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The Determinants of Self-Medication: Evidence from Urban Vietnam[†]

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June 2016

Abstract. This study examines the primary determinants of self-medications among urban citizens in Ho Chi Minh City, Vietnam. To achieve the research objective, the questionnaire is designed to elicit the respondents' necessary information using in-depth personal interviews. Employing logistic models the paper finds that the probability of self-medication is positively associated with the respondents' high school degree or vocational certificate, married status, and income while it is negatively related to employed status, the number of children, the geographical distance from home to the nearest hospital, doing exercise, and living in a central region. Meanwhile, using Poisson models the paper finds that the frequency of self-medication is positively associated with the respondents' high school and vocational, married, income, and chronic disease while the frequency of self-medication is adversely related to male, employed, children number, distance, being close to health professional and central areas.

Keywords: Self-medication; Ho Chi Minh City; Vietnam

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"The desire to take medicine is perhaps
the greatest feature which distinguishes man from animals"
Sir William Osler (Cushing 1925)

1 Introduction

Self-medication has been widely used as a common approach to illness treatments in the developed world over many years ago (Jones 1976; Bennadi 2014). An increased incidence of self-medication is also recognized from the developing world (WHO 2000a, 2015; Shankar *et al.* 2002). This study empirically investigates the fundamental determinants of self-proscribed medication among urban citizens in Ho Chi Minh City, Vietnam - a developing and transition country in Southeast Asia.

Self-medication is understood as the behavior of using any medicinal products without prescription in order to resolve minor deseases or symptoms that are recognized by medicine customers (Hernandez-Juyol and Job-Quesada 2002). Self-medication is relatively popular in areas where medicines or pharmaceutical products are predominantly available. The commonness of self-medication can be explained for the reduced demand for doctor visits.

Self-medication can generate benefits for both individuals and the society when it is correctly practiced (WHO 2000b). For example, self-medication allows individuals and households manage their health problems with the low costs and the saved time. Meanwhile, self-medication probably contribute to the public health system in the aspect of decreasing the burden for public health facilities. However, self-medication also imposes some potential risks related to side-effects of the misuse of medicines such as incorrect diagnosis, inappropriate duration of using medicines, or drug resistance, abusing the medicines without professional advice (WHO 2000b). Obviously, self-medication is probably unavoidable in some situations so that

individuals or households have certain incentives to purchase medicines to treat their illnesses without prescriptions (WHO 2000b).

Previous statistics has shown that self-medication uses range from 2 percent to 99 percent among various countries (Shehnaz *et al.* 2014). For example, there is about 38.5 percent of repspondents who use self-medication among children and adolescents in Germany (Du 2009). Meanwhile, de Melo *et al.* (2006) find that there is about 21.5 percent of respondents who use self-medication in a survey for rural Portugal.

Also, the prevalence of self-medication is a fact in developing countries. Vietnam is so far not an exception. Research on self-medication however is rarely conducted in developing countries although it is a common phenomenon there. Hence, this study contributes to the existing literature on this line of research.

Vietnam considerably has a large population. Healthcare for its citizens becomes one of the most important problems facing the country. However, Vietnam is also a developing countries where the public health system is seemingly insufficient for the tremendous demand for healthcare and the resource-constrained households are dominant within the economy. This context of development progress stage stylized for a developing country like Vietnam apparently affects its citizens' behaviors in choosing the treatments for illness problems and probably self-medication also an important measure.

In addition, the big size of market for medical products and the relaxable status of legal aspect for medicine trades allow self-medication being common phenomenon in the society as a measure for people to resolve their health problems. Understanding the primary determinants of self-medication is therefore important in Vietnam. That is this study's main purpose.

It is important to understand the fundamental determinants of self-medication in order to recommend public health policies aimed to reduce pharmaceutical product-related health-risk among citizens. In addition, evidence-based understands of factors related to self-medication behaviors promote the awareness of potential health hazards of using medicines without doctoral consultances.

Chang and Trivedi (2003) is a quantitative study on self-medication in Vietnam and find that the behavior of self-prescribed medication is significantly affected by income and health insurance status. This paper uses survey data from Vietnam Living Standard Surveys (VLSS) of 1997-1998 in Vietnam to disclose that both income and health insurance negatively correlate to self-medication among Vietnamese citizens. Because of the limitation of available data, they mostly focus on income and insurance status as two main determinants of self-medicating behaviors. This approach therefore is probably questionable because of the possible omitted variables that are crucial to understand the influential factors of self-medication in a developing country like Vietnam. In this study, we provide a more in-deep investigation of the determinants of self-medication in Vietnam. In particular, we relate the wide potential socio-economic factors to the behaviors of self-medication. To do this, we design the questionnaire to elicit information on the characteristics of respondents as well as their self-prescribed medicating behaviors in Ho Chi Minh City, Vietnam.

The remainder of the paper is organized as follow. Section 2 reviews the existing literature in the topic of self-medication factors for both developed and developing countries. In section 3, the research design and the sample of data used to achieve the research objective are presented. In particular, the structure of the questionnaire is described and the method of data collection is discussed. Section 4 shows the emprical method of estimation that is the specifications of econometric models that is employed in this study. Next, in the empirical results are discussed in section 5. Finally, concluding remarks are made in section 6.

2 Literature Review

The investigation of determinants of self-medication is increasingly conducted in developed countries (Grigoryan 2006; Grigoryan *et al.* 2008) and developing nations as well (WHO 2000a, 2015; Shankar et al. 2002).

WHO (1998) sytemmatically provides a relatively possible factors that are potentially related to self-medication behaviors. In particular, these factors are

grouped into eight groups including socio-economic characteristics, lifestyle, accessibility, illness management, environmental and pulic health conditions, demographic and epidemiological characteristics, health sector reforms, and medicine availability. This framework has applied in many empirical studies on this line of research to disclose the important determinants of self-medication in both developed and developed countries.

Yusuff and Omarusehe (2011) provide an investigation of key determinants of self-medication with othordox and herbal medicines among pregnant women in Ibadan, Nigeria. The results suggest that the self-medication is significantly associated with age and occupational status of respondents. In addition, the lack of knowledge on inverse outcomes stemming from the use of self-medication negatively affects the behaviors of self-medication in Nigeria.

Ramalhinho *et al.* (2014) give an attempt of relating important variables to self-medication with antibiotics in the Algarve Region of Portugal. There are three groups of respondents' possible variables used in this study include socio-demographic variables, variables related to health and the health system, and behavioral variables. The findings show that non-prescription acquisition, age and gender are strongly associated with the self-medicating behaviors with antibiotics.

