressions of health care utilization and out-of-pocket spending per health care visit using panel data of VHLSSs 2004 and 2006. Table AIV in Appendix A shows that people who are insured by voluntary health insurance are more likely to have health care visits and lower inpatient payment for each health care visit.

Thirdly, we assessed the key assumption on time-invariant unobservables, which were imposed by difference-in-differences methods as well as fixed-effects regressions. It might be possible that people who know that their health will deteriorate will have more incentive to get voluntary health insurance. A simple way to investigate this issue is to run fixed-effects regressions of health variables Being sick during the past 12 months' or Being sick during the past 4 weeks'. It shows that the effect of voluntary health insurance is not statistically significant (Table AV in Appendix A).

Finally, we tried to employ instrumental variable regressions. A key challenge is to find a valid instrument for voluntary health insurance, which is correlated with voluntary health insurance but not health care utilization and health expenditure. In this study, we used the proportion of people having voluntary health insurance within a district as an instrument for voluntary health insurance of individuals. For each individual, we calculated the proportion of the voluntarily insured people within the district of residence, excluding the individual itself. It is expected that the proportion of people having voluntary health insurance within a district can reflect the availability of health insurance in districts, but not affect strongly health care utilization of people. The results of instrumental variable regressions are presented in Table AVI in Appendix A. The impact estimates were found to be quite similar to the impact estimates yielded by the matching methods.[19] Voluntary, health insurance helps the insured increase annual health care visits. The effect of voluntary health insurance on out-of-pocket expenses on outpatient and inpatient health care is negative, but not statistically significant.

6. CONCLUSIONS

Health shocks are one of the main reasons for poverty in Vietnam. The government of Vietnam has set up health improvement as a major goal policy. Vietnam has committed to Eight Millennium Development Goals (MDGs), in which there are four MDGs related to health.[20] Accordingly, provision of health insurance can contribute to achievement of these MDGs, and the government has set up an objective with full coverage of health insurance by 2015. Information on impact evaluation of health insurance can be helpful for the government to formulate measures to increase the effectiveness of health insurance. This paper investigates the impact of voluntary health insurance on health care utilization and out-of-pocket spending of the insured using the matching method and panel data from two nationally representative household surveys in 2004 and 2006.

Findings on the impact of voluntary health insurance on health care utilization are similar to those found in Wagstaff and Pradhan (2005) and Wagstaff (2007). The paper shows that voluntary health insurance has a

[18]Because estimates from the matching might be sensitive to different sets of control variables in the estimation of the propensity score, we tried to use different models include small, medium and large models to estimate the propensity score (in terms of the number of explanatory variables). We do not report results from the sensitivity analysis in this paper because of page limitation.

[19]In the instrumental variable regressions, the effect of voluntary health insurance on the number of outpatient and inpatient contacts is 0.8534 and 0.0618, respectively (Table AVI in Appendix A). These are similar to the estimates of health insurance impacts produced by the matching method (Table II).

[20]More specifically, the four goals are as follows: (i) eradicate extreme poverty and hunger; (ii) reduce child mortality; (iii) improve maternal health; and (iv) combat HIV/AIDS, malaria and other diseases.

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positive and statistically significant impact on health care utilization. More specifically, voluntary health insurance helps the insured people increase the average annual outpatient and inpatient visits by around 45% and 70% in 2006, respectively. The effect of voluntary health insurance is very similar for groups who had different health insurance status in 2004. This finding implies that the impact of current voluntary health insurance does not depend on the status of health insurance in the previous period.

However, unlike other studies including Sepehri *et al*. (2006), Jowett *et al*. (2003), Bales *et al*. (2007), and Wagstaff (2009), we do not find significant impacts of voluntary health insurance on out-of-pocket health care expenses. The impact estimates are negative but not statistically significant. One reason might be that the out-of-pocket expenses defined in this paper include not only treatment fees but also all costs related to health treatment, and health insurance covers only health care fees and drugs. In addition, out-of-pocket expenditure data might be subject to large measurement errors, which can also increase the standard errors of the estimates.

