SHORT ARTICLE

Empirical probabilities of (non)optimal healthcare choice conditional on socio-economic status and time consumption

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Abstract

Background: Patients need healthcare information for making decisions in choosing health service provider, but data sufficiency and quality are major obstacles. Non-optimal decisions are common. The problem persists even with the growing power of the Internet and ICT-based facilities. Asymmetric information exacerbates the economic inequality, worsening community health. **Aims & Objectives**: The study reports results on existence of empirical relations between such factor as socioeconomic status, consumption of time and outcome of healthcare provider choice by Vietnamese patients. **Material & Methods**: Cross-section data from a patient community survey spanning >30 hospitals in Hanoi, during 2015 Q4-2016 Q1. Study sample contains 1459 observations. Main method used is baseline category logits regression. **Results:** Empirical relations among the above factors are confirmed. The rich possess advantages over the poor, with a >63% probability of making an optimal choice. But two groups are not different with respect to wrong choice, with probabilities of making wrong choice for high- and low-SES patients, spending significant time for seeking information, being 13.6% and 15.1% respectively. **Conclusion**: a) Even for the rich with significant information the chance of choosing right healthcare provider is relatively low, 51%; b) Quality of information or information processing by healthcare consumers shows some problem.

Keywords

Health services; Health care surveys; Health care quality, access, and evaluation; Information science

Introduction

Healthcare information is important for patients in making their decisions of choosing an appropriate health service provider (1). Nonetheless, Vietnamese patients faced various obstacles in accessing healthcare data; a situation that often led to non-optimal decision (2) although the existence of the Internet has provided them with more tools and sources in their search of quality healthcare information (3). In addition, the issue of health consumers' trust in the health professionals, especially general practitioners, has been not just limited to Vietnam (2) but also reported in other emerging countries, such as India (4). Addressing the information need for patients is believed to be an efficient way for societies to alleviate part of the increasingly problematic issue of economic inequalities (5) and to improve community health (6); and in so doing, there remains to be a need of

learning about health consumers' processing and evaluating of healthcare information (7).

It is also noteworthy that the problem of inequality in access to information facilities and sources among healthcare products consumers in this age of ICT (7,8). Therefore, it would be logical and reasonable to predict that the cost of information may be related to patients' information-seeking behaviors and choice of healthcare provider (1,9,10).

The issues of costs and consumption of time also hold true for Vietnamese patients, as the information infrastructure has still been in its infancy (11) and households frequently find it costly to consult with health professionals (12).

The above issues regarding information costs, time consumption and socioeconomic conditions/status (SES) have led to the need of understanding about the likelihood of making an (non)optimal decision on choosing a healthcare provider for patients. This paper serve to communicate some new empirical results from a categorical dataset for the city of Hanoi, Vietnam.

Aims & Objectives

The analysis and results reported in this short paper aims to answer major research questions: 1) "How do a patient's socioeconomic status (SES) and their consumption of time influence the (non)optimality of their decisions on healthcare provider choice?"; and, 2) This broader aim is transformed into specific objectives of establishing empirical relations among variables and estimating conditional probabilities for outcomes of health provider choice by patients.

Material & Methods

The dataset is constructed from a community-based cross-section survey conducted starting in the fourth quarter of 2015, ending the first quarter 2016, at over 30 hospitals in the Hanoi region of Vietnam. The original dataset is made available for download by the author in (13).

The sample size of this research is 1,459 patients whose data were collected through authorized research personnel at hospitals, with help from health professionals, and mostly categorical by nature of the survey questions. The sample size is satisfactory for modeling the multi-category logistic specification with about 20% of cells having observed value <5. The research random sampling does not discriminate against any specific criteria for inclusion/exclusion.

Data collecting was performed by Hanoi-based Vuong & Associates, with its ethical standards being maintained by an institutional regulation and decision, numbered V&A/15#01 dated October 19, 2015, and with written approval by survey participants being obtained by its surveying team. Socioeconomic status was categorized using data from General Statistics Office 2016 (14).

