Centre Emile Bernheim
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Medical insurance and expenditure thresholds for Vietnamese patient satisfaction with healthcare services

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This short communication report some new results obtained from a medical survey among 900 Vietnamese patients. Both income and medical expenditure have positive influence to improving patient satisfaction. But insurance reimbursement rate has negative influence. Patients with residency status are more demanding than those without. The more seriously ill, the less patients find the health services to be satisfactory. The probability of satisfaction conditional on insurance reimbursement is lower for patients with residency status, and higher for those without. There exist thresholds of income, expenditures and insurance reimbursement rate, surpassing which probabilistic trends switch. The expenditure threshold for resident patients is almost three times that for non-residents. The computed “insurance threshold” exists only within the group of non-resident patients, ~65%, suggesting that getting a reimbursement rate higher than this can be very difficult. Therefore, the government's ambitious goal of universal coverage may be both unrealistic and too rigid as patients with different conditions show different perceptions toward healthcare services.

Keywords: Health insurance; threshold; medical expenditures; healthcare policy; Vietnam

JEL Classifications: I13, I18

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Abstract: This short communication report some new results obtained from a medical survey among 900 Vietnamese patients. Both income and medical expenditure have positive influence to improving patient satisfaction. But insurance reimbursement rate has negative influence. Patients with residency status are more demanding than those without. The more seriously ill, the less patients find the health services to be satisfactory. The probability of satisfaction conditional on insurance reimbursement is lower for patients with residency status, and higher for those without. There exist thresholds of income, expenditures and insurance reimbursement rate, surpassing which probabilistic trends switch. The expenditure threshold for resident patients is almost three times that for non-residents. The computed "insurance threshold" exists only within the group of non-resident patients, ~65%, suggesting that getting a reimbursement rate higher than this can be very difficult. Therefore, the government's ambitious goal of universal coverage may be both unrealistic and too rigid as patients with different conditions show different perceptions toward healthcare services.

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Introduction

As a transitional economy, Vietnam's healthcare system has faced numerous challenges (1) of which providing patients with feasible financing options for medical treatments is one of the most thorny issues. Health insurance is one such option (2-3). The Vietnamese National Assembly passed an amended Law of Health Insurance in 2014, which has been effective since January 2016, stipulating a new set of regulations supposed to reduce poverty risks among local patients by improving health insurance coverage (4).

Although the idea has been welcomed by the populace, it remains to be seen if actual implementation will meet the public expectation because medical expenditures have increasingly been a problem for a large group of patients (5-6) while an effective market design for reducing healthcare costs has still been absent (7-9).

In reality, poor people in both urban and rural areas tend show a low willingness pay for health insurance (10). Unfortunately this has been one of the main reasons for the risk of destitution among poor patients to significantly increase, causing numerous households to struggle with health shocks, especially in the rural and remote areas (11-12).

Although many scholars advocate the idea that there are possible ways for low-income countries, such as Vietnam, to escape the medical poverty trap (13), the delivery and financing of healthcare services appear to have been more problematic and complicated than most think about (14-15). The situation is in part due to the complication in encouraging health insurance in informal sectors, which are omnipresent in the economy(16), and universal coverage of social health insurance proved to be an elusive target (17).

Despite these issues, there has been lack of understanding about how such factors as residency status, degree of illness, income, insurance and health costs affect patient assessment about healthcare services. This short communication introduces new results obtained from a medical survey in Vietnam in 2015, addressing specific research questions as stated below.

Research questions (RQ)

RQ1. Does there exist any empirical relation between such factors as residency status, degree of illness, income, total medical expenditures, actual health insurance coverage and patient satisfaction with healthcare services deliveries.

RQ2. Do there exist some thresholds of income, expenditures and insurance coverage at which trends of patient satisfaction with healthcare services start changing?

The answers to these questions would enhance our understanding and provide evidence for policy-makers in devising policy changes in the future.

Materials and Methods

Materials / data

The dataset contains 900 records randomly collected from a medical survey on Vietnamese patients conducted in five different provinces in Northern Vietnam–including major cities as Hanoi, Hai Phong, Quang Ninh–from August 2014 to June 2015. The survey team approached patients without prior knowledge if they actually held a health insurance policy. The questionnaire asks for such key information as their actual medical expenditures, (in)eligibility for insurance coverage, perceived dis/satisfaction about health insurance service, as well as some other such as income, and residency status.