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APPENDIX A

Table AI. Impact estimates of voluntary health insurance using method 1 (ATT_{2006})

Annual health utilization and out-of-pocket expenses	2006			2004			Diff-in-diff
	Treatment	Matched control	Difference	Treatment	Matched control	Difference	
Kernel matching with bandwidth of 0.03							
Outpatient visits	2.9278***	1.5260***	1.4018	1.9847***	1.5112***	0.4736	0.9282***
	[0.2809]	[0.0872]	[0.2900]	[0.2456]	[0.0964]	[0.2544]	[0.2809]
Inpatient visits	0.1875***	0.0831***	0.1044***	0.1417***	0.1146***	0.0271	0.0773**
	[0.0277]	[0.0080]	[0.0293]	[0.0203]	[0.0097]	[0.0222]	[0.0364]
Total visits	3.1153***	1.6103***	1.5050***	2.1264***	1.6251***	0.5013*	1.0037***
	[0.2802]	[0.0881]	[0.2899]	[0.2481]	[0.0979]	[0.2559]	[0.2834]
Out-of-pocket expenses per outpatient visit (thousand VND)	69.40***	85.79***	−16.39	78.00***	60.56***	17.44	−33.83
	[9.15]	[16.95]	[19.20]	[11.15]	[3.93]	[11.95]	[22.47]
Out-of-pocket expenses per inpatient visit (thousand VND)	198.80***	115.17***	61.68*	217.57***	143.37***	74.20	−12.52
	[36.33]	[16.76]	[32.93]	[56.20]	[19.31]	[60.85]	[67.96]
Out-of-pocket expenses per visit (thousand VND)	176.85***	156.54***	20.31	232.02***	151.18***	80.84	−60.52
	[25.97]	[19.69]	[33.58]	[52.21]	[13.96]	[55.03]	[61.97]
Kernel matching with bandwidth of 0.05							
Outpatient visits	2.9278***	1.5000***	1.4277***	1.9847***	1.4764***	0.5084**	0.9194***
	[0.3135]	[0.0818]	[0.3234]	[0.2356]	[0.0864]	[0.2359]	[0.3206]
Inpatient visits	0.1875***	0.0818***	0.1057***	0.1417***	0.1120***	0.0297	0.0760**
	[0.0258]	[0.0071]	[0.0272]	[0.0181]	[0.0092]	[0.0196]	[0.0343]
Total visits	3.1153***	1.5831***	1.5322***	2.1264***	1.5877***	0.5387**	0.9935***
	[0.3147]	[0.0832]	[0.3252]	[0.2384]	[0.0867]	[0.2395]	[0.3254]
Out-of-pocket expenses per outpatient visit (thousand VND)	69.40***	83.02***	−13.62	78.00***	59.03***	18.97	−32.59
	[10.59]	[14.66]	[18.23]	[11.68]	[3.85]	[12.12]	[21.70]
Out-of-pocket expenses per inpatient visit (thousand VND)	198.80***	114.87***	61.98	217.57***	141.49***	76.08	−14.11
	[37.40]	[15.98]	[31.78]	[50.29]	[18.20]	[52.91]	[60.27]
Out-of-pocket expenses per visit (thousand VND)	176.85***	153.71***	23.14	232.02***	149.01***	83.01*	−59.87
	[26.27]	[17.78]	[34.29]	[47.92]	[13.26]	[49.42]	[61.42]

*significant at 10%, **significant at 5%; ***significant at 1%.

Figures in brackets are standard errors. Standard errors are corrected for sampling weights and estimated using bootstrap (non-parametric) with 500 replications. Source: Estimation from panel data of VHLSSs 2004 and 2006.