Figueiras *et al.* (2000) is another investigation of the determinants of non-prescription medicine uses in Spain. The study relates socio-economic factors of respondents to their self-medication decisions. The results find that gender, marriage status, and residential location are primary factors of self-medication in Spain. Particularly, respondents who are female, single marriage status, and urban residents cogently tend to have more self-medication than others.

Grigoryan *et al.* (2008) examine the relationship between predisposing factors (attitudes and knowledge concerning antibiotic use and self-medication) and enabling factors (country wealth and healthcare system factors) and self-medication with antibiotics in 12 European countries. The results indicate that the more likely behavior of self-medication is highly correlated with highly perceived beliefs on useful treatments of self-medication with antibiotics for minor ailments and bronchitis for the individual level. Also, the availability of antibiotics is positively

related to the behavior of self-medication of an individual. At a macro level, the study reveals that the wealthy degree of country where repondents live has a negative impact on its citizens' likelihood of self-medication.

Setiawan *et al.* (2012) evidently argue that the possibility of self-medication use depends on public policies from the government related to regulating and monitoring the dispensation of medicines and drugs within the country. The more likely the government fails to regulate and supervise informal markets for medicines and drugs, the more poor citizens tend to have self-medication. This study is implemented in Yogyakarta city of Indonesia.

de Melo *et al.* (2006) show that the significant factors of self-medicating behaviors among rural Portugees include age, type of health consultants, and the duration of time waited to meet doctors and other health professional services. Importantly, the study also finds that there exists the seasonal fator of self-medication, for some specific deseases, particularly cough and cold preparations, dermatologicals, and anti-inflammatory and anti-rheumatic products.

In addition to original studies of determinants of self-medication, there are some systematic review studies on this topic. For instance, Shehnaz *et al.* (2014) provide a comprehensive review of the factors of self-medication behaviors among adolecents aged 13-18 years using 163 primary studies. The results in particular show that the prevalent determinants of self-medication among adolecents consist of female gender, older age, maternal education, and familial practices. In addition, headache, allergies, and fever are frequently the most self-medicated health problems among deseases or symptoms. Meanwhile, Eticha and Mesfin (2014) produce a cross-sectional study of self-medication in Mekelle, Ethiopia. The results indicate that the high probability of self-medication is associated with some certain health problems such as headache, fever, gastrointestinal diseases and respiratory tract infections. Also, some types of medical products are more frequently used for self-medication such as analgesics/antipyretics, gastrointestinal drugs, respiratory drugs and oral rehydration salt than others.

Some studies also find that self-medication is predominantly populous among people who have knowledge related to medical or phamarcy sciences. Alam *et al.*

(2015) evidently show that the likelihood of self-medication is considerably high among medical and phamarcy students in Bangladesh. This populous phenomenon is clearly characterized for a developing country like Bangladesh although it potentially promotes the misuse of medicines even among educated citizens.

A similar result is demonstrated in Nepal (Gyawali *et al.* 2015). Notably the results find that the dominant medicines among self-medication include painkillers with 73.2 percent, antipyretics with 68.8 percent, and antimicrobials with 56.2 percent of the total sample of respondents. Pavydė *et al.* (2015) find that respondents are male, from rural areas, and single persons are more likely to self-medicate with using antibiotics in Lithuania.

3 Research Design and the Sample

Research Design

In order to examine the fundamental determinants of self-medication in urban Vietnam, the questionnaire is designed to elicit information about respondents' characteristics. The key variables in the questionnaire are arranged into three main following groups.

(1) *Socio-economic characteristics of respondents:* This group includes information on age, gender, education level, marital status, employment status, and income.

(2) *Information on health care systems:* This section provides questions in order to elicit the effect of charateristics of health care systems on the respondents' decisions of self-medication in Vietnam such as the respondents' insurance status.

(3) *Self-medication behaviors:* This group consists of questions in order to obtain information related to self-medication behaviors. These are health status, the number of doctor visits, the number of self-medication, insurance purchase, the reasons for using self-medication, the types of diseases for self-medication, the effect of information disclosure or external advices on self-medication behaviors, the popular places to buy medicines, the methods the respondents

use medicines, knowledge on the effect of using self-medication on respondents' health, and the respondents' lifestyle such as exercise activities.

The full questionnaire is presented in the *Appendix 2* at the end of this paper. The survey is administered in Ho Chi Minh City, one of the biggest cities in Vietnam. Face-to-face interviews are implemented.

Ho Chi Minh City is the largest city in Vietnam with a population of about at least 8 millions of people. Ho Chi Minh City has seen a collection of socities with a wide ranges of income, education, and other socio-demographic characteristics of their citizens. To construct a sample that is representative for the population in the city, the households was randomly choosen from various areas including the central areas and sub-urban ones as well, areas with the rich households and those with poor households. Ho Chi Minh City is a good case study for investigating urban citizens' self-medicating behaviors for urban Vietnam.

The Sample

The sample size of 241 respondents is achieved. The mean age is about 30 years old. Approximately 42 percent of the respondents is male and about 58 percent is female. The descriptive statistics of the sample is presented in Table 1.

Among the respondents, 18 percent has the degree of lower or secondary school as the highest degree of education while the corresponding figures for high school or vocational and tertiary education are 39 percent and 43 percent respectively. There are about 32 percent and 68 percent of respondents with being married and employed respectively. The average monthly income of the respondent is about VND 4.6 million.

Approximately 11.6 percent of the respondents state that they have chronic diseases. About 53 percent of them have relatives or friends who are working the heath industry or have healthcare related jobs. Regarding information on the respondents' lifestyle, one respondent does exercises with a mean frequency of nearly 2.2 times per week and about 32 percent of the respondents have diet. Meanwhile, there is about 39 percent of the respondents living in the central areas of Ho Chi Minh City.