The subset containing data from 605 insured patients is used for analysis, of whom 333 are female and 272 male. Patients' age spans from 1 to 92, with a majority of 67% belonging to the 40-70 age bracket.

Patient satisfaction is a dichotomous response variable ("SatServ"), receiving value of "satis" or "unsat".

Predictor variables that influence the probability of "SatServ" to take one of the two above values are as follows.

(i) Residency status ("Res"), with value "yes" if a patient comes from the same region where the healthcare unit is located, and "no" if different;

(ii) Degree of illness ("Ill") has three categories; "emerg" (hospitalized with an emergency); "bad" (seriously ill), or "light" (moderately or mildly ill);
(iii) Annual income of a patient ("Income"), in millions of Vietnamese Dong (exchange: VND 1 million=US$47);
(iv) Actual treatment expenditures ("Spent"), in millions of Vietnamese Dong;
(v) Actual insurance reimbursement as percentage of total expenditure ("Pins").

The contingency table for this dataset is given in Table 1.

Table 1. The dataset for analysis

Factor	Category	Obs.	Percentage
"SatServ"	"satis"	206	34.05
	"unsat"	399	65.95
"Res"	"yes"	404	66.78
	"no"	201	33.22
"Ill"	"emerg"	112	18.51
	"bad"	365	60.33
	"light"	128	21.16

About 66% find the health services to be unsatisfactory. The portion of patients surveyed with a residency is 67%. Approximately 80% of patients report their health status as with an emergency or seriously ill (477/605).

Three continuous variables used in the analysis are given in Table 2.

Table 2. Additional continuous variables

Variable	Max	Min	Mean	SD
"Income"	550.00	0.00	42.33	42.65
"Spent"	425.00	1.97	25.42	36.86
"Pins"	0.90	0.00	0.58	0.23

Methods

The subsequent analysis employs logistic regression, having the specification of Eq.1:

$$\ln\left(\frac{\pi(x)}{1-\pi(x)}\right) = \text{logit}(\pi) = \beta_0 + \beta_i X_i^K, i = 1, \dots, K \qquad \text{Eq. (1)}$$

In Eq.1, $\pi(x)$ represents the success probability, i.e. $Y_i = 1$; Y_i is the event we want to observe from the empirical data; β_0 is the intercept; and $\beta_i$coefficients associated with the i^{th} predictor variable, X_i. $\pi(x)$ is given by: $\pi(x) = \frac{e^{(\beta_0+\beta_1 X_1+\cdots+\beta_K X_K)}}{1+e^{(\beta_0+\beta_1 X_1+\cdots+\beta_K X_K)}}$. The standard null hypothesis is $\beta_0 = 0$, for each $i = 1, \dots, K$. In the case of X_i being a continuous variabe, if $\beta_i > 0$ then an increase of X_i will result in the increase of $\pi(x)$. The reverse is true when $\beta_i < 0$. Therefore, when X_i increase by 1 unit, the odds of Y increase by exp (β_i). The likelihood ratio test statistic is employed for hypothesis testing using:

$$G^2 = -2\ln\left(\frac{l_0}{l_1}\right) = -2(L_0 - L_1)$$

where l_0 is the numerical value of the likelihood function computed from the observed data using under the null hypothesis estimate (π) and l_1 under the empirical data-based estimate $(\hat{\pi})$. This G^2 test statistic follows a X^2distribution with K degrees of freedom (df). Actual estimations and technical treatments for the analysis are provided in (18-20).

Results

Result for RQ1:

The result is provided in Table 3, yielding a set of relations between the response variable "SatServ" and predictor variables "Income", "Spent", "Pins", "Res", and "Ill".

Table 3. Estimation results for RQ1

	Intercept	"Income"	"Spent"	"Pins"	"Res"	"Ill"	
					"yes"	"emerg"	"light"
	β_0	β_1	β_2	β_3	β_4	β_5	β_6
logit(satis|unsat)	0.172 [0.397]	0.017*** [3.906]	0.027*** [4.871]	-2.658*** [-4.797]	-1.521*** [-5.237]	-0.225 [-0.686]	0.604* [2.069]
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1, z-value in square brackets; baseline category for: "Res": "no"; "Ill": "bad". Residual deviance: 497.57 on 598 degrees of freedom.							