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Table AII. Impact estimates of voluntary health insurance using method 2 (ATT_{2006_b})

Annual health utilization and out-of-pocket expenses	2006			2004			Diff-in-diff
	Treatment	Matched control	Difference	Treatment	Matched control	Difference	
Kernel matching with bandwidth of 0.03							
Outpatient visits	3.1950***	1.5744***	1.6207***	2.5221***	1.5684***	0.9537**	0.6670**
	[0.3699]	[0.0847]	[0.3766]	[0.4135]	[0.1019]	[0.3971]	[0.3268]
Inpatient visits	0.2020***	0.0877***	0.1143***	0.1473***	0.1197***	0.0276	0.0867***
	[0.0354]	[0.0085]	[0.0368]	[0.0186]	[0.0099]	[0.0207]	[0.0411]
Total visits	3.3970***	1.6634***	1.7336***	2.6694***	1.6871***	0.9823**	0.7513***
	[0.3757]	[0.0859]	[0.3819]	[0.4170]	[0.1035]	[0.4009]	[0.3670]
Out-of-pocket expenses per outpatient visit (thousand VND)	84.42***	96.31***	−11.89	82.51***	63.45***	19.06	−30.95
	[16.18]	[25.28]	[30.79]	[15.24]	[4.55]	[15.38]	[31.64]
Out-of-pocket expenses per inpatient visit (thousand VND)	215.60***	120.42***	77.75**	274.19***	147.42***	126.77	−49.02
	[43.37]	[17.72]	[37.47]	[80.67]	[16.84]	[80.62]	[88.90]
Out-of-pocket expenses per visit (thousand VND)	198.17***	169.50***	28.67	288.02***	156.85***	131.17	−102.50
	[34.21]	[27.28]	[47.05]	[79.52]	[13.44]	[79.58]	[93.46]
Kernel matching with bandwidth of 0.05							
Outpatient visits	3.1950***	1.5494***	1.6456***	2.5221***	1.5271***	0.9951***	0.6505*
	[0.3699]	[0.0819]	[0.3758]	[0.4135]	[0.0979]	[0.4011]	[0.3895]
Inpatient visits	0.2020***	0.0862***	0.1158***	0.1473***	0.1160***	0.0313	0.0846
	[0.0354]	[0.0079]	[0.0367]	[0.0186]	[0.0091]	[0.0204]	[0.0409]**
Total visits	3.3970***	1.6368***	1.7602***	2.6694***	1.6420***	1.0273***	0.7329*
	[0.3757]	[0.0830]	[0.3813]	[0.4170]	[0.0996]	[0.4049]	[0.3999]
Out-of-pocket expenses per outpatient visit (thousand VND)	84.42***	88.86***	−4.44	82.51***	61.56***	20.95	−25.39
	[16.18]	[20.00]	[26.37]	[15.24]	[4.22]	[15.39]	[27.87]
Out-of-pocket expenses per inpatient visit (thousand VND)	215.60***	119.73***	78.44**	274.19***	145.93***	128.26	−49.81
	[43.37]	[17.16]	[37.38]	[80.67]	[16.87]	[80.70]	[89.11]
Out-of-pocket expenses per visit (thousand VND)	198.17***	161.40***	36.77	288.02***	153.85***	134.17*	−97.40
	[34.21]	[22.80]	[43.82]	[79.52]	[13.50]	[79.59]	[91.00]

*significant at 10%, **significant at 5%, ***significant at 1%.

Figures in brackets are standard errors. Standard errors are corrected for sampling weights and estimated using bootstrap (non-parametric) with 500 replications. Source: Estimation from panel data of VHLSSs 2004 and 2006.