More information on the sample and highlighting variables is presented in *Appendix 1.*

Table 1. Descriptive statistics of the Sample

Variable	Definition	Obs	Mean	Std. Dev.	Min	Max
Self-medication times	The times the respondent self-medicated over last year (time/year)	241	3.154	3.019	0	12
Self-medication without prescription	Whether the respondent self-medicated without prescription over last year (=1 if yes, =0 if no)	241	0.759	0.428	0	1
Average self-medication cost	The average cost of self-medication for the self-medicating respondents (1000 VND/time)	183	7.525	133.748	5	1500
Age	Age of the respondent (years)	241	30.436	12.664	17	84
Male	The gender of the respondent is male (=1 if yes, =0 if no)	241	0.423	0.495	0	1
Lower secondary school	The highest academic degree that the respondent has is secondary schoor or lower (=1 if yes, =0 if no)	241	0.183	0.387	0	1
High school or vocational	The highest academic degree that the respondent has is high schoor or vocational school (=1 if yes, =0 if no)	241	0.385	0.488	0	1
Tertiary education	The highest academic degree that the respondent has is bachelor or post-graduate's degree (=1 if yes, =0 if no)	241	0.432	0.496	0	1
Married	The respondent's marital status is married (=1 if yes, =0 if no)	241	0.320	0.467	0	1
Employed	The employment status of respondent is employed (=1 if yes, =0 if no)	241	0.680	0.467	0	1

Income	The monthly income of the respondent (1000 VND)	241	4589.212	4597.251	0	31000
Family size	The number of family member (numbers)	241	4.369	1.411	2	11
Children	The number of children within family (numbers)	241	0.556	0.969	0	6
Insurance	The respondent buys insurance (=1 if yes, =0 if no)	241	0.801	0.400	0	1
Distance	Distance from the respondent's house to the nearest hospital (km)	241	3.115	2.655	0.1	20
Chronic disease	Whether the respondent has a chronic disease (=1 if yes, =0 if no)	241	0.116	0.321	0	1
Close to health professional	Having friends or relatives who work in medical professional or health care (=1 if yes, =0 if no)	241	0.531	0.500	0	1
Doing exercise	The number of times the respondent does exercise (time/week)	241	2.187	1.965	0	5
Diet	Whether the respondent has a diet (=1 if yes, =0 if no)	241	0.320	0.467	0	1
Central area	Whether the respondent lives in a central area (=1 if yes, =0 if no)	241	0.390	0.489	0	1

4 Estimation Methods

In this study, there are two types of data for the dependent variable, which are proxies for self-medication, including binary data (where the respondent self-medicated over the last year) and count data (the number of times the respondents use self-medication as the treatment for their illness problem over the last year). Corresponding to each type of data for the dependent variable, there are corresponding empirical models. In particular, for binary dependent variable, the logit and probit models are employed to estimate the probability of the pharmacy visit without prescriptions. Meanwhile, Poisson regression is employed in the case of using the count-data dependent variable.

The estimation methods for the probability of self-medication

The logit model is specified as below:

$$p_i = Pr\left[Y_i = 1|\boldsymbol{X_i}\right] = \frac{exp(\boldsymbol{\beta X'}_i)}{1+exp(\boldsymbol{\beta X'}_i)} \quad (1)$$

where p_i is the likelihood of using self-medication from the respondent ($0 < p_i < 1$), and $\boldsymbol{X}$ is the vector of control variables.

The alternative model for the binary dependent variable is probit model that is specified as follows:

$$p_i = Pr\left[Y_i = 1|\boldsymbol{X_i}\right] = \boldsymbol{\Phi}(\boldsymbol{\beta X'}_i) \quad (2)$$

where $\boldsymbol{\Phi}(\boldsymbol{\beta X'}_i)$ is the cumulative distribution function for the standard normal.

The estimation methods for the frequency of self-medication

The poisson regression model is used for estimate the frequency of self-medication conditional on the distribution of the dependent variable on the vector of covariates and parameters of interests, that is called the Poisson distribution:

$$Pr\left[Y_i|\boldsymbol{X_i}\right] = \frac{e^{-\mu_i}\,\mu_i^{Y_i}}{Y_i!} \quad (3)$$

where $Y_i = 0, 1, 2, \ldots$ is the number of self-medication times, and μ is the intensity or rate parameter with it's mean parameterization is presented as below:

$$\mu_i = exp(\boldsymbol{\beta X'}_i) \tag{4}$$

Notably, the number of self-medication times from the respondents that is measured in a sufficient duration of one year allows this study to control for the potential problem of zero-utilization as seen in some studies where the time period for eliciting the number of self-medication is short. For example only 4 weeks for the observed period and the 74.43 percent of zero-utilization in Chang and Trivedi (2003). The frequency distribution of the number of self-medication is shown in Table 2. The zero-outcome only accounts for 23.97 percent of the sample.

Table 2. The frequency distribution of the number of self-medication

Self-medication number	Frequency	Observed frequency (percent)
0	58	23.97
1	36	14.88
2	31	12.81
3	24	9.92
4	23	9.50
5	17	7.02
6	15	6.20
7	11	4.55
8	9	3.72
9	8	3.31
10	5	2.07
11	4	1.65
12	1	0.41

5 Empirical Results

Reasons for self-medication

Table 3 shows the results of reasons demonstrated for the self-medicating behaviors among the respondents in this study. Accordingly, among 184 respondents who have self-medication(s) over last year, only 2.17 percent of the total self-medicating respondents state that *financial constraints/difficulties* lead them to self-medicate for resolving their health problems. Apparently, the problem of financial constraints or difficulties is not a considerable issue that directly lead to self-medication for urban citizen in Ho Chi Minh City of Vietnam.

Table 3: Reasons for self-medication (n=183)

Reason	Frequency	Percent
Financial constraints/difficulties	4	2.17
Lower costs compared with hospitals' costs	48	26.09
Long distance from home to hospital	54	29.35
Insufficient service quality of hospital	35	19.02
Legally available medicines	63	34.24

Meanwhile, the most important factor of self-medication is *legally available medicines* that accounts for 34.24 percent of the total self-medicating respondents. This result therefore indicates a fact that the common widespreads of medical products promotes the use of self-medication as the popular treatment for citizens' health problems. This phenomenon is intitutively true in the developing world where people can easy find almost medical products in the unregulated market. This finding probably imposes the public policy implication for the regulation of medical markets in Vietnam.

Other primary reasons for self-medication consist of *insufficient service quality of hospital, lower costs compared with hospitals' costs,* and *long distance from home to hospital* that amount to 35 percent, 48 percent and 54 percent respectively.

Diseases for self-medication

Table 4 reports the types of diseases or disorders facing the respondents's self-medications over one year. For all respondents who purchased medicines or medical products to resolve their health problems in Ho Chi Minh City, *catching a cold* is the most popular disease for self-medications with 88.52 percent. Other popular diseases for self-medications include *fever, cough, runny nose, headache disorders* and *throat symptoms*. The proportion of the sample have these health problems are 66.12 percent, 65.57 percent, 62.84 percent, 58.47 percent and 56.83 percent respectively.

It is obvious that the most popular diseases or disorders for the respondents' self-medications in Ho Chi Minh City, Vietnam is almost minor health problems. These minor health problems is apparently less serious than other ones. Therefore, citizens are probably easy to treat them with self-medications without going to the hospitals or receiving professional consultants from doctors.