Statistical Analysis: Data entry was performed using MS Excel. The processing and structuring of categorical data were done using R statistical package (3.2.3); structured data table for statistical analysis was in CSV format. The estimations employ baseline category logit (BCL) procedures as provided in (15). Coefficients estimated by multinomial logistic regression would then be used to compute empirical probabilities conditional upon events in our consideration.

Dataset: The dataset (provided in Table 1) reflects responses from the survey, which then play roles of response and predictor variables as follows. The first predictor variable is time taken for searching healthcare and related information (coded "Timecons") which has three categories of value: "non.timecons" (which indicates a non-time-consuming evaluation); "sw.timecons" (somewhat time-consuming but still acceptable); and, "hi.timecons" (highly time-consuming). The second predictor is "SES", having three categorical values: "rich", "mid" and "poor". The one response variable is "Optimality" reflecting patients' assessment of their choice on whether their decision is: "right" (best available), "not best" (not the best, but acceptable), or "wrong".

Table 1 indicates that although 70% of respondents did spend significant amount of time on information search homework, still >88% did not make their optimal decision regarding choice of healthcare provider.

Results

The statistical estimation results are provided in Table 2, with the first estimation referring to Eq.1, and the second Eq.2.

The significance of the relation among groups of factor (response and predictor variables) is confirmed with most of coefficients being highly significant at any conventional level, and no group of factor has does not have at least one significant coefficient. All predictor coefficients >0; and the largest in Eq.1 is β_4=1.567 ($p<0.01$) suggesting a

stronger influence on the trend of making an optimal decision by a high-SES patient. In Eq.2, β_4=0.463 ($p<0.05$) showing a much lower contribution to the likelihood of making an "ok" decision, compared to the influence of consumption of time β_1, $\beta_2>1$ ($p<0.0001$) and $\beta_3>0.8$ ($p<0.001$).

$$\ln\left(\frac{\pi_{\text{right}}}{\pi_{\text{wrong}}}\right) = -0.252 + 1.382\times\text{non.timecons} + 1.039\times\text{sw.timecons} + 0.907\times\text{poor} + 1.567\times\text{rich} \quad \text{(Eq.1)}$$

$$\ln\left(\frac{\pi_{\text{notbest}}}{\pi_{\text{wrong}}}\right) = 0.487 + 1.079\times\text{non.timecons} + 1.059\times\text{sw.timecons} + 0.822\times\text{poor} + 0.463\times\text{rich} \quad \text{(Eq.2)}$$

Eq.1-2 are used to compute empirical probabilities that are provided in Table 3. The highest probability is 63.3% for the rich to make a right decision.

Discussion

The stronger influence of SES="rich" in Eq.1 may be attributed to quality of information that high-SES patients would usually enjoy, compared to lower-SES, especially in the socioeconomic setting of East and South East Asian regions where people rely on personal relations in various social and economic activities (healthcare included). Specifically, a probability is computed as:

$$\pi_{\text{right}} = \frac{e^{(-0.252+1.567)}}{1 + e^{(-0.252+1.567)} + e^{(0.487+0.463)}} = 0.510,$$

showing that the likelihood for a high-SES patient who does spend time on doing health information exercise to make his/her optimal decision is 51%. Apparently, the numerical estimate is not quite high as one may expect given the advantages that a rich patient possesses.

The trends of changing probabilities of making right/ok/wrong choice are shown in Figure 1, where we can see that spending more time on searching for more information may not be the best thing to do for both the rich and the poor, as far as the right choice is concerned. The left-hand-side figure trend shows declining probabilities when patients try to increase their time on searching for more information.

Regarding the chance of making a wrong choice, the likelihood jumps by almost 10 percentage point if a patient, regardless of their SES, moves from "somewhat time-consuming" to "highly time-consuming" (from 4% to 14% for the rich, and 5% to 15% for the poor).