Table AIII. Impact estimates of voluntary health insurance using method 2 (ATT'_{2006_b})

Annual health utilization and out-of-pocket expenses	2006			2004			Diff-in-diff
	Treatment	Matched control	Difference	Treatment	Matched control	Difference	
Kernel matching with bandwidth of 0.03							
Outpatient visits	3.3042***	1.6618***	1.6423***	2.7046***	1.6924***	1.0122**	0.6301**
	[0.3993]	[0.0893]	[0.4025]	[0.5030]	[0.1310]	[0.4993]	[0.3178]
Inpatient visits	0.1946***	0.0879***	0.1068***	0.1502***	0.1189***	0.0313	0.0755*
	[0.0327]	[0.0093]	[0.0340]	[0.0239]	[0.0120]	[0.0254]	[0.0439]
Total visits	3.4988***	1.7497***	1.7491***	2.8547***	1.8091***	1.0457**	0.7034**
	[0.4016]	[0.0912]	[0.4064]	[0.5066]	[0.1324]	[0.4813]	[0.3502]
Out-of-pocket expenses per outpatient visit (thousand VND)	75.50***	69.92***	5.58	83.93***	67.53***	16.40	−10.83
	[9.03]	[7.33]	[11.38]	[16.80]	[5.01]	[17.07]	[20.77]
Out-of-pocket expenses per inpatient visit (thousand VND)	239.87***	119.48***	88.44**	294.79***	156.55***	138.24	−49.80
	[56.63]	[17.02]	[41.03]	[110.31]	[20.76]	[113.10]	[118.13]
Out-of-pocket expenses per visit (thousand VND)	207.92***	139.77***	68.16	320.16***	163.35***	156.81	−88.66
	[38.12]	[11.74]	[40.93]	[107.79]	[16.47]	[109.67]	[115.24]

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Table AIII. *Continued.*

Annual health utilization and out-of-pocket expenses	2006			2004			Diff-in-diff
	Treatment	Matched control	Difference	Treatment	Matched control	Difference	
Kernel matching with bandwidth of 0.05							
Outpatient visits	3.3042***	1.6270***	1.6771***	2.7046***	1.6372***	1.0674**	0.6098*
	[0.3822]	[0.0919]	[0.3841]	[0.4506]	[0.1122]	[0.4398]	[0.3595]
Inpatient visits	0.1946***	0.0860***	0.1087***	0.1502***	0.1152***	0.0350	0.0736*
	[0.0302]	[0.0082]	[0.0305]	[0.0232]	[0.0120]	[0.0264]	[0.0425]
Total visits	3.4988***	1.7130***	1.7858***	2.8547***	1.7503***	1.1044**	0.6814**
	[0.3773]	[0.0943]	[0.3807]	[0.4572]	[0.1141]	[0.4457]	[0.3305]
Out-of-pocket expenses per outpatient visit (thousand VND)	75.50***	69.27***	6.22	83.93***	65.58***	18.35	−12.12
	[9.16]	[6.88]	[10.38]	[19.40]	[4.92]	[19.37]	[22.01]
Out-of-pocket expenses per inpatient visit (thousand VND)	239.87***	118.23***	89.70**	294.79***	155.80***	138.99	−49.29
	[50.67]	[16.88]	[40.37]	[110.34]	[23.32]	[111.83]	[115.49]
Out-of-pocket expenses per visit (thousand VND)	207.92***	138.39***	69.54*	320.16***	161.00***	159.16	−89.62
	[36.99]	[12.08]	[37.47]	[107.79]	[17.09]	[107.61]	[111.02]

*significant at 10%, **significant at 5%, ***significant at 1%.
Figures in brackets are standard errors. Standard errors are corrected for sampling weights and estimated using bootstrap (non-parametric) with 500 replications. Source: Estimation from panel data of VHLSSs 2004 and 2006.