Table 4: Types of diseases for self-medication (n=183)

Disease	Frequency	Percent
Aches and pains	37	20.22
Catching a cold	162	88.52
Fever	121	66.12
Cough	120	65.57
Throat symptoms	104	56.83
Cardiovascular diseases	1	0.55
Runny nose	115	62.84
Depression/Sonasthenia	17	9.29
Indigestion symptoms	33	18.03
Diarrhea	40	21.86
Eye-related disorders	11	6.01
Headache disorders	107	58.47
Insomnia	27	14.75
Gastropathy related diseases	26	14.21
Dermatology related diseases	8	4.37
Sexually transmitted diseases	1	0.55
Advanced sterilization products	40	21.86

Gynecologic disorders	1	0.55
Nutrition supporting products	8	4.37
Other diseases	5	2.73

On the contrary, the respondents do not seemingly employs self-medications as the solutions to the more serious health problems such as *cardiovascular diseases, sexually transmitted diseases, gynecologic disorders,* and *dermatology related diseases.* The percentages for self-medications due to these serious diseases or disorders is less than 10 percent.

Other health problems that leads to the small parts for self-medications in Ho Chi Minh City consist of *diarrhea, advanced sterilization products, aches and pains, indigestion symptoms, insomnia,* and *gastropathy related diseases.* The percentages of the respondents who self-medicated due to these health problems are 21.86 percent, 21.86 percent, 20.22 percent, 18.03 percent, 14.75 percent, and 14.21 percent respectively.

Another finding is that there is a 97.27 percent of respondents who self-medicated over the last year buy medicines without presriptions from *pharmacist-owned stores.*

Probablity of self-medication

Table 5 reports the results from logistic models for the probability of self-medication in this study. The study uses both logit and probit models to produce the estimation results. Using probit model in addition to logit model is one way to conduct a robustness test of the results of estimation.

In addition, there are two types of empirical models including simple model and full model. For simple model, some crucial dependent variables that are characterized for socio-demographic characteristics of the respondents are included such as age, gender, education, marital status, employment status, income, the number of children as the dependents, the geographic distance between home and the nearest hospital, and whether the respondent do exercises. In full model, all other independent varibles in addition those from simple model are included in the models

such as family size, insurance status, whether the respondent are with chronic disease, whether the respondent is close to health professional, whether the respondent has diet, and whether the respondent lives in central areas or locates in suburban areas of Ho Chi Minh City.

In column (1) the results for the simple logit model show that among independent variables included in simple models, some variables are statistically significant for the probability of self-medication at the traditional levels including *high school or vocational* ($p<0.05$), *married* ($p<0.05$), *employed* ($p<0.1$), *log of income* ($p<0.05$), *children number* ($p<0.01$), distance ($p<0.05$), and *doing exercise* ($p<0.05$).

Table 5: Logistic models for the probability of self-medication (dependent variable: the dummy for self-medication)

Variables	Simple model		Full model	
	Logit (1)	Probit (2)	Logit (3)	Probit (4)
Age	0.022	0.012	0.024	0.012
	(0.021)	(0.012)	(0.021)	(0.012)
	[1.022]		[1.024]	
Male	0.005	0.0009	0.044	0.040
	(0.349)	(0.200)	(0.363)	(0.209)
	[1.005]		[1.045]	
Lower secondary school	0. 360	0.169	0.262	0.083
	(0.544)	(0.311)	(0.577)	(0.334)
	[1.434]		[1.299]	
High school or vocational	1.259**	0.701**	1.285**	0.703**
	(0.489)	(0.274)	(0.504)	(0.282)
	[3.523]		[3.615]	
Married	1.801**	0.979**	1.598*	0.861*
	(0.826)	(0.448)	(0.859)	(0.476)
	[6.056]		[4.944]	
Employed	–5.986*	–3.307*	–5.833*	–3.049
	(3.294)	(1.916)	(3.303)	(1.935)
	[0.003]		[0.003]	
Log of income	0.782**	0.432*	0.775**	0.408*
	(0.383)	(0.223)	(0.383)	(0.224)

	[2.186]		[2.171]	
Family size			–0.079	–0.041
			(0.123)	(0.073)
			[0.924]	
Children number	–1.212***	–0.678***	–1.132***	–0.627***
	(0.410)	(0.221)	(0.414)	(0.228)
	[0.298]		[0.322]	
Insurance			–0.332	–0.149
			(0.472)	(0.269)
			[0.717]	
Distance	–0.147**	–0.087**	–0.165***	–0.095***
	(0.058)	(0.035)	(0.061)	(0.036)
	[0.863]		[0.848]	
Chronic disease			–0.082	–0.063
			(0.592)	(0.339)
			[0.921]	
Close to health professional			–0.388	–0.221
			(0.361)	(0.207)
			[0.678]	
Doing exercise	–0.174**	–0.101**	–0.170*	–0.100*
	(0.087)	(0.050)	(0.092)	(0.054)
	[0.840]		[0.844]	

Diet			0.168	0.127
			(0.418)	(0.242)
			[1.183]	
Central area			–0.615*	–0.330
			(0.354)	(0.204)
			[0.540]	
Constant	0.524	0.389	1.517	0.903
	(0.766)	(0.442)	(1.052)	(0.603)
	[1.689]		[4.557]	
Log likelihood	–114.861	–115.134	–111.971	–112.466
Pseudo R^2	0.136	0.134	0.158	0.154
Observations	241	241	241	241

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. *Tertiary education* is omitted variable. Standard errors are in parentheses and odds ratios are in brackets.

In particular, the respondents with *high school or vocational degree* increase the log odds of purchasing medicines without prescription by 1.259 (OR = 0.489) compared to the respondents with *tertiary education* as the highest degree. The respondents whose highest degree is *high school or vocational degree* are 0.489 times more likely to self-medicate than those with *tertiary education*.

The respondents with married positively correlate with the likelihood of self-medications. Their log odds and times of self-medications are 1.801 and 6.056 higher than those with single or other marital statuses. *Log of income* also has the positive impacts of probability of self-medication although its' magnitude is smaller than *married* and *high school or vocational*. The probability is equivalent to an increase of 0.782 in log odds for an increase of VND 1,000 in the respondent's monthly income (OR = 2.182).

Among statistically significant independent variables with a negative side with probability of self-medication, employment status has the largest impact. In particular, the respondents with employed decrease the log odds by 5.986 (OR = 0.003) compared to those with unemployed or other employment statuses. With smaller degrees, *children number, doing exercise,* and *distance* have the negative effects on the probability of self-medications. The coefficients for these variables are –1.212 (OR = 0.298), –0.174 (OR = 0.840), and –0.147 (OR = 0.863) respectively. Other variables in simple model are statistically insignificant including *age*, *male* (gender), and *lower secondary school* (education) as in column (1).