Most coefficients are highly significant, indicating plausible relations between variables in consideration. From these results, empirical probabilities for patient satisfaction conditional on values of predictor variables can be computed. For instance, for a patient with residency status, with annual income of VND 100 million (US$4,700), being seriously ill, paying VND 40 million for treatment expenditures, and with insurance coverage of 50%, the probability that patient finds the services to be satisfactory is 52.5%, computed as follows:

$$\pi_{satis} = \frac{\mathrm{e}^{(0.172+0.017\times100+0.027\times40-2.658\times0.5-1.521)}}{1+\mathrm{e}^{(0.172+0.017\times100+0.027\times40-2.658\times0.5-1.521)}} = 0.525.$$

Result for RQ2:

This set provides estimations for "SatServ" and predictor variables "Res", "Ill" and one of the three continuous variables "Income", "Spent", "Pins", for each result as reported in Table 4.

Table 4. Three estimation results for RQ2

	Intercept	"Income"	"Res"	"Ill"	
			"yes"	"emerg"	"light"
	β_0	β_1	β_2	β_3	β_4
logit(satis|unsat)	0.143 [0.687]	0.021*** [4.739]	-2.862*** [-12.146]	-0.233 [-0.800]	0.556* [2.018]
Estimation 4(a)					
	Intercept	"Spent"	"Res"	"Ill"	
			"yes"	"emerg"	"light"
	β_0	β_1	β_2	β_3	β_4
logit(satis|unsat)	-0.643* [-2.274]	0.030*** [5.632]	-1.690*** [-6.645]	-0.475 [-1.515]	1.257*** [4.879]
Estimation 4(b)					
	Intercept	"Pins"	"Res"	"Ill"	
			"yes"	"emerg"	"light"
	β_0	β_1	β_2	β_3	β_4
logit(satis|unsat)	2.190*** [6.986]	-3.057*** [-5.925]	-2.073*** [-9.156]	-0.199 [-0.671]	0.550*** [2.055]
Estimation 4(c)					

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1, z-value in square brackets; baseline category for: "Res": "no"; "Ill": "bad". Residual deviance: 556.741 on 600 degrees of freedom.

Table 4 enables the computing of "thresholds" and an example follows. Subtable 4(a) has a functional form of Eq.(RQ2.1):

$$\ln\left(\frac{\pi_{satis}}{\pi_{unsat}}\right) = 0.143 + 0.021 \times Income - 2.862 \times yesRes - 0.233 \times EmergIll + 0.556 \times LightIll \quad \text{Eq. (RQ2.1)}$$

Thus, a probability of patient satisfaction conditional upon "Res", "Ill", and "Income" is:

$$\pi_{satis} = \frac{e^{(0.143+0.021\times Income-2.862\times yesRes-0.233\times EmergIll+0.556\times LightIll)}}{1+e^{(0.143+0.021\times Income-2.862\times yesRes-0.233\times EmergIll+0.556\times LightIll)}}$$

For each value of "Res", "Ill" we can attempt to determine numerical value of "threshold income". For instance, for "Res"="yes"; "Ill"="emerg", then:

$$\pi_{satis} = \frac{e^{(-2.952+0.021\times Income)}}{1+e^{(-2.952+0.021\times Income)}}$$

In our definition, "threshold income" is the level of income at which $\pi_{satis} = 50\%$; thus the computed "threshold income" in this situation is VND 140.6 million (US$6,600). In the same vein, income threshold for "Res"="no" ("Ill" remains "emerg") is VND 4.29 million. These two thresholds are presented in Fig.1.