Table AIV. Fixed-effects regressions of the number of annual visits and out-of-pocket expenses per visit

Explanatory variables	Outpatient visits		Inpatient visits	
	The number of annual visits	Out-of-pocket expenses per visit	The number of annual visits	Out-of-pocket expenses per visit
Have voluntary health insurance (yes = 1)	0.5267***	−19.12*	0.0622***	−38.79
	[0.1237]	[9.95]	[0.0224]	[41.39]
Have other health insurance types (yes = 1)	0.0100	−14.08***	0.0177*	−13.82
	[0.0578]	[4.65]	[0.0105]	[19.35]
Having relatives covered by compulsory health insurance	0.1422	1.54	0.0426	−3.98
	[0.1586]	[12.76]	[0.0288]	[53.07]
Being sick during the past 4 weeks	2.3494***	7.54	0.1938***	14.03
	[0.0654]	[6.19]	[0.0119]	[22.30]
Being sick during the past 12 months	1.3344***	4.38	0.1743***	6.90
	[0.0486]	[4.86]	[0.0088]	[16.74]
Per capita income (million VND)	0.0021	0.03	−0.0008	6.68***
	[0.0046]	[0.37]	[0.0008]	[1.52]
Household size	−0.0187	1.63	0.0109**	2.85
	[0.0261]	[2.10]	[0.0047]	[8.73]
Have used inpatient service (yes = 1)		114.55***		
		[4.90]		
Have used outpatient service (yes = 1)				1,367.30***
				[28.11]
Year 2006 (yes = 1)	−0.0306	0.63	−0.0320***	−13.26
	[0.0300]	[2.42]	[0.0054]	[10.05]
Constant	0.3734***	−2.46	−0.0429	−49.74
	[0.1438]	[11.58]	[0.0261]	[48.12]
Observations	33370	33370	33370	33370
Number of households	16685	16685	16685	16685
R-squared	0.09	0.06	0.03	0.13

*significant at 10%, **significant at 5%, ***significant at 1%. Standard errors in brackets. Source: Estimation from panel data of VHLSSs 2004 and 2006.

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Table AV. Fixed-effects logit regressions of health status

	Being sick during the past 4 weeks	Being sick during the past 12 months
Have other health insurance types (yes = 1)	0.3338	−0.3982
	[0.2459]	[0.3104]
Per capita income (million VND)	−0.0004	0.0012
	[0.0067]	[0.0040]
Household size	0.0651*	−0.0876***
	[0.0339]	[0.0252]
Year 2006 (yes = 1)	0.6940***	0.2617***
	[0.0401]	[0.0280]
Observations	6856	12188
Number of households	3428	6094

*significant at 10%, **significant at 5%, ***significant at 1%. Standard errors in brackets. Source: Estimation from panel data of VHLSSs 2004 and 2006.

Table AVI. OLS and IV regressions of the number of annual visits and out-of-pocket expenses per visit in 2006