The results is similar for the simple probit model as indicated in column (2). The statistically significant determinants of the likelihood of self-medication consist of *high school or vocational* ($p<0.05$), *married* ($p<0.05$), *employed* ($p<0.1$), *log of income* ($p<0.1$), *children number* ($p<0.01$), *distance* ($p<0.05$), and *doing exercise* ($p<0.05$).

Columns (3)–(4) present the estimation results for full logistic models. For the full logit model as shown in column (3), all independent variables which are statistically significant at the traditional levels in the simple logit model are also the same in the

full logit model. Particularly, *high school or vocational, married,* and *log of income* have the positive effects on the probability of self-medication with respective coefficients of 1.285 ($p<0.05$, OR=3.615), 1.598 ($p<0.1$, OR=4.944), and 0.775 ($p<0.05$, OR=2.171) on the one hand. On the other hand, the independent variables that have statistically significant and negative impacts on the likelihood of self-medication include *employed* with a coefficient of –5.833 ($p<0.1$, OR=0.003), *children number* with a coefficient of –1.132 ($p<0.01$, OR=0.322), *distance* with a coefficient of –0.165 ($p<0.01$, OR=0.848), and *doing exercise* with a coefficient of –0.170 ($p<0.1$, OR=0.844).

Among additional control variables included in the full model, *central area* is statistically significant ($p<0.1$) and has a negative effect on the probability of self-medication. Specifically, the respondents living in a central area of Ho Chi Minh City have a decrease of 0.615 in the log odds of the probability of self-medication compared to those from suburban areas (OR=0.540). Other additional covariates are statistically insignificant at any traditional level. These variables are *family size*, *insurance, chronic disease, close to health professional,* and *diet.*

Generally, there are certain variables that have statistically significant effects on the likelihood of self-medication include *high school or vocational, married, employed, log of income, children number, distance, doing exercise,* and *central area.* The findings demonstrate that the respondent with high school degree or vocational certificate, married status, or larger income tends on average to have more possibility to purchase medicines without prescriptions to resolve her or his health problems. In contrast, with being employed, having more one child, longer distance from home to the nearest hospital, doing exercise, living in a central region, the respondent on average decreases the probability of self-medication in Ho Chi Minh City, Vietnam.

Frequency of self-medication

Table 6 presents the results from poisson models for the frequency of self-medication in this study. There are also simple and full models of estimation in this section.

For simple model as indicated in column (1) of Table 6, almost independent variable are statistically significant at traditional level except for *age, lower secondary school*, and *doing exercise*. The Poisson regression model produces hence a high fit to the data in this study. The estimates are reasonable to indicate the crucial role of the respondents' socio-demographic characteristics as the primary determinants of the number of pharmacy visits without medical prescription.

It is clear that female on average have a larger number of self-medication compared to male. In particular, the male respondent is 0.442 time of self-medication less than the female. The negative association with the number of pharmacy visits without prescription are also found in variables such as *employed, children number* and *distance*. Specifically, the respondent with being employed, having more one child, or having one more km to the nearest hospital from home tends to decrease the number of self-medication compared to the counterpart by 3.254, 0.294, and 0.031 times respectively.

Table 6: Poisson models for the frequency of self-medication (dependent variable: the number of self-medication)

Variables	Simple model (1)	Full model (2)
Age	–0.006	–0.009
	(0.005)	(0.006)
	[0.994]	[0.991]
Male	–0.442***	–0.364***
	(0.079)	(0.083)
	[0.643]	[0.695]
Lower secondary school	–0.055	–0.120
	(0.139)	(0.149)
	[0.947]	[0.887]
High school or vocational	0.415***	0.385***
	(0.097)	(0.098)
	[1.514]	[1.470]
Married	0.449***	0.530***
	(0.143)	(0.167)
	[1.567]	[1.699]
Employed	–3.254***	–2.904***
	(0.816)	(0.832)
	[0.039]	[0.055]
Log of income	0.421***	0.387***
	(0.095)	(0.096)
	[1.523]	[1.473]

Family size		0.0003
		(0.031)
		[1.0003]
Children number	–0.294***	–0.350***
	(0.084)	(0.096)
	[0.746]	[0.704]
Insurance		–0.069
		(0.103)
		[0.933]
Distance	–0.031**	–0.037**
	(0.015)	(0.016)
	[0.969]	[0.964]
Chronic disease		0.546***
		(0.113)
		[1.726]
Close to health professional		–0.191**
		(0.076)
		[0.826]
Doing exercise	–0.001	0.006
	(0.020)	(0.021)
	[0.999]	[1.006]
Diet		0.018
		(0.090)

		[1.019]
Central area		–0.248***
		(0.082)
		[0.780]
Constant	1.140***	1.346***
	(0.171)	(0.246)
	[3.127]	[3.842]
Log likelihood	–608.480	–587.399
Pseudo R^2	0.076	0.108
Observations	241	241

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. *Tertiary education* is omitted variable. Standard errors are in parentheses and incidence rate ratios are in brackets.

In another pattern, *high school or vocational, married*, and *log of income* are positively related to the frequency of self-medication. In particular, the respondent with having the degree of high school or vocational certificate, being married status, or have one more VND 1,000 of monthly income is on average has the higher number of self-medications by respectively 0.415, 0.449, and 0.421 times compared to the counterpart with tertiary education, single or other maritual status, or less than one more VND 1,000 of monthly income.

Column (2) of Table 6 presents the estimation results for the full model of Poisson regression. It is apparently that when additional covariates included in the full model, the pattern of estimation results do not change. This finding can show that the estimation results are highly robust.

In particular, among addition variables, *chronic disease* ($p<0.01$) is positively correlated with the frequency of pharmacy visits without prescription. The repsondent with having chronic health problems on average has more the frequency of self-medication by 0.546 times compared to the counterpart observation. On the contrary, *close to health professional* ($p<0.05$) and *central area* ($p<0.01$) decrease the number of self-medication by 0.191 and 0.248 times respectively. Meanwhile, *family size, insurance* and *diet* are statistically insignificant for any conventional level among additional variables.

In general, both simple and full models of Poisson regression recognize the important variables that are statistically significant related to the frequency of self-medication from the sample of respondents in Ho Chi Minh City, Vietnam. In particular, *high school and vocational, married, log of income,* and *chronic disease* are positively associated with the number of self-medication. Meanwhile, *male, employed, children number, distance, close to health professional,* and *central area* are adversely related to the frequency of self-medication. Other variables including *age, lower secondary school, family size, insurance, doing exercise,* and *diet* are statistically insignificant at any conventional level.