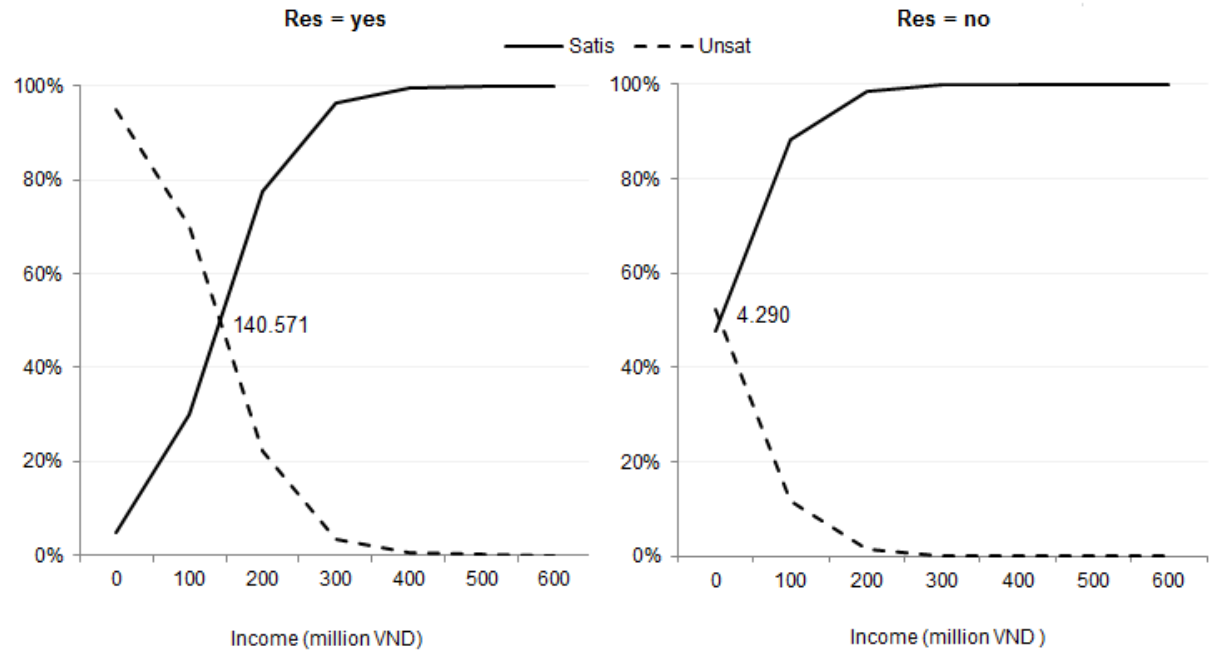

Figure 1. Probabilities of patient dis/satisfaction for patients with emergency, conditional on income

In the same vein, many more thresholds for different conditions can be computed and the changing patterns of conditional probabilities of dis/satisfaction can be observed.

Discussion

Generally speaking the empirical results indicate that both income and actual expenditure have positive influence to improving patient satisfaction. However, it is noteworthy that the influence of insurance reimbursement rate is negative β_3= -2.658 ($p<0.0001$). A possible explanation is that the time and effort or even money (as corruption is not uncommon at hospitals) may make most patients think: "It is not worth spending the time and making effort to have a unit of increase in insurance benefits". Furthermore, it is more difficult to satisfy patients coming from the same region as the healthcare unit; β_4= -1.521 ($p<0.0001$). Finally, as $\beta_5<0$ and $\beta_6>0$, the more seriously ill, the less patients find the health services to be satisfactory.

The next implication is about some of the thresholds. Our computations show that the probability of satisfaction conditional on insurance reimbursement is lower for patients with residency status, in the range of 4.1% to 66%; but for patients without residency ("Res"="no") from 25.6% to 93.9%.

For "expenditure threshold" in Fig.2 the threshold jumps from VND 37.3 million (US$1,750) for non-resident patients to VND 93.6 million (US$4,400).