Conclusion

The study establishes the impacts of patients' consumption of time and socioeconomic status on the probabilities of a specific outcome of healthcare provider choice. However, some unexpected insights can be acquired.

Firstly, as far as the "right choice" outcome is concerned, the rich have shown their much stronger advantage over the poor, with probabilities being much higher in all conditions of consumption of time, by approximately 25 percentage points. The unexpected observation here is even with that much better outcome, the chance is still low, 51%, or a coin-flipping probability!

Secondly, regarding the situation of making a wrong choice, no significant difference between the rich and the poor.

These combined with the fact of declining probability trend for optimal choice as shown in Fig.1 lead to an insight that quality of information is a significant problem and the amount of time spent could not make up the loss of quality and reliability that healthcare information should bring to patients in need.

Recommendation

The study results recommend the proliferation of ICT tools and Internet-based apps that enable the majority of patients to access information with less time. Information portals from hospitals and health information centers should be utilized more efficiently for improving efficiency and quality of information and data, making the suggestion on the use of Internet-based innovations in healthcare sector by (2,17) more specific and feasible.

Limitation of the study

The study is so far limited to the region of Hanoi, therefore comparison with other regions for learning about differences and changing trends is for the time being limited. Another limitation is that the results have not been controlled for different information sources, i.e. the Internet versus health professionals.

Relevance of the study

The study reports new empirical results with regards to public health policy and literature in developing countries, aiming at better devised community health mechanism and practical tools for patients. The results of the study and policy implications would likely improve general level of public health services, when combined with improved health

insurance schemes (16) and social network development (13).

Authors Contribution

QHV as the sole author designs the survey and study, performs statistical analysis, checks validity of statistical results and writes the manuscript.

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Tables

TABLE 1 DISTRIBUTION OF PATIENTS AGAINST FACTORS OF "OPTIMALITY"; "TIMECONS" AND "SES"

"Timecons"	"SES"	"Optimality"		
		"not best"	"right"	"wrong"
"hi.timecons"	"middle"	43	17	27
	"poor"	20	15	5
	"rich"	2	1	0
"non.timecons"	"middle"	227	154	44
	"poor"	52	28	8
	"rich"	4	10	1
"sw.timecons"	"middle"	360	165	79
	"poor"	111	60	8
	"rich"	7	10	1

TABLE 2 ESTIMATION RESULTS

	intercept	"Timecons"		"SES"	
		"non.timecons"	"sw.timecons"	"poor"	"rich"
	β_0	β_1	β_2	β_3	β_4
logit(optimal|wrong)	-0.252 [-0.972]	1.382*** [4.638]	1.039*** [3.683]	0.907*** [3.449]	1.567* [2.085]
logit(ok|wrong)	0.487* [2.160]	1.079*** [4.046]	1.059*** [4.264]	0.822** [3.268]	0.463 [0.602]
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1; z-value in square brackets; baseline category for: "Timecons" = "hi.timecons"; and, "SES" = "middle". Residual deviance: 9.16 on 8 degrees of freedom.					

TABLE 3 PROBABILITIES OF (NON)OPTIMAL CHOICE CONDITIONAL UPON SES, CONSUMPTION OF TIME

"Optimality"	"right" (a)			"notbest" (b)			"wrong" (c)		
"SES"	"poor"	"middle"	"rich"	"poor"	"middle"	"rich"	"poor"	"middle"	"rich"
"non.timecons"	0.392	0.348	0.633	0.557	0.539	0.324	0.051	0.113	0.043
"sw.timecons"	0.318	0.278	0.555	0.624	0.595	0.393	0.058	0.127	0.052
"hi.timecons"	0.290	0.228	0.510	0.559	0.478	0.354	0.151	0.294	0.136

Figures

FIGURE 1 CHANGING PROBABILITIES FOLLOWING CONSUMPTION OF TIME, CONTROLLING FOR SES