6 Concluding Remarks

This study shows that self-medication is prevalent as a popular treatment for illnesses among urban citizens from Ho Chi Minh City in Vietnam, developing country in Southeast Asia.

This study recognized important determinants of self-medication among respondents in Ho Chi Minh City. In particular, the findings indicate that high school degree or vocational certificate, married status, or larger income are positively related to the probability of self-medication. In contrast, being employed, having more one child, longer distance from home to the nearest hospital, doing exercise, living in a central region are negatively associated with the probability of self-medication.

The study also finds that high school and vocational, married, income, and chronic disease are positively associated with the frequency of self-medication. Meanwhile, male, employed, children number, distance, close to health professional, and central area are adversely related to the frequency of self-medication in Ho Chi Minh City, Vietnam.

It is important to show that there is a difference in the association of gender on self-medication using various dependent variables. While gender is not significantly related to the probability of sel-medication, it is associated with the frequency of self-medication in Ho Chi Minh City, Vietnam. Hence the implication is the choice of proxy for self-medication can considerably influence the result.

Apparently, there are some common factors associated with self-medication as indicated from the existing literature that are also found in this study such as employment status (de Moraes *et al.* 2011), income (Awad *et al.* 2005), schooling level (Awad *et al.* 2005). Importantly, this paper shows that gender is not significantly associated with the probability of self-medication in Vietnam as other studies' findings, for instances de Moraes *et al.* (2011) in urban Brazil, Awad *et al.* (2005) in Sudan, and Garofalo *et al.* (2015) in urban Italy. Meanwhile, the result is that is respondents with chronic disorders are not associated with the probability self-medication is supported by the finding from de Moraes *et al.* (2011) in urban Southern Brazil.

This paper evidently provides more important facts on the determinants of self-medicating behaviors from developing countries, especially in urban areas where medicines and medical products are widely traded in the markets. Vietnam is an important and interesting case for investing this research topic because of its' process of transition from the planning economy to the market-oriented system including the health care activities.

The findings from this study also provide some significant implications for public policy in the management of self-medication, especially for the developing countries like Vietnam. Firstly, the management of quality of medicines and medical products is important to minimize the side-effects of self-medication when self-medication as a convenient approach to minor illnesses or health problems is so far seemingly unavoidable in the society. Secondy, the public provision of necessary information on the guide for self-medication is also crucial for citizens in order to maximize the positive effects of self-medication and decrease or even better avoid its adverse impacts as well.

However, this study also face some certain limitations. Firstly, the small sample does not this study allow to conduct more robustness checks for the results using various sub-samples based on different ranges or categories of income, education, location for instance among other respondents' and communities' characteristics. Secondly, this study employs the cross-sectional data and therefore it does not reveal the long-term trends of self-medicating behaviors of urban citizens. These limitations is necessary to be indicated as the research gaps for further studies.