	Outpatient visits				Inpatient visits			
Explanatory variables	The number of annual visits: OLS	The number of annual visits: IV	Out-of-pocket expenses per visit: OLS	Out-of-pocket expenses per visit: IV	The number of annual visits: OLS	The number of annual visits: IV	Out-of-pocket expenses per visit: OLS	Out-of-pocket expenses per visit: IV
Have voluntary health insurance (yes = 1)	0.9073***	0.8534*	−7.18	−90.55	0.0952***	0.0618*	−3.75	−75.15
	[0.0804]	[0.4572]	[8.05]	[66.03]	[0.0111]	[0.0333]	[20.85]	[118.41]
Have other health insurance types (yes = 1)	0.2701***	0.2657***	−27.18***	−35.98***	0.0366***	0.0339***	−66.92***	−72.69***
	[0.0376]	[0.0521]	[3.77]	[5.29]	[0.0052]	[0.0072]	[9.76]	[13.56]
Having relatives covered by compulsory health insurance	−0.0103	−0.0090	2.65	5.29	−0.0088	−0.008	−9.65	−7.89
	[0.0423]	[0.0437]	[4.22]	[4.37]	[0.0058]	[0.0060]	[10.95]	[11.32]
Age	0.0189***	0.0189***	0.53***	0.62***	0.0021***	0.0022***	0.10	0.15
	[0.0009]	[0.0010]	[0.09]	[0.10]	[0.0001]	[0.0001]	[0.23]	[0.25]
Gender (Male = 1; Female = 0)	0.0871***	0.0878***	−3.71	−2.32	−0.0027	−0.0022	−17.66**	−16.68**
	[0.0309]	[0.0315]	[3.08]	[3.15]	[0.0043]	[0.0044]	[7.99]	[8.15]
Ethnic minority (Ethnic minority = 1; Kinh/Chinese = 0)	−0.1848***	−0.1850***	−1.77	−2.09	0.0138*	0.0137*	−16.81	−17.06
	[0.0529]	[0.0529]	[5.28]	[5.29]	[0.0073]	[0.0073]	[13.69]	[13.69]
Being sick during the past 4 weeks	2.8764***	2.8780***	5.19	6.35	0.1980***	0.1990***	−10.39	−8.58
	[0.0431]	[0.0452]	[5.18]	[5.21]	[0.0060]	[0.0062]	[11.37]	[11.75]
Being sick during the past 12 months	1.3373***	1.3380***	−6.01	−6.33	0.1321***	0.1325***	10.59	11.21
	[0.0352]	[0.0356]	[4.21]	[4.22]	[0.0049]	[0.0049]	[9.28]	[9.33]
Per capita income (million VND)	−0.0004	−0.0004	1.75***	1.84***	0.0003	0.0004	2.91***	2.96***
	[0.0022]	[0.0022]	[0.22]	[0.22]	[0.0003]	[0.0003]	[0.57]	[0.58]
Household size	−0.0610***	−0.0610***	0.46	0.46	−0.0001	−0.0001	0.93	0.91
	[0.0090]	[0.0090]	[0.90]	[0.90]	[0.0012]	[0.0012]	[2.33]	[2.33]
Not complete primary school	Omitted							
Completed primary school	−0.1558***	−0.1560***	18.23***	18.00***	−0.0015	−0.0016	9.37	9.16
	[0.0410]	[0.0410]	[4.10]	[4.11]	[0.0057]	[0.0057]	[10.62]	[10.62]