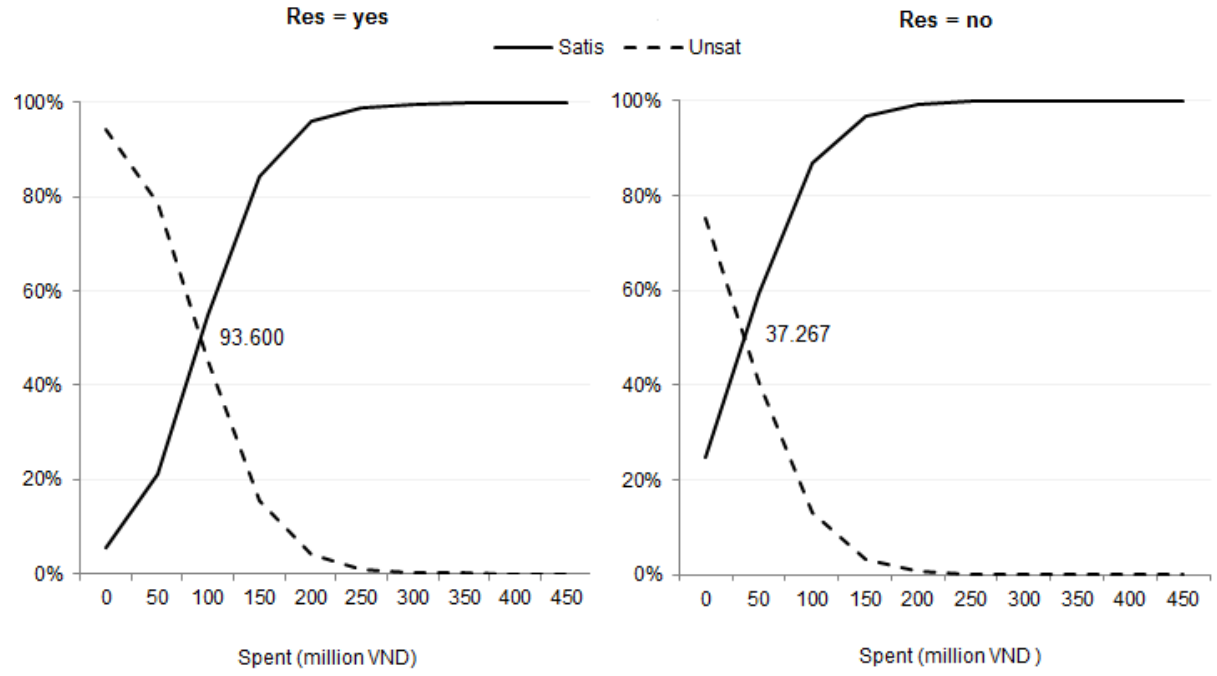

Figure 2. Probabilities of patient dis/satisfaction for patients with emergency, conditional on medical expenditure

Fig.3 suggests that "insurance threshold" only exists among non-resident patients, ~65%. This insight is counter-intuitive as most believe that the higher insurance reimbursement rate is the happier a patient becomes. It also confirms that getting a reimbursement of >65% of expenditures is very difficult, and that attempt might incur more costs to patients than the benefits they may receive.

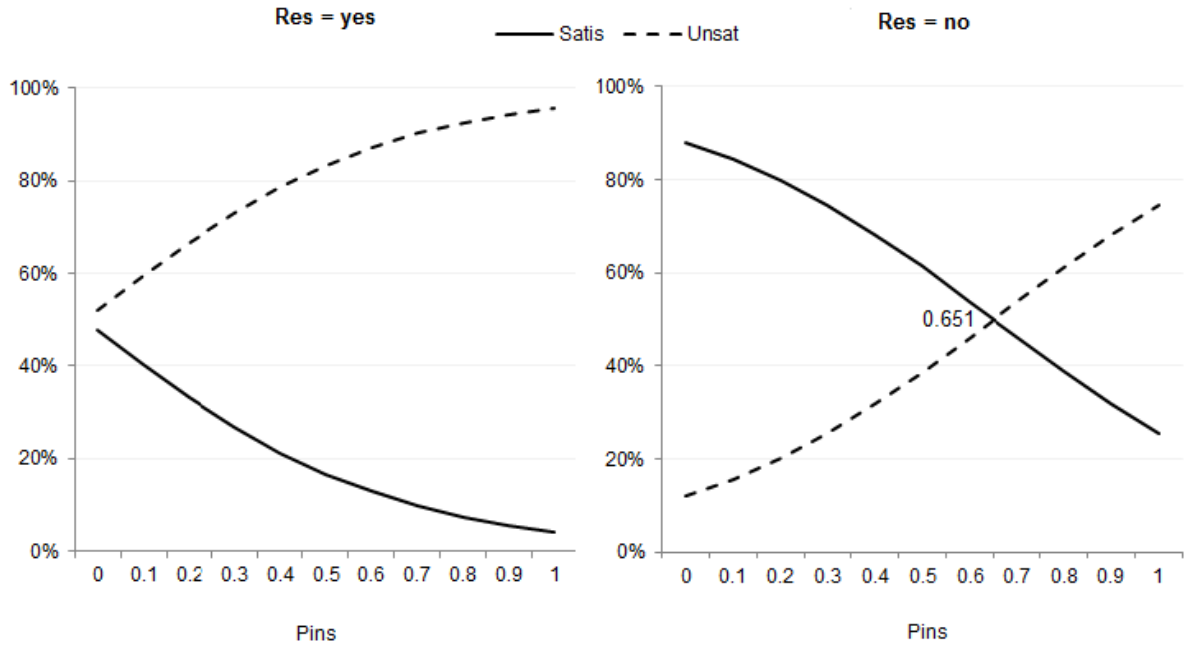

Figure 3. Probabilities of patient dis/satisfaction for patients with emergency, conditional on medical insurance reimbursement rate

Finally, the results show that the ambitious goal of universal coverage may be both unrealistic and too rigid as patients with different conditions show different perceptions toward healthcare services and influences of factors.

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