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Appendices

APPENDIX 1: STATISTICAL DESCRIPTIONS

Table A1: The distribution of the frequency of self-medication

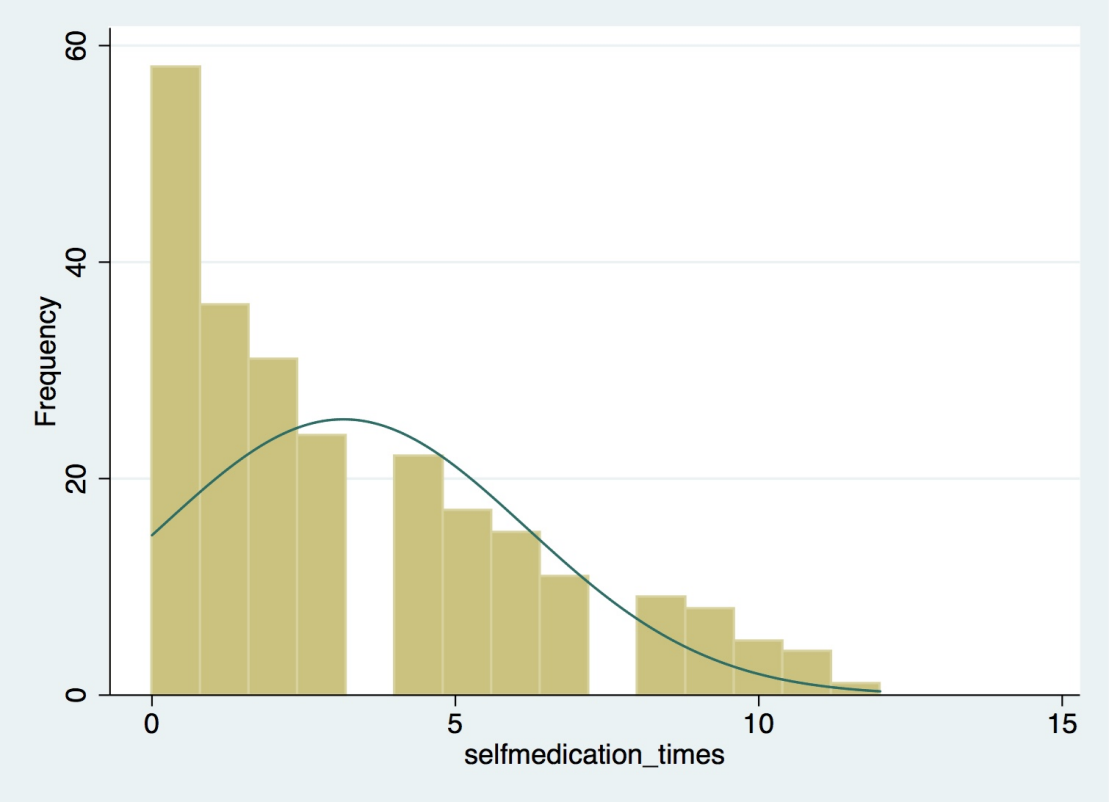


Table A2: The distribution of the respondents' income

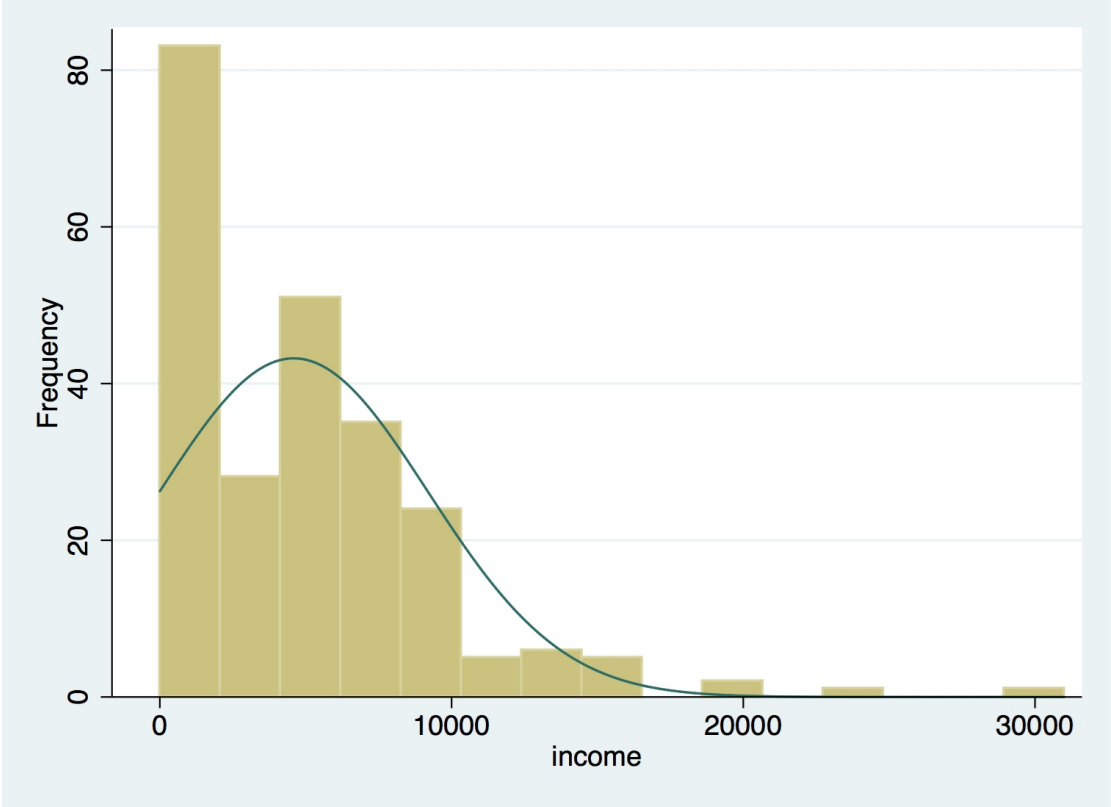


Figure A1: The percentage of types of illness/health problems using self-medication among respondents

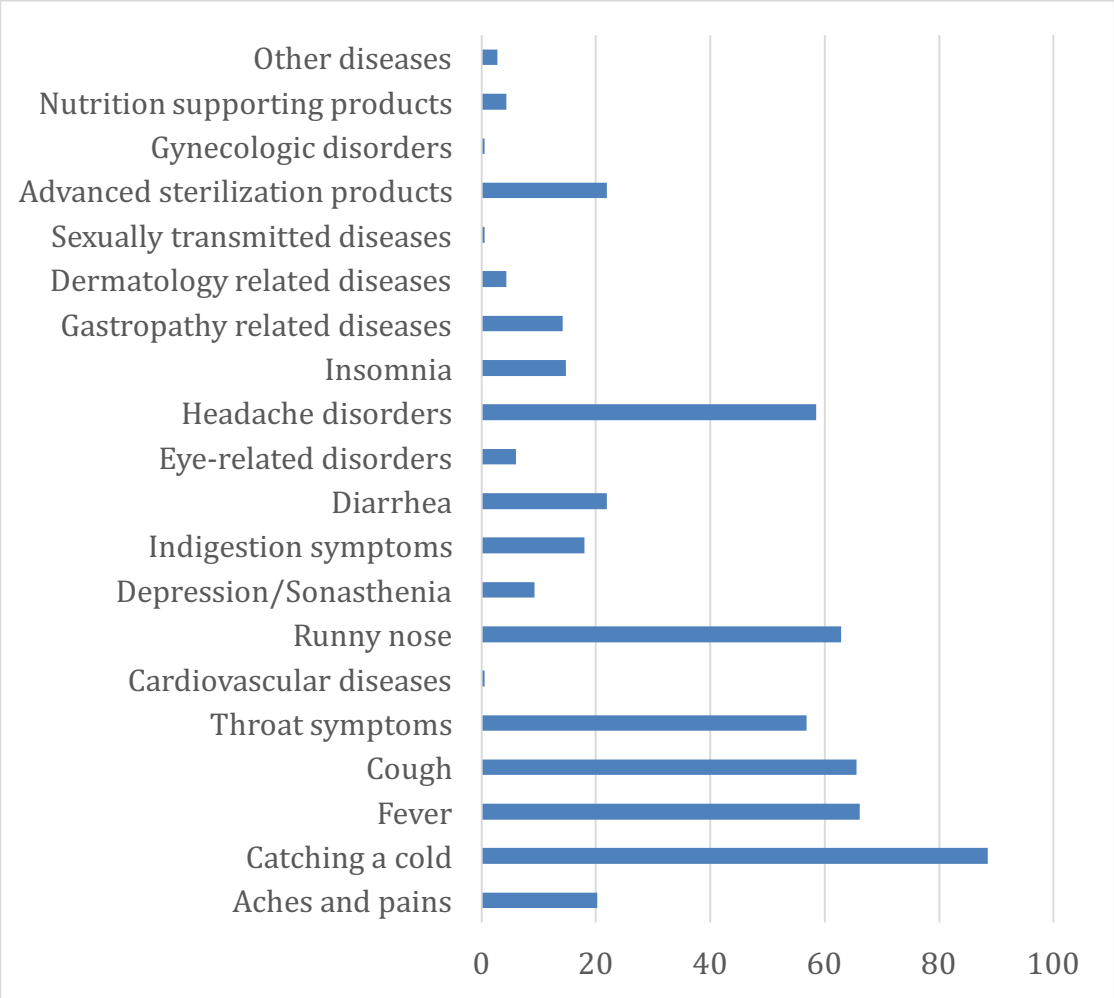
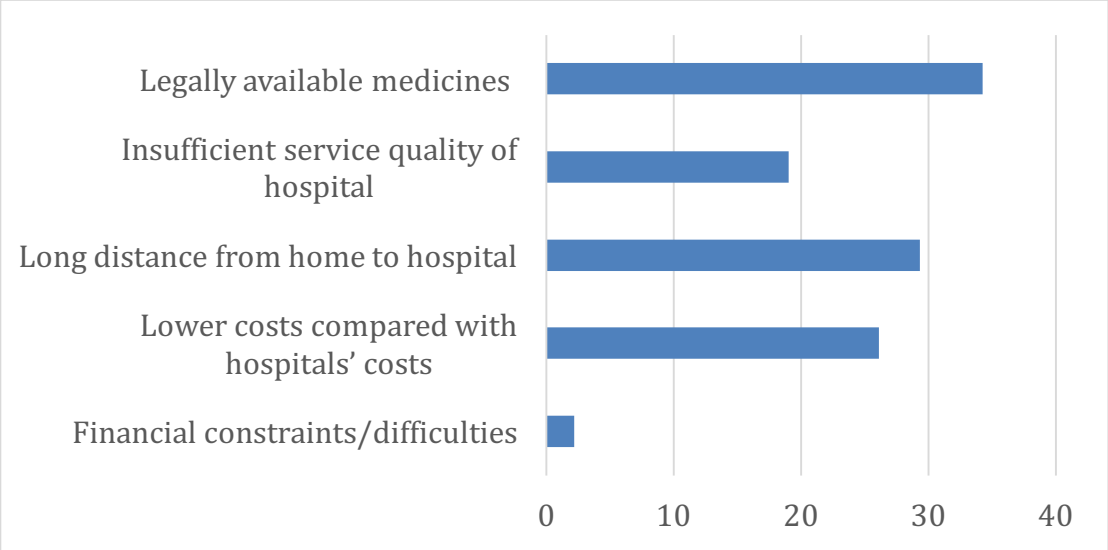