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Table AVI. *Continued.*

Explanatory variables	Outpatient visits				Inpatient visits			
	The number of annual visits: OLS	The number of annual visits: IV	Out-of-pocket expenses per visit: OLS	Out-of-pocket expenses per visit: IV	The number of annual visits: OLS	The number of annual visits: IV	Out-of-pocket expenses per visit: OLS	Out-of-pocket expenses per visit: IV
Completed lower-secondary school	−0.1932***	−0.1931***	16.05***	16.47***	−0.0005	−0.0004	11.09	11.30
	[0.0456]	[0.0456]	[4.56]	[4.57]	[0.0063]	[0.0063]	[11.81]	[11.82]
Completed upper secondary school	−0.2364***	−0.2361***	12.96**	13.69**	0.0008	0.001	−10.04	−9.64
	[0.0615]	[0.0615]	[6.15]	[6.16]	[0.0085]	[0.0085]	[15.92]	[15.93]
Completed technical degree	−0.0108	−0.0105	10.99	11.59	0.0118	0.012	19.90	20.28
	[0.0758]	[0.0758]	[7.57]	[7.59]	[0.0105]	[0.0105]	[19.63]	[19.64]
Completed college/university	0.0125	0.0115	−0.20	−2.13	0.0174	0.0168	−30.30	−31.65
	[0.1195]	[0.1197]	[11.93]	[11.98]	[0.0165]	[0.0166]	[30.94]	[31.01]
Leaders/Managers	Omitted							
Professionals/Technicians	0.1451	0.1437	17.6	14.88	0.0332	0.0324	60.98	59.11
	[0.1832]	[0.1835]	[18.30]	[18.37]	[0.0254]	[0.0254]	[47.45]	[47.53]
Clerks/Service Workers	0.1425	0.1421	64.57***	63.85***	0.0223	0.022	79.80*	79.25*
	[0.1856]	[0.1855]	[18.54]	[18.57]	[0.0257]	[0.0257]	[48.06]	[48.06]
Agriculture/Forestry/Fishery	0.1802	0.1787	9.33	6.32	0.0338	0.0328	−1.02	−3.07
	[0.1664]	[0.1668]	[16.62]	[16.70]	[0.0230]	[0.0231]	[43.09]	[43.21]
Skilled Workers/Machine Operators	0.1081	0.1069	11.01	8.77	0.034	0.0333	28.66	27.07
	[0.1722]	[0.1724]	[17.20]	[17.26]	[0.0238]	[0.0239]	[44.59]	[44.65]
Unskilled Workers	0.1963	0.1952	13.05	10.96	0.0283	0.0276	27.49	26.04
	[0.1699]	[0.1701]	[16.97]	[17.03]	[0.0235]	[0.0235]	[44.00]	[44.05]
Not working	0.4723***	0.4713***	28.25*	26.44	0.0798***	0.0793***	27.22	25.91
	[0.1662]	[0.1663]	[16.60]	[16.65]	[0.0230]	[0.0230]	[43.05]	[43.09]
Household in Red River Delta	Omitted							
Household in North East	−0.1356**	−0.1348**	−6.53	−4.75	0.0069	0.0074	6.90	7.98
	[0.0584]	[0.0588]	[5.83]	[5.89]	[0.0081]	[0.0081]	[15.12]	[15.22]
Household in North West	0.0179	0.0197	0.39	3.93	0.0288**	0.0298**	−4.14	−1.88
	[0.0850]	[0.0862]	[8.49]	[8.64]	[0.0118]	[0.0119]	[22.02]	[22.32]
Household in North Central Coast	−0.0999*	−0.0988*	−2.43	−0.25	0.0111	0.0117	10.92	12.29
	[0.0581]	[0.0587]	[5.80]	[5.88]	[0.0080]	[0.0081]	[15.04]	[15.20]
Household in South Central Coast	0.2821***	0.2835***	−14.09**	−11.38*	0.0216**	0.0225***	6.47	8.33
	[0.0615]	[0.0627]	[6.15]	[6.27]	[0.0085]	[0.0087]	[15.94]	[16.22]
Household in Central Highlands	0.2228***	0.2229***	−0.15	0.05	−0.0009	−0.0008	−19.15	−18.97
	[0.0697]	[0.0697]	[6.97]	[6.98]	[0.0096]	[0.0096]	[18.06]	[18.05]
Household in South East	0.6042***	0.6044***	−10.38*	−10.08*	−0.0280***	−0.0280***	9.14	9.38
	[0.0567]	[0.0567]	[5.67]	[5.68]	[0.0078]	[0.0078]	[14.70]	[14.70]
Household in Mekong River Delta	0.9588***	0.9594***	−24.53***	−23.59***	−0.0092	−0.0089	−6.56	−5.82
	[0.0508]	[0.0510]	[5.08]	[5.11]	[0.0070]	[0.0071]	[13.16]	[13.22]
Household in urban areas (yes = 1)	0.0797**	0.0791*	−8.62**	−9.96**	0.0005	0.0001	1.65	0.83
	[0.0401]	[0.0404]	[4.00]	[4.05]	[0.0055]	[0.0056]	[10.37]	[10.46]
Have used inpatient service (yes = 1)			122.20***	125.25***				
			[4.25]	[4.45]				
Have used outpatient service (yes = 1)							1,340.50***	1,342.91***
							[16.10]	[16.57]
Constant	−0.9244***	−0.9220***	−17.42	−12.3	−0.1293***	−0.1278***	6.68	10.12
	[0.2075]	[0.2084]	[20.73]	[20.88]	[0.0287]	[0.0288]	[53.75]	[54.03]
Observations	39063	39063	39063	39063	39063	39063	39063	39063
R-squared	0.18		0.05		0.06		0.16	

*significant at 10%, **significant at 5%,***significant at 1%. OLS, ordinary least squares; IV, instrumental variable; Standard errors in brackets Source: Estimation from panel data of VHLSSs 2004 and 2006.

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