Figure A2: The percentage of reasons for self-medicating among respondents



APPENDIX 2: THE QUESTIONNAIRE

We are the researchers from University of Economics Ho Chi Minh City (UEH). We are implementing a study on health care and the behavior of self-medication among citizens. We would like to interview you in order to elicit related information. We promise that we use surveyed information for the scientific purposes and we do not publicly disclose your information.

Do you agree with us these terms and are willing to be our respondent?
☐ Yes → Let's begin the interview
☐ No → Stop the interview.

Name of respondent:
Address:
Phone number:

ID: ____

Name of emerator:
Date of interview:
Duration: ___hour ___ minute

SECTION 1: INFORMATION ON DEMOGRAPHIC-SOCIO-ECONOMIC CHARACTERISTICS OF THE RESPONDENT

QUESTION 1: How old are you? _____ years

QUESTION 2: What is your gender?
☐ Male
☐ Female
☐ Other

QUESTION 3: What is your schooling years? _____ years

QUESTION 4: Please indicate your highest qualification?

□ Going to primary school but	□ Going to vocational school

not having degree	but not having certificate
□ Completing and having the primary school's degree	□ Completing and having the vocational school's certificate
□ Going secondary school but not having degree	□ Going university but not having degree
□ Completing and having the secondary school's degree	□ Completing and having the bachelor's degree
□ Going high school but not having degree	□ Going post-graduate school but not having degree
□ Completing and having the high school's degree	□ Completing and having the post-graduate's degree

QUESTION 5: [For whom has tertiary education] Have you studied medical science or related major?
☐ Yes
☐ No

QUESTION 6: Do you have friends or relatives who work in the medical professional (doctor, nursing…)?
□ Yes
□ No

QUESTION 7: What is your marital status?
□ Single
□ Married
□ Divorced
□ Others

QUESTION 8: How many people your family currently has?
Family member number: _____ people
Children number: ____ people

QUESTION 9: What is your current employment status?
□ Part-time employment (self-employment or paid job)
□ Full-time employment (self-employment or paid job)
□ Unemployment
□ Retired
□ Home-working
□ Students

QUESTION 10: What is your monthly average level of income?

□ From VND 0 to under VND 2,000,000	□ From VND 16,000,000 to under VND 18,000,000
□ From VND 2,000,000 to under VND 4,000,000	□ From VND 18,000,000 to under VND 20,000,000
□ From VND 4,000,000 to under VND 6,000,000	□ From VND 20,000,000 to under VND 22,000,000
□ From VND 6,000,000 to under VND 8,000,000	□ From VND 22,000,000 to under VND 24,000,000
□ From VND 8,000,000 to under VND 10,000,000	□ From VND 24,000,000 to under VND 26,000,000
□ From VND 10,000,000 to under VND 12,000,000	□ From VND 26,000,000 to under VND 28,000,000
□ From VND 12,000,000 to under VND 14,000,000	□ From VND 28,000,000 to under VND 30,000,000
□ From VND 14,000,000 to under VND 16,000,000	□ From VND 30,000,000 and over

QUESTION 11: Do you participate in an organization in medical activities/public health and health care?
□ Yes
□ No
□ Unknown

SECTION 2: SELF-MEDICATION BEHAVIORS

QUESTION 12: Did you face any health problem over last year?
☐ Yes
☐ No
☐ Unknown

QUESTION 13: How many times did you visit doctors (including staying hospitals) over last year?
_____ times

QUESTION 14: Did you buy medicine by yourself in order to resolve some health problems?
☐ Yes
☐ No

QUESTION 15: How many times did you self-medicate from medicine shops over last year? _____ times

QUESTION 16: Do you buy medicines with doctors' prescription?
☐ Yes
☐ No

QUESTION 17: Do you take part in which on among the following insurance systems?
☐ State social insurance
☐ Private insurance
☐ I don't buy insurance
☐ I don't know

QUESTION 18: On average, how much did you cost for one time of self-medication? VND:_____

QUESTION 19: Which are the reasons for your self-medications? (You can choose more than one option)
☐ Financial constraint/difficulties
☐ Lower costs compared with hospitals' costs
☐ Long distance from home to hospital
☐ Insufficient service quality of hospital
☐ Legally available medicines
☐ Other reasons (please indicate): _____

QUESTION 20: Which disease do you use self-medication to treat for?
☐ Aches and pains
☐ Catching a cold
☐ Fever
☐ Cough
☐ Throat symptom
☐ Cardiovascular disease
☐ Runny nose
☐ Depression/Sonasthenia
☐ Indigestion symptoms
☐ Diarrhoea
☐ Eye-related disorders
☐ Headache disorders
☐ Insomnia
☐ Gastropathy related diseases

☐ Dermatology related diseases
☐ Sexually transmitted diseases
☐ Advanced Sterilization Products
☐ Gynecologic disorders
☐ Nutrition supporting products
☐ Other: _____

QUESTION 21: Where do you buy medicines by yourself?
☐ Pharmacist-owned store
☐ Hospital's pharmacy store
☐ Online transaction
☐ Supermarket/gloceries
☐ Other: _____

QUESTION 22: Do you buy medicines for treating chronic disease?
☐ Yes → Disease: _____
☐ No

QUESTION 23: Do you do exerices
☐ Yes
☐ No
☐ I don't know

QUESTION 24: How about your frequency of doing exercises?
☐ Daily
☐ Every two-day
☐ Every four-day
☐ Once a week
☐ Other:_____

QUESTION 25: Do you have diet for being better health?
☐ Yes
☐ No
☐ I